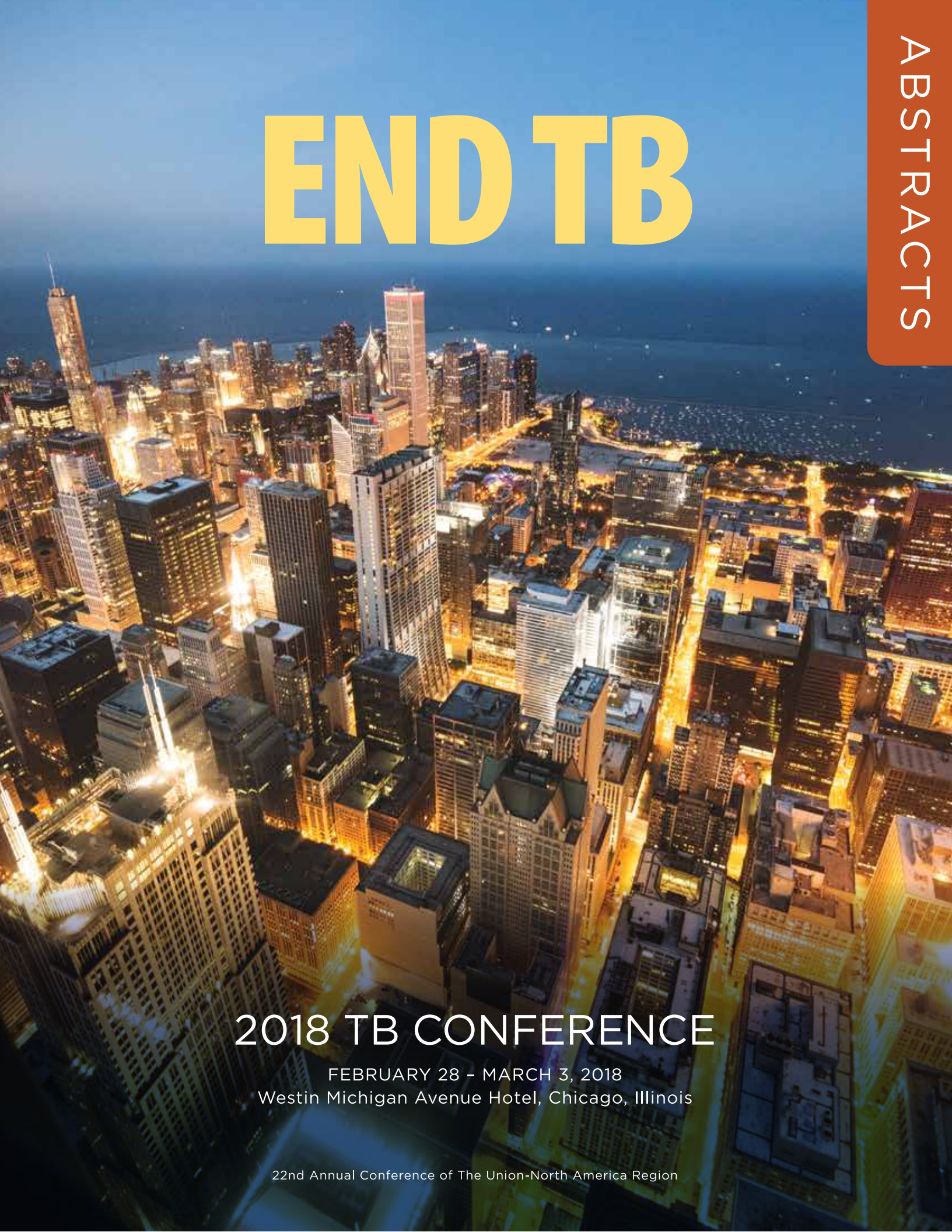
ABSTRACTS

END TB



2018 TB CONFERENCE

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Facilitator: Dr. Max Salfinger
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B. TB TREATMENT

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C. DRUG-RESISTANCE TB

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Facilitator: Dr. Robert Horsburgh
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D. TB DRUG-RESISTANCE/SEQUENCING

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POSTER SESSION FACILITATORS

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ABSTRACTS FOR ORAL PRESENTATION

Eligibility for a Shorter Treatment Regimen for Multidrug-resistant Tuberculosis in the United States, 2011-2016

Ms. Clarisse Tsang
Centers for Disease Control and Prevention, Atlanta, GA, USA

Promoting Communication through Texting at British Columbia Centre for Disease Control (BCCDC) Tuberculosis (TB) Services

Dr. Victoria Cook
British Columbia Centre for Disease Control, Vancouver, BC, Canada

Whole Genome Sequencing of *Mycobacterium tuberculosis* Identifies Transmission to Pediatric Patients in British Columbia, Canada, 2005-2014

Ms. Jennifer Guthrie
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Enhanced Completion and Safety for Treating Pediatric Tuberculosis Infection Using Shorter Regimens

Dr. Andrea Cruz
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Estimating the Impact of World Health Organization Latent Tuberculosis Screening and Treatment Guidelines on Tuberculosis Risk in Migrants to British Columbia, Canada

Dr. Lisa Ronald
British Columbia Centre for Disease Control, Vancouver, BC, Canada

Meta-Analysis of the Impact of Smoking on Tuberculosis Treatment Outcomes

Ms. Elisha Wang
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A. TB DIAGNOSIS

A1. STRENGTHENED TUBERCULOSIS CASE DETECTION IN MOTHER AND CHILD HIV TRANSMISSION CLINICS TO IMPROVE THE DETECTION OF TUBERCULOSIS CASES AMONG PREGNANT WOMEN IN KASAÏ CENTRAL/DR CONGO

Ilunga Mulaja JP. Equilibre International, Kananga, Province of Kasai Central, Democratic Republic of the Congo.

BACKGROUND

HIV prevalence in the Congo is estimated at 10.3% among adults aged 15-64 years. Women are more likely to be infected at 28.5%. Congo ranks 16th among the 22 countries with high tuberculosis suffering from tuberculosis in sub-Saharan Africa and an estimated TB / HIV co-infection rate of 60%. HIV testing at the antenatal clinic increased steadily between April 2014 and September 2016, with HIV testing rates of up to 93% among women. The purpose of this implementation study was to evaluate the implementation of the Integrated Tuberculosis Clinic for pregnant women receiving care in PMTCT clinics in 15 clinics in eight districts in the Provinces of Kasai Central and Lualaba in Congo DR.

METHODS

Tuberculosis screening forms have been used in health centers at clinics for the prevention of mother-to-child transmission of HIV, followed by on-the-job support through on-going training. Health care workers who are: nurses, clinicians and doctors have used TB testing tool in PMTC clinics. The patient's pathway was three-step, symptomatic screening, sputum smear and initiation of tuberculosis treatment, patients diagnosed with tuberculosis were monitored and monitored weekly for 2 months in the intensive phase and 2 weeks for 4 months in the continuation phase to reduce lost to follow-up.

RESULTS

56,010 pregnant mothers followed a clinic over an 18-month period, 52,144 (93%) were tested for HIV and 4567 (9%) were HIV-positive. Among positive clients, 4567 (100%) were screened by ICF and 310 (7%) were symptomatic, 22 (7%) diagnosed with active tuberculosis. 4 (18%) cases of smear-positive tuberculosis were diagnosed, 14 (64%) smear negative and 4 (18%) extra pulmonary and all 22 (100%) started treatment and placed on anti-tuberculosis treatment.

CONCLUSION

ICF management was 100% high in pregnant HIV-positive women. CIF has been operationally feasible and has become a routine aspect of tuberculosis and integrated HIV care in clinics for the prevention of mother-to-child transmission of HIV.

A2. BIOMARKERS TO DETECT ACTIVE TUBERCULOSIS: A SYSTEMATIC REVIEW OF THE EVIDENCE, QUALITY, AND PROGRESS IN THE LAST SIX YEARS

MacLean E[1], Broger T[2], Yerlikaya S[2], Pai M[1]. [1]McGill International TB Centre, Montreal, QC, Canada; [2]FIND, Geneva, Switzerland.

BACKGROUND

As 1.8 million of the 10.4 million people with new TB cases die each year, timely diagnosis and treatment initiation is critical. However, traditional diagnostic methods, such as sequencing or GeneXpert MTB/RIF, are inaccessible to populations at greatest risk of contracting TB. Biomarkers to detect active TB have been proposed as the bases for new diagnostic assays.

METHODS

In collaboration with FIND and in relation to WHO's high-priority Target Product Profiles (TPPs), we are conducting a systematic review of biomarkers for the detection of active TB. A comprehensive search term was composed and used in multiple scientific databases.

RESULTS

Initially, 6543 publications from 2010 to 2016 were identified. After deduplication, 3970 records were screened by title and abstract. Finally, 374 publications fulfilled the inclusion criteria. Types of biomarkers identified included antibodies, cytokines, metabolic activity markers, Mycobacterial antigenic proteins, and volatile organic compounds. Only 51% of studies reported a culture-based reference standard and diagnostic performance data beyond p-values. Few high-quality studies met TPP minimum criteria. Frequently, publications repeated the findings of other discovery-phase studies without moving the biomarker to a next developmental stage.

CONCLUSION

Overall, more validation studies that incorporate intended diagnostic use-cases are needed. The extracted data are currently being used by FIND as the foundation of a dynamic database in which biomarker data and developmental status will be presented. Ultimately, this database will enable developers and researchers to populate the TB biomarker pipeline, accelerating diagnostic test development.

A3. TOPOGRAPHY AND RADIOGRAPHIC PATTERNS OF PULMONARY TUBERCULOSIS IN MIGRANT POPULATION

Acosta-Loya J[1], Orozco-Andrade I[1], Bravo-Rodríguez G[1], Martínez-Lozano F[1], Enríquez-Porras A[1], Espinoza-Hernández M[1], Durán-Peña O[2], Orozco-Béjar I[3]. [1]Centro de Diagnóstico y Tratamiento Integral de la Tuberculosis (CDTITB) Servicios Médicos de la Frontera; [2]Secretaría de Salud del Estado de Chihuahua; [3]Universidad Autónoma de Chihuahua, Chihuahua, México.

BACKGROUND

To know the topography and radiographic patterns of pulmonary tuberculosis in migrant population.

METHODS

The databases of pulmonary tuberculosis (PTB) cases confirmed with culture positive and their postero-anterior chest radiographs were reviewed during the period from September 2007 to December 2016. The search for TBP was conducted based on the 2009 CDC Immigration requirements: Technical Instructions for Tuberculosis Screening and Treatment of the US. Descriptive analysis of the migrant population diagnosed with TBP was performed, using measures of central tendency and frequency, as well as Chi square significance tests, using the software STATA 12.

RESULTS

According to the medical and radiographic evaluation of 394,482 applicants to emigrate to the United States, 8,775 (2.2%) were patient with suspected TB, of which, 157 (1.8%) were positive for TBP. In 99%, the suspicion of TBP was by chest X-ray, 1.18% because of HIV and the remaining 0.05% because of clinical data. The pulmonary topography most often observed was the right apex (63.08%). The most frequent radiographic pattern was the infiltrate (72.48%). Radiographic images of 71 patients (52%) were considered highly suggestive.

CONCLUSION

The diagnosis of tuberculosis, in all forms, is not easy. And outside the gold standard (culture), there are no other tests that give us a certainty diagnosis. However, although there are no pathognomonic manifestations of TBP in the chest X-ray; we can observe radiographic patterns and pulmonary topography, which give us the possibility of suspecting in this pathology, so this study remains a very useful tool in the TB diagnosis.

A4. IS AN ENDOTRACHEAL ASPIRATE SUPERIOR TO EXPECTORATED SPUTUM IN EVALUATING PULMONARY TUBERCULOSIS?

Petrossian R, Conetta R, Walczyszyn M, Shakil J. Flushing Hospital Medical Center, Flushing, NY, USA.

BACKGROUND

Pulmonary tuberculosis (PTB) remains a leading cause of infectious disease morbidity and mortality worldwide. General consensus guidelines for PTB control recommend 3 negative sputum smears prior to the discontinuation of Airborne Isolation (AI). In clinical practice, this can cause a logistical strain on healthcare facilities and psychological burdens for patients. Flushing, New York has a tuberculosis incidence 5-fold greater than the nation.

METHODS

Patients included in our study had their sputum specimen (SS) collected from an endotracheal tube or tracheostomy tube. In our retrospective review, we examined the yield of Endotracheal Aspirates (EA) in evaluating the need for further airborne isolation.

RESULTS

We reviewed 117 cases of suspected or confirmed PTB evaluated using EA. No instance was documented where the third EA sputum specimen was discordant with previous samples. Specificity of 1 sputum smear from an EA was approximately 95%. In 104 cases where PTB disease or treatment failure was ruled out, the specificity of 2 smears was equal to that off 3 smears (98%).

CONCLUSION

Multiple studies have purported the third SS as negligible, minimally contributing to negative predictive value in certain populations. We propose that the third SS is unnecessary when the first two negative specimens are drawn from an endotracheal tube and AI can be discontinued. Third sample collection incurs an undue encumbrance on healthcare delivery. The requirement of three sputum specimens for patients with endotracheal tubes is probably unnecessary. Further investigation is warranted especially considering the increasing prevalence of chronic lung disease and access to mechanical ventilation worldwide.

A5. TUBERCULOSIS DIAGNOSTIC YIELD FROM ZIEHL-NEELSEN SMEAR MICROSCOPY, GeneXpert MTB/RIF AND A THIN LAYER AGAR MDR/XDR-TB COLOUR TEST

Ramos ES[1], Datta S[1,2,3], Aparicio C[1,2], Alvarado K[1,2], Tovar MA[1,2], Montoya R[2], Valencia TR[1], Evans CA[1,2,3]. [1]IFHAD: Innovation For Health And Development, Universidad Peruana Cayetano Heredia, San Martin de Porres; [2]Innovación por la Salud y el Desarrollo (IPSYD), Asociación Benéfica Prisma, San Miguel, Lima, Perú; [3]Wellcome Trust Centre for Global Health Research, Imperial College London, UK.

BACKGROUND

Sputum laboratory testing is important for patients commencing TB therapy to confirm their diagnosis and test for drug-resistance Objective: To compare the TB diagnostic yield of sputum testing by direct Ziehl-Neelsen smear microscopy (smear), GeneXpert MTB/RIF (Xpert) and MDR/XDR-TB Colour Test thin layer agar solid culture (culture).

METHODS

Between July 2016 to August 2017, all patients about to commence treatment for suspected pulmonary or extrapulmonary TB provided a single 'spot' sputum sample in Callao, Peru. All samples underwent smear (0.04 ml sputum), Xpert (1 ml sputum) and culture (0.5 ml sputum). Failed tests were analysed as negative (invalid Xpert results or uninterpretable cultures because of contamination).

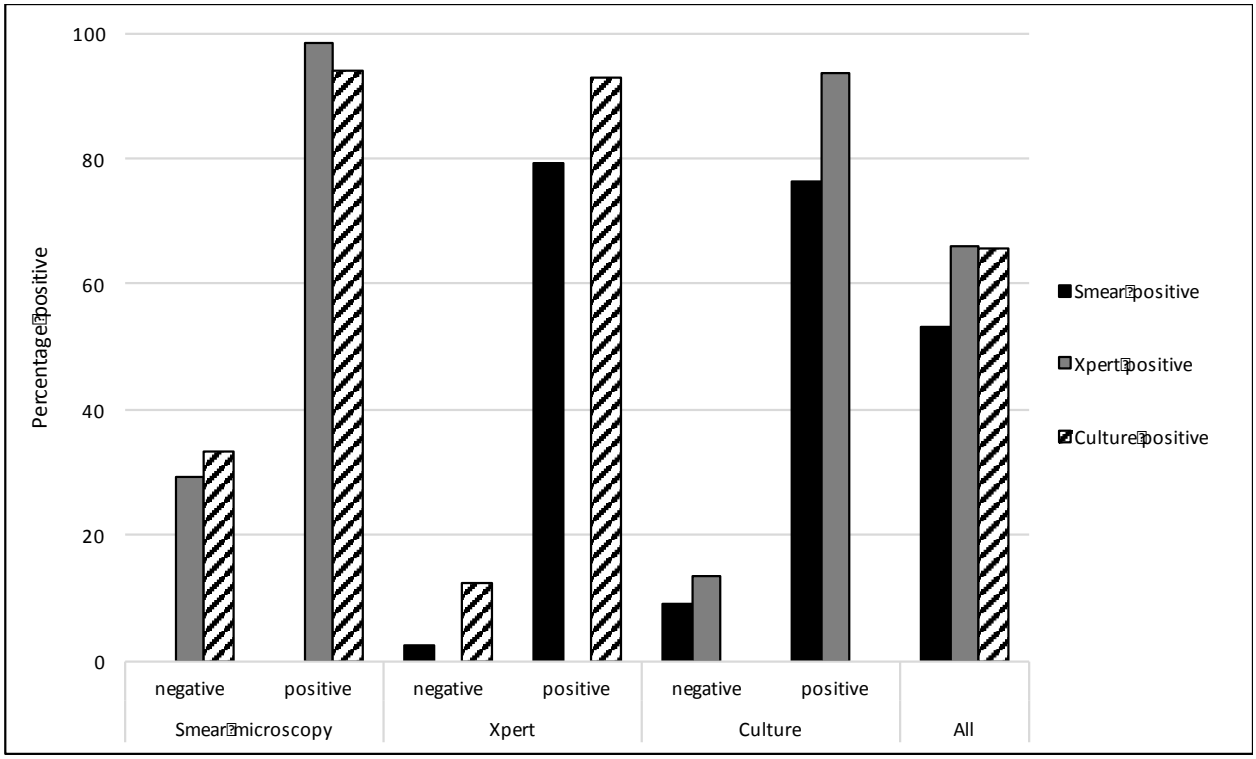
RESULTS

739 samples were collected, 2 of which were excluded because only non-tuberculous mycobacteria were detected. 53% (391/737) of samples were smear-positive, significantly (P<0.0001) less than 66% positivity for Xpert (486/737) and 66% for culture (483/737). 2.4% (18/737) Xpert tests failed and no cultures failed. Xpert and culture had similar diagnostic yield (P=0.8). For culture-positive samples, 16% were Xpert-negative, and 24% were smear-negative; for Xpert-positive samples, 13% were culture-negative, and 29% were smear-negative (see Figure). Xpert and smear results took 1 day and cultures took 8-42 days, median 16 days

CONCLUSION

Xpert and culture had similar diagnostic yields. Xpert was much more rapid whereas culture was less expensive and provided more complete drug-susceptibility testing and the *M. tuberculosis* strain for further analysis. Smear was rapid, least expensive but had lowest yield. Thus, Xpert largely obviated smear, whereas Xpert and culture provided complementary information for patient care.

Figure: Bar chart demonstrating the yield of smear microscopy versus Xpert versus Culture.



B. TB TREATMENT

B1. FIXED-DOSE COMBINATION SCHEME: TB TREATMENT OUTCOMES IN HIGH INCIDENCE AREA

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BACKGROUND

To describe both pulmonary tuberculosis (PTB) and the main treatment outcomes in the period before and after the introduction, in 2010, of the fixed-dose combination therapeutic regimen (RHZE) in a city with high burden of TB.

METHODS

A descriptive study covering the period from 2008 to 2014, including patients with PTB with 15 years of age or older, residing in Santos, treated with RHZ or RHZE. Source of data: São Paulo state tuberculosis surveillance. The descriptive analysis was done by cohorts of patients defined according to the year of the first treatment. We used Pearson's chi-square test, Fisher's exact test, chi-square test for trends for comparative proportions analyzes, and the Kruskal-Wallis test for the continuous variables.

RESULTS

Of the 1603 cases studied, 39 years old on average, 7.7% diabetics, 11.5% had TB/HIV coinfection; 29.8% were treated with RHZ and 70.2% with RHZE. Comparing the cases treated with RHZ, in 2008, with those treated with RHZE, in 2014, we found a decrease of hospitalizations (21.6% versus 12.9%; p<0.0001, X2 trend), the cure rates and treatment failure remained at around 80.0% and 1.3%, respectively. There was a decline in post-cure retreatment (4.7% versus zero; p<0.0001, X2 trend), in the proportion of deaths from TB (3.4 % versus 0.9%; p=0.050; X2 trend) and deaths from other causes (3.4% versus 2.1 %; p=0.028; X2 trend). Treatment abandonment remained at around 13.7% while 70.0% of then, did not return for retreatment.

CONCLUSION

After the introduction of RHZE, there was a decrease in TB severity, nevertheless, the cure rate and treatment abandonment showed no significant change. Moreover, a high proportion of patients who abandoned treatment did not return for retreatment. Such results suggest the necessity of additional strategies to improve patient adherence to TB treatment focusing on patients at high risk of abandoning the treatment.

Keywords: Tuberculosis, control, epidemiology, treatment outcome, Therapeutic scheme.

B2. **RETHINKING THE CONTAGION OF LARYNGEAL TUBERCULOSIS: TWO CASE REPORTS AND LITERATURE REVIEW**

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BACKGROUND

Laryngeal tuberculosis (LTB) has a reputation as being one of the most infectious forms of active tuberculosis. New Hampshire Division of Public Health Services investigated two recent cases of LTB and sought to clarify associated public health risk of the disease.

METHODS

We summarize clinical and epidemiologic aspects of two LTB cases, and conduct a comprehensive literature review of LTB.

RESULTS

A 50 year old Indonesian woman sought medical attention multiple times over nine months for isolated dysphagia and dysphonia. She developed cough, abnormal chest imaging, and received biopsy culture confirmation of LTB. An 81 year old Indian male sought medical attention for isolated dysphagia six times over six months before weight loss and cough developed, prompting imaging and eventual laryngeal biopsy; tissue culture confirmed *M. tuberculosis*. For both cases, pulmonary symptoms occurred several months following the onset of laryngeal symptoms, suggesting primary LTB. Extensive contact investigations around both patients revealed no transmission. We identified 1695 articles in our search, of which 325 articles described LTB. Primary LTB results from direct invasion of the bacilli into the larynx, in contrast to secondary TB attributable to progression from advanced pulmonary TB. Literature supports limited contagion of primary LTB, as compared to secondary LTB.

CONCLUSION

Delayed diagnosis of primary LTB may allow disease extension into the lungs. Our results suggest that primary LTB may not be as infectious as secondary LTB. Clinicians should consider this diagnosis for patients with TB risk presenting with laryngeal symptoms. Early diagnosis may prevent additional patient morbidity and community transmission.

B3. DRONE OBSERVED THERAPY SYSTEM (DrOTS) FOR TUBERCULOSIS CARE DELIVERY IN REMOTE RURAL MADAGASCAR

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BACKGROUND AND PROBLEM ADRESSED

In Madagascar, as in many other high prevalence settings, tuberculosis (TB) care relies on centralized infrastructures with limited geographic coverage and inadequately supported community health workers. The time and economic burden of seeking medical care in this context is prohibiting.

INTERVENTION

The "Drone Observed Therapy System" (DrOTS) integrates drones to transport medication and clinical samples between communities and diagnostic and treatment centers, evriMED pillboxes to remotely monitor treatment adherence, and end-user developed educational videos to support patients and providers throughout the TB pathway from diagnosis to cure (Figure 1). Impact of DrOTS on additionally notified cases and treatment initiation, adherence and completion in the Androrangavola commune is monitored by step-wedge and historic trend case-control studies. A mixed quantitative and qualitative methods study assessed villager's cultural acceptability and perceptions of DrOTS. A population-based decision-analysis model was designed to measure its cost-effectiveness.

RESULTS AND LESSONS LEARNED

Baseline TB data has been collected, DrOTS has been deployed, cases of TB have been diagnosed and cost-effectiveness analysis modeling data found DrOTS to be cost-effective compared to directly observed therapy (DOT) for pulmonary drug sensitive TB at $1015.27 per disability adjusted life years (DALY) averted. Acceptability qualitative data collection is ongoing.

CONCLUSIONS AND KEY RECOMMENDATIONS

DrOTS is innovative, cost-effective and anticipated to increase TB detection and successful treatment in underserved communities. Its deployment will provide comprehensive and translational evaluation of its various technological components and provide the evidence base to pave the way for future scale.

B4. BARRERAS EN EL DIAGNÓSTICO Y TRATAMIENTO PARA TUBERCULOSIS EN UNA REGIÓN DE COLOMBIA

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ANTECEDENTES

La tuberculosis (TB) es uno de los principales problemas de salud en el mundo. Para 2035 la Organización Mundial de la Salud (OMS) plantea ponerle fin como problema de salud pública. En Colombia, el departamento del Cauca no ha logrado alcanzar la meta de diagnóstico oportuno de casos nuevos de TB. Por tanto, requiere identificar factores asociados a demoras en diagnóstico e inicio de tratamiento en ese contexto.

MÉTODOS

Estudio descriptivo de corte transversal, momento inicial de estudio con enfoque mixto. Se muestran resultados de fase cuantitativa donde se recolectaron, a partir de diversas fuentes dentro del sistema, variables individuales, clínicas y del sistema de salud. Se incluyeron adultos que eran casos nuevos de TB pulmonar bacteriológicamente confirmados durante 2016. Se realizaron análisis univariados, bivariados y regresión logística usando STATAv14.

RESULTADOS

En total 117 casos fueron detectados. La mediana desde inicio de síntomas hasta inicio de tratamiento fue 54 días (RIC: 30-122). El 66,7% de los pacientes tuvieron diagnósticos tardíos (>30 días desde inicio de síntomas hasta confirmación bacteriológica). El 30,8% tuvo inicio de tratamiento tardío (>2 días desde confirmación bacteriológica hasta inicio de tratamiento). Tanto para diagnóstico como inicio de tratamiento, ser atendido en una institución de mediana o alta complejidad representó un factor protector (OR: 0,21; IC95%: 0,1-0,5 y OR: 0,08; IC95%: 0,0-0,4 respectivamente).

CONCLUSIÓN

En esta población, las demoras en el diagnóstico de TB están asociadas con atención en niveles de baja complejidad. Es preciso profundizar el análisis de datos para identificar el cuadro completo que explica los retrasos diagnósticos.

B5. **ACCURATELY MEASURING TUBERCULOSIS TREATMENT ADHERENCE IN OBSERVATIONAL RESEARCH: A DOT PROGRAM DESIGNED FOR A PROSPECTIVE COHORT STUDY**

Ragan EJ[1], Banos M[2], Gill CJ[2], Horsburgh CR[2], Warren RM[3], Myers B[4], Jacobson KR[1]. [1]Boston Medical Center; [2]Boston University School of Public Health, Boston, MA, USA; [3]Stellenbosch University; [4]South African Medical Research Council, Cape Town, South Africa.

BACKGROUND

Obtaining accurate medication adherence measures in prospective observational studies is challenging. Commonly used measures, such as self-report and pill counts, are vulnerable to falsification. We created an mHealth-based directly observed therapy (DOT) program to improve adherence capture for TRUST, an ongoing prospective cohort study (R01AI119037) in South Africa.

METHODS

In our program, community health workers (CHWs) observe therapy on weekdays for assigned participants throughout the six months of treatment and submit adherence data via our smartphone application. CHWs indicate whether pill-taking was self-reported or observed, the latter confirmed by scanning a unique barcode placed on each participant's pill bottle. Daily adherence data is remotely uploaded to a central server, which feeds a data dashboard we created to display monitoring indicators defined at both the participant and the CHW level. This provides study staff near real-time knowledge of patient adherence and CHW performance.

RESULTS

Within the preliminary period of May to October 2016, we recorded 930 participant-days for 20 participants. Of these, 678 (72.9%) were observed ingestion, 236 (25.4%) were self-reported ingestion, and 16 (1.7%) were missed doses. The median number of days per participant was 43 (IQR 13-76). The mean cumulative adherence (both observed and self-reported) per participant was 98.8% (sd 1.9%), and the median proportion of adherent days that were observed per participant was 75.9% (IQR 62.3-80.1%).

CONCLUSION

Our findings demonstrate that mHealth-based DOT can be achieved in a setting with high gang violence, substance use, and low personal mobile phone ownership, with more than 70% of participant-days as observed.

C. DRUG-RESISTANCE TB

C1. TUBERCULOSIS MULTIDRUG-RESISTANT AND EXTENSIVELY RESISTANT IN METROPOLITAN AREA OF HIGH INCIDENCE, BRAZIL

Gobetti Vieira Coelho A[1], Chiou AC [1], Ferrazoli L[2], de Oliveira R[2], Alves Waldman E[3]. [1]Laboratório de Micobactérias, Núcleo de Ciências Biomédicas, Instituto Adolfo Lutz, Centro Laboratório Regional de Santos (CLR); [2]Núcleo de Tuberculose e Micobacterioses, Instituto Adolfo Lutz, Laboratório Central; [3]Faculdade de Saúde Pública da Universidade de São Paulo, SP, Brasil.

BACKGROUND

The tuberculosis (TB) incidence in the city of Santos (SP), southeastern Brazil, is 73/100,000 inhabitants-year, with the incidence for MDR-TB in the city on early last decade estimated at 1.9/100,000 inhabitants-year. This report describes the epidemiology and drug sensitivity profile of first and second line between patients with pulmonary TB (TBP), in the municipality of Santos (SP).

METHODS

Descriptive study was conducted including pulmonary TB cases confirmed by culture and submitted to drug susceptibility testing (DST). Patients were 15 years or older, living in Santos, and started treatment between 2011 and 2012.

RESULTS

The study included 263 cases of pulmonary TB, 68.4% (180/263) were men, the median age was 38 years, 18.2% (39/214) were HIV positive, 21.7% (57/263) had a previous history of TB, 46.7% (123/263) were undergoing supervised treatment, 71.7% (182/254) progress to cure, 21.7% (55/254) abandoned the treatment and 4.8% (12/254) died. Were sensitive to all drugs 89.3% of the cases, the prevalence of resistance to isoniazid was 8.4%, to rifampicin was 3.8%. The MR-TB stood at 3.4% (9/263), and 4/9 were XR-TB; the primary MR-TB was found was found in 1.9% (4/206) of the cases. The average annual incidence of MR-TB was 0.57/100.000 inhabitants.

CONCLUSION

The high prevalence of resistance, especially of MR-TB, including TBXR cases highlight the need to universalize the culture and TS, increase the supervised treatment coverage, the routine investigation of contacts and monitoring of drug resistance.

C2. AN OUTBREAK OF MULTI-DRUG RESISTANT TUBERCULOSIS, MINNESOTA 2016-2017

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BACKGROUND

Multidrug-resistant tuberculosis (MDR TB) is more difficult to treat and outcomes are worse than for drug-susceptible TB disease. MDR TB cases in Minnesota increased from zero in 2015 to nine in 2016. Case investigations suggested an outbreak. We describe the public health response, challenges of contact investigations (CIs), and ongoing management of contacts.

INTERVENTION/RESPONSE

CDC performed whole-genome sequencing (WGS) to evaluate relatedness of MDR TB isolates. We conducted CIs for infectious cases. We created outbreak specific guidelines for screening and management of contacts, and partnered with various agencies to increase MDR TB awareness.

RESULTS

WGS results were consistent with an MDR TB outbreak that included 10 cases (70% pulmonary) as of November, 2017. Limited provider awareness about TB contributed to delayed diagnoses. CIs identified 498 contacts; 7.8% (n=39) of contacts had previously documented positive TB infection test results, and 14.7% (n=73) were newly positive for TB infection (median age: 73 years). Eight cases were epidemiologically-linked to one Hmong adult day center. Forty-five contacts started moxifloxacin for latent MDR TB infection. Contacts who declined treatment began a 2-year clinical monitoring program.

CONCLUSION

In this outbreak, delayed diagnoses resulted in long infectious periods and hundreds of contacts. WGS results were consistent with recent transmission. We discovered adult day centers are an overlooked congregate setting. CIs were complicated by limited public health funding and high underlying TB infection prevalence in the affected community. Increased community and provider awareness and intensified screening of contacts resulted in additional case finding and prevention interventions.

C3. BARRIERS TO BEDAQUILINE USE IN TUBERCULOSIS PROGRAM IN THE UNITED STATES

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BACKGROUND

Treatment options for drug-resistant tuberculosis (DR-TB) are limited. Bedaquiline is a new drug that can be added to MDR-TB treatment regimens; yet relatively few programs have accessed it. Barriers to bedaquiline use are unclear, and we undertook a survey of U.S. TB controllers to assess what can be done to increase use, with a focus on cost and access issues.

METHODS

A survey was administered to all 68 U.S. Centers for Disease Control and Prevention CDC) funded health department TB programs in 50 states, 10 large cities, 6 U.S. affiliated territories using a web-based questionnaire.

RESULTS

Responses were received for TB programs in 9 cities, 6 territories, and all 50 states. Sixty-three of 65 (97%) respondents felt that the cost of bedaquiline is prohibitively expensive. Cost was the only reported barrier for 11/62 (18%) of respondents, and was an additional barrier to use for 21/62 (34%). WE analyzed open-ended responses on other barriers which are summarized in figure 1. When asked about the maximum cost of TB programs were willing to pay for a full course of bedaquiline, the mean response was $6,130.

CONCLUSIONS

While a donation program or concessional pricing is available in most high burden countries, bedaqiline's cost in the U.S. is prohibitive. With drug-resistant forms of TB rising, we urge Janssen to lower the cost of bedaquiline and remove the requirement to purchase the full six-month course of treatment up front. Standardized guidance on how to navigate the process for prescribing and procuring bedaquiline may also help increase access.

C4. **A PROFILE OF THE CHARACTERISTICS OF MDR-TB IN GUYANA**

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BACKGROUND

With the implementation of the Xpert MTB/RIF testing in 2014, the NTP has noticed an upward trend in the amount of DR cases diagnosed. However, Guyana did not met its WHO estimated annual number of MDR cases. To improve case detection, it was important to determine the risk factors associated with the development of MDR-TB.

METHOD

An investigative study was conducted on 23 MDR-TB cases registered during June, 2015 – August, 2017 from 6 of the 10 administrative regions. A data collection checklist of possible risk factors associated with MDR-TB was analysed in MS Excel, 2007. Factors inclusive of age, sex, ethnicity, marital status, category of patients, drug history, incarceration history, substance misuse and HIV status were among some of the variables investigated.

RESULTS

Over 85% of the total cases were males; 87% had single marital status and 96% were among the working population. The Afro-Guyanese population was most affected representing 61% of the cases, followed by 22% indigenous population and 13% Indo-Guyanese population. Relapse TB cases accounted for 57% as compared to 17 % new cases; 13% cases were LTFU and similar 13% was treatment failure. 57% cases were smokers and 22% cases consume alcohol. 35% of the cases were TB/HIV co-infected of which 9% occurred in the prisons. Urban areas accounted for 74% of all cases.

CONCLUSION

Evidently, there is a high association of certain factors with MDR-TB, however, more comparative studies are needed to determine associative risk factors.

C5. POOR ENVIRONMENT AS A RISK FACTOR OF HOUSEHOLD MDR-TB TRANSMISSION: A CASE STUDY FROM INDONESIA

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BACKGROUND

Indonesia is a high MDR-TB burdened country with 2,293 confirmed cases in 2016. The transmission is associated to environmental factors in household setting. This case study aims to measure and evaluate household factors in household contacts which representing MDR-TB household transmission risk in Indonesia.

METHODS

A house occupied by a mother as the index case, a son as the contact case, and three other family members were assessed in three aspects. We utilized Vaneometer™, Mastech MS6612 Digital Light Lux Meter ®, and measuring tape, to measure ventilation in air change per hour (ACH), lighting in lux, and crowd in meter square (m2), respectively. The measurement was held in the three rooms as the center of family's activity. The results were compared to national and international healthy house standard.

RESULTS

Ventilation rate were 59.78, 24.34, and 37.56 ACH, whereas two rooms of them improved by fan (73.03 and 250.44 ACH). Lighting in three rooms showed 4.01, 22.30, and 140.67 lux. The house had a space per person 8.56 m2. Generally, the house had adequate ventilation and inadequate lighting. Overcrowding was also revealed in this house.

CONCLUSION

Environmental factors such as poor lighting and overcrowd could influence the risk of transmission. Moreover, both the index and contact case have another factor which may increase transmission: diabetes mellitus and smoking habit, respectively. We suggest for further investigation of pathogen strain on the two subjects to prove household transmission and re-evaluation of three other family members to confirm there is no latent MDR-TB infection.

C6. **HOW WELL IS DIRECTLY OBSERVED THERAPY (DOT) DELIVERED IN A COMMUNITY-BASED MULTIDRUG-RESISTANT TUBERCULOSIS CARE PROJECT IN MYANMAR?**

Kyaw NT[1], Aye Myat Thi AM[1], Kumar AMV[2,3], Srinath Satyanarayana S[3], Kyaw KW[1], Sithu A[1], Oo MM[1], Thein S[4], Aung ST[4], Htwe PS[1], Yar N[1], Harries HD[2,5]. [1]International Union against Tuberculosis and Lung disease, The Union Myanmar, Mandalay, Myanmar; [2]International Union Against Tuberculosis and Lung Disease, Paris, France; [3]International Union Against Tuberculosis and Lung Disease, The Union South-East Asia, New Delhi, India; [4]National Tuberculosis Program, Department of Public Health, Nay Pyi Taw, Myanmar; [5]London School of Hygiene and Tropical Medicine, London, UK.

BACKGROUND

Multidrug-resistant tuberculosis (MDR-TB) patients were treated with 20 months long regimen in Myanmar and daily directly observed therapy (DOT) is one of the main components of the management of MDR-TB patients. We assessed the evening DOT delivered by the volunteers under the community-based MDR-TB care project implemented by The Union.

METHODS

A cross-sectional community-based survey was conducted in 10 townships in Myanmar in 2016. The study participants were patients with MDR-TB receiving DOT for their treatment, volunteers administering evening DOT and nurses. DOT was defined as “the swallowing of drugs being eye-witnessed by a community volunteer”.

RESULTS

Out of 43 patients participated in the survey, 95% of them received DOT in intensive phase, and 88% received DOT in the continuation phase of treatment. According to volunteers, they provided DOT to 87% and 94% of patients in intensive and continuation phases respectively. Seven (70%) of focal point nurses answered that volunteers practiced daily DOT during intensive phase and three (30%) of them answered the same for the continuation phase. While 84% of patients thought that DOT by a community volunteer was necessary, 16% thought otherwise as they felt that a family member could serve as DOT provider.

CONCLUSION

The finding suggested that there were MDR-TB patients who did not receive DOT. Barriers of being unable to deliver daily DOT need to be explored, and new approaches for different treatment administration options such as assigning family members to be DOT providers or video-observed treatment should be considered.

C7. TRANSMISSION OF TUBERCULOSIS AMONG HOUSEHOLD CONTACTS OF PATIENTS WITH MULTIDRUG-RESISTANT TUBERCULOSIS IN MYANMAR, 2016-2017

Kyaw NT[1], Aye Myat Thi AM[1], Kumar AMV[2,3], Srinath Satyanarayana S[3], Kyaw KW[1], Sithu A[1], Oo MM[1], Thein S[4], Aung ST[4], Htwe PS[1], Yar N[1], Harries HD[2,5]. [1]International Union against Tuberculosis and Lung Disease, The Union Myanmar, Mandalay, Myanmar; [2]International Union Against Tuberculosis and Lung Disease, Paris, France; [3]International Union Against Tuberculosis and Lung disease, The Union South-East Asia, New Delhi, India; [4]National Tuberculosis Program, Department of Public Health, Nay Pyi Taw, Myanmar; [5]London School of Hygiene and Tropical Medicine, London, UK.

BACKGROUND

Myanmar is considered among one of the 30 highest multidrug resistant tuberculosis (MDR-TB) burdened countries in the world. Household contacts of MDR-TB patients are at a higher risk of developing active TB. A systematic TB screening and investigation among household contacts of MDR-TB patients was implemented by The Union in 33 townships in Myanmar.

METHODS

We assessed the TB screening cascade, yield of TB, and their risk factors among household contacts of MDR-TB patients. A trained nurse visited households of MDR-TB patients, screened TB following an algorithm (Figure). Those who tested positive on smear microscopy, Xpert-MTB/RIF testing, or diagnosed clinically by the medical officers as TB were considered to be a case of active TB.

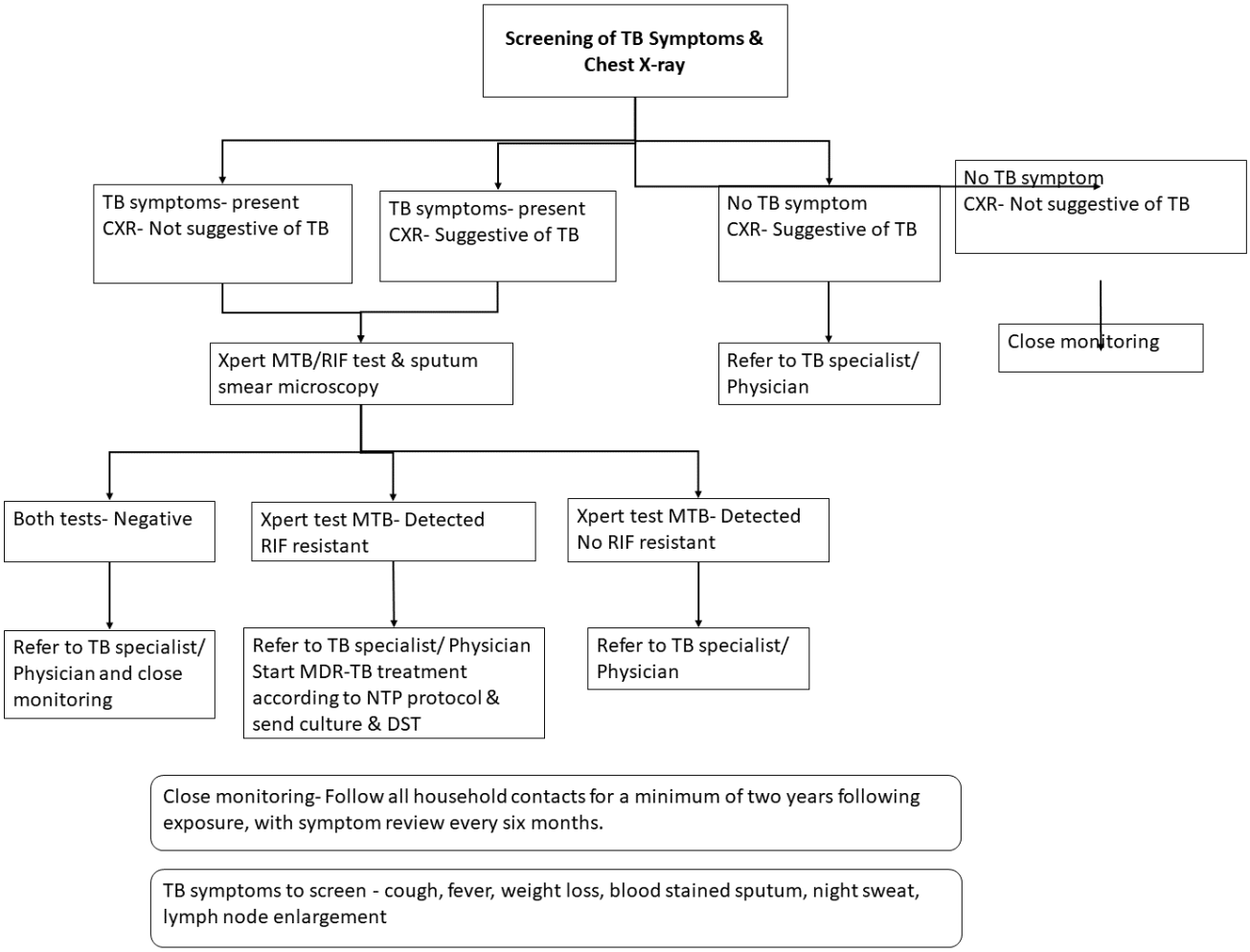
RESULTS

Out of 620 household members of 210 index MDR-TB patients, all underwent TB symptoms screening, 505 (81%) received chest radiography, 231 (37%) underwent sputum smear microscopy, and 178 (29%) tested for Xpert MTB/RIF testing. A total of 24 contacts were diagnosed with TB, two of which were resistant to Rifampicin. Yield of TB among all household contacts was 3.9% (95% CI: 2.3, 6.5). Children aged less than 5 years was a significant risk factor for TB diagnosis among household contacts (PR 3.7 (95% CI: 1.2, 11.4).

CONCLUSION

Our study highlights the importance of the systematic screening and investigation of TB in household contacts of MDR-TB patients. In addition, infection control measure at the household level should be strengthened to prevent TB transmission among contacts of MDR-TB patients.

Figure. Screening and diagnosis algorithm of tuberculosis (TB) among household contacts of MDR-TB patients



C8. EVALUATION OF A NOVEL JOB AID FOR MDR-TB NURSING CARE

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BACKGROUND

Second-line anti-TB drugs are associated with many side-effects which left unaddressed, may result in the patient stopping MDR/XDR-TB treatment prematurely. Nurses oversee MDR/XDR-TB treatment yet resources to guide nursing assessment and care of patient's experiencing side-effects are limited. A job aid aimed at providing this guidance was developed and evaluated by nurses practicing in high and low TB incidence settings.

INTERVENTION

Common and serious side-effects were included and possible presenting symptoms described for each. Nursing and MDR-TB literature was reviewed to establish best practice nursing assessment and intervention guidance. Draft job aid was translated into multiple languages and distributed to nurses providing MDR/XDR-TB care in high- and low-incidence settings with evaluation questionnaire completed after using the tool.

RESULTS

113 nurses from 8 countries (China, Russia, Mexico, Uganda, Tanzania, Zambia, Thailand, USA) provided feedback. Respondent's nursing experience ranged from 1-40 years (median 10; IQR 5-19) and MDR-TB experience from 1-22 years (median 6; IQR 2-8). Of respondents who self-assessed their confidence in ability to help MDR-TB patients with side-effects during treatment, 62/112 (55%) reported confident to extremely confident before using the job aid compared with 86/95 (90.5%) after use. Of nurses who gave example(s) of how they used the tool, 50/81 (62%) reported a positive influence on their nursing practice. Comments included "It helped me make decisions about interventions" and "Became the main reference book."

CONCLUSION

Nurses reported benefit from this job aid which provides guidance on nursing assessment and interventions for DR-TB treatment side-effects. Feedback will be used to refine the tool.

C9. **ELIGIBILITY FOR A SHORTER TREATMENT REGIMEN FOR MULTIDRUG-RESISTANT TUBERCULOSIS IN THE UNITED STATES, 2011–2015**

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BACKGROUND

In May 2016, the World Health Organization (WHO) recommended a shorter (9-12 month) multidrug-resistant tuberculosis (MDR TB) regimen over the conventional 18-24 month regimen for patients who meet specific eligibility criteria. The current recommendation was based on successful clinical trials conducted in Asia and Africa, but published studies, using mainly European data, have shown few patients would meet WHO eligibility criteria.

METHODS

We analyzed data for MDR-TB cases (primary resistance to isoniazid and rifampin) in persons alive at diagnosis reported to the U.S. National TB Surveillance System (NTSS) from 2011–2016. The WHO eligibility criteria exclude extrapulmonary TB, pregnancy, previous second-line TB medications, or initial drug resistance to pyrazinamide, ethambutol, kanamycin, moxifloxacin, ethionamide, or clofazimine. The NTSS does not collect data on pregnancy, previous TB medications, and costs. We estimated costs by applying the eligibility criteria, shorter regimen and proportional inpatient and outpatient costs to U.S. MDR-TB patients from a previously published population-based study.

RESULTS

Of 491 MDR-TB cases with full DST results, 11.6% were eligible for the shorter regimen. The majority of ineligible patients were excluded due to resistance to ethambutol (62.2%) and/or pyrazinamide (53.8%) and/or extrapulmonary TB (28.8%). Based on the earlier study, compared with conventional MDR-TB treatment costs, implementing the shorter regimen would reduce the U.S. annual societal MDR-TB cost burden by four percent.

CONCLUSION

A minority of MDR-TB patients would be eligible for the shorter regimen. The reduced cost of the shorter regimen would have minimal impact on the economic burden of MDR TB.

C10. **ISONIAZID RESISTANCE AMONG TUBERCULOSIS PATIENTS FROM SÃO PAULO, BRAZIL**

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BACKGROUND

We describe the prevalence of isoniazid (INH)-resistant tuberculosis patients from the state of São Paulo, Brazil.

METHODS

We analyzed all INH-resistant TB patients with *M. tuberculosis* isolates identified at Instituto Adolfo Lutz from January to December 2016 (1 isolate/patient was included). INH at 1 µg/ml (low-level), 3 µg/ml (intermediate) and 10 µg/ml (high-level resistance) was tested by MGIT 960. Patients' data were collected from TB-WEB, an information system for TB patients' notification.

RESULTS

Among the 203 INH-resistant isolates, 111 (54.7%) were monoresistant, 63 (31%) MDR and 29 (14.3%) polyresistant. Of the 63 MDR isolates, 11 (17.5%) were pre-XDR, 5 (7.9%) XDR and 1 (1.6%) resistant to all drugs. Most of monoresistant isolates (79; 71.2%) were low-level, while 7 (6.3%) were high-level resistant. Of the 29 polyresistant isolates, 12 (41.4%), 13 (44.8%) and 4 (13.8%) showed low, intermediate and high-level resistance, respectively. Of the 63 MDR isolates, 19 (30.2%) showed low-level, 35 (55.6%) intermediate and 9 (14.3%) high-level resistance. Of the pre-XDR isolates, 8 (72.7%) showed intermediate resistance. Among the XDR isolates, 2 (40%) showed intermediate and 2 (40%) high-level resistance. The all-drug-resistant isolate had an intermediate INH-resistance. 157/203 (77.3%) patients were male, 195 (96%) had pulmonary TB and 114 (56.1%) had never had TB before. Cure was achieved by 89 (43.8%) patients: 60 (67.4%) low-level, 25 (28.1%) intermediate and 4 (4.5%) high-level-resistant. Sixty-two (30.5%) patients were still under treatment.

CONCLUSION

More than half (110/203; 54.2%) of the INH-resistant TB patients from São Paulo have low-level resistance to this drug.

C11. INVESTIGATION OF FLUOROQUINOLONE HETERORESISTANCE IN SERIAL PATIENT ISOLATES USING ULTRA-DEEP AMPLICON SEQUENCING

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BACKGROUND

Fluoroquinolones (FQ) are important for treatment of multidrug-resistant tuberculosis (MDR TB). Resistance to FQs is most often associated with specific mutations within a region of *gyrA* known as the Quinolone Resistance Determining Region (QRDR), and samples from patients often contain mixtures of FQ-susceptible and FQ-resistant *Mycobacterium tuberculosis* (Mtb) or of Mtb expressing different *gyrA* alleles (heteroresistance).

METHODS

To investigate heteroresistance, we sequenced the *gyrA* QRDR from serial sputum cultures from MDR TB patients in the Preserving Effective TB Treatment Study (PETTS) with baseline (N=106) or acquired FQ (N=80) resistance using the IonTorrent Personal Genome Machine™.

RESULTS

We present preliminary analysis of data from individuals with cultures from at least four timepoints (range = 4–18) and evidence of FQ heteroresistance (N=37). Twenty-seven unique QRDR alleles were identified. The number of alleles present at least once ranged from 2 to 16 per patient and from 1 to 10 for any given time point. For individuals with acquired FQ resistance, negative outcome (e.g., death, failure) was experienced by 100% of those with heteroresistance compared to 84% with no evidence of heteroresistance. Of individuals with baseline FQ resistance, 83.3% with heteroresistance experienced a negative outcome, and 80% without heteroresistance experienced negative outcomes.

CONCLUSION

Results highlight the complexities of FQ heteroresistance within this patient population including possible impact on outcomes in patients with baseline versus acquired heteroresistance. Future plans include analysis of treatment regimens, evaluation of mixed infections through whole genome sequencing and determination of FQ minimum inhibitory concentrations to assess the impact of evolving FQ resistance.

D. TB DRUG-RESISTANCE/SEQUENCING

D1. BIOISOSTERIC ANALOGS OF INDOLE-2-CARBOXAMIDES TARGETING THE MMPL3 TRANSPORTER PROTEIN IN THE MYCOLIC ACID BIOSYNTHETIC PATHWAY

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BACKGROUND

Due to increasing drug resistance of *Mycobacterium tuberculosis* (*M. tb*) to the current therapy, new anti-TB compounds with novel mechanisms of action that have activity against resistant strains are urgently needed. Mycolic acids are the primary lipid component in the mycobacterial cell wall and are responsible for mycobacterial cell wall integrity, permeability and virulence. Mycobacterial membrane protein large 3 (MmpL3) is an essential transporter responsible for the translocation of mycolic acids to the outer membrane. Published indole-2-carboxamides with suggested MmpL3 inhibition showed good potency, against *M. tb,* but poor aqueous solubility and hence were difficult to formulate.

METHOD

We hypothesized that bioisosteric replacement of the indole ring, will maintain anti-tubercular activity with improved aqueous solubility leading to enhanced pharmacokinetics. We focused on retaining the required pharmacophore and increasing the molecular heteroatom percentage by reducing lipophilic atoms. The designed and synthesized indole bioisosteres are pyrrole, mandelic acid and imidazole all coupled to lipophilic head groups ensuring anti-tubercular activity. In addition to MIC determination, these compounds were subjected to *in vitro* ADMET assays, including aqueous solubility and PAMPA permeability, to determine their suitability for further *in vivo* preclinical evaluation.

RESULTS

Lead compounds had improved *in vitro* pharmacokinetics over their indole-2-carboxamide analogs while their potency against mycobacteria varied. The pharmacophore, SAR and evaluation of these compounds and their suitability for further *in vivo* testing will be discussed.

CONCLUSION

The enhanced *in vitro* pharmacokinetic profile suggests that further structural changes can be made to the lead compounds to enhance MIC.

D2. **IDENTIFICATION OF NOVEL MUTATIONS THAT CONFER ISONIAZID RESISTANCE IN *Mycobacterium tuberculosis***

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BACKGROUND

Only 85% of isoniazid resistance (INH-R) can be explained by common mutations in the *katG* and *fabG1-inhA* loci in *Mycobacterium tuberculosis* (*Mtb*). Discovery of novel resistance markers can enhance the accuracy of rapid molecular tests and improve patient treatment with more effective drug regimens.

DESIGN/METHODS

We identified 52 *Mtb* isolates from archived clinical strains that were INH-R by phenotypic testing but lacked mutations commonly targeted by rapid molecular tests. INH minimum inhibitory concentrations (MICs) were determined by broth microdilution and whole genome sequencing (WGS) was performed to identify candidate mutations potentially involved in INH-R. A subset of these mutations were generated in a clean genetic background, *Mtb* H37Rv, and INH MICs were determined to quantify each mutation's impact on INH-R.

RESULTS

75% (39/52) of clinical strains were highly resistant to INH (MIC ≥2 μg/mL) while 25% (13/52) exhibited low-level resistance (MIC ≥0.25 but ≤1.00 μg/mL). INH-R in 92% of strains (48/52) was conferred by rare modifications to the *furA-katG-Rv1907c* and/or *fabG1-inhA* operons. Functional genetics demonstrated *katG* mutations V1A, A110V, N138S, W161Q, W161R, W300R, S315G, S315N, W328R, E402stop, L415P, and A480del independently confer INH-R in *Mtb* H37Rv. 29 other mutations in *katG* or *inhA* identified through WGS are likely to confer INH-R. The INH-R mechanism for 8% (4/52) of these clinical strains remains unclear.

CONCLUSION AND RECOMMENDATIONS

We experimentally confirmed 12 novel *katG* mutations as INH-R determinants in *Mtb*. We have shown that some current targeted sequencing and probe-based molecular testing methods are insufficient to detect numerous INH-R-conferring mutations; WGS can remedy this problem.

D3. **EVALUATION OF rpsA AND panD FOR MOLECULAR DETECTION OF PYRAZINAMIDE RESISTANCE IN CLINICAL ISOLATES OF *Mycobacterium tuberculosis***

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BACKGROUND

Pyrazinamide (PZA) is an integral first-line drug for the treatment of tuberculosis. While detection of PZA resistance by *pncA* gene sequencing is well established, a proportion of *Mycobacterium tuberculosis* (MTB) isolates that reproducibly test PZA-resistant (PZA-R) by the conventional MGIT 960 method have no mutations in *pncA*. Mutations in the genes *rpsA* and *panD* have been associated with PZA resistance. We explored the prevalence of mutations in *rpsA* and *panD* in MTB PZA-R isolates that do not have mutations in *pncA*.

METHODS

Fifty-six clinical isolates of MTB that tested as PZA-R ≥2 times in multiple laboratories by the MGIT 960 method, but did not have mutations in *pncA,* were selected for this study. The *rpsA* and *panD* ORFS were amplified, sequenced, and results compared to the H37Rv strain.

RESULTS

17/56 (30.3%) isolates had a non-synonymous mutation in *rpsA*, 2 (3.6%) had a non-synonymous mutation in *panD*, 1 (1.8%) had non-synonymous mutations in both *rpsA* and panD, and 36 (64.3%) lacked non-synonymous mutations in either gene. 16/18 (88.9%) isolates with non-synonymous *rpsA* mutations had the Val260Ile mutation.

CONCLUSION

The occurrence of non-synonymous mutations in *rpsA* and *panD* in 36% of PZA-R isolates examined in this study indicates that further investigation of the prevalence of these mutations and their role in PZA resistance is warranted. Future work to determine the prevalence of these mutations in PZA-susceptible MTB isolates and PZA-resistant MTB isolates with non-synonymous *pncA* mutations will help to clarify the contribution of *rpsA* and *panD* mutations to PZA resistance.

D4. **ETHICAL CHALLENGES IN THE USE OF WHOLE GENOME SEQUENCING FOR TUBERCULOSIS SURVEILLANCE: A QUALITATIVE STUDY OF STAKEHOLDER PERSPECTIVES**

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BACKGROUND

Advancements in whole genome sequencing (WGS) can aid public health officials in tuberculosis (TB) surveillance efforts, both nationally and globally. However, use of these technologies raises a number of ethical concerns that have not been examined empirically. We present findings from a qualitative study exploring key stakeholder perspectives regarding ethical challenges associated with the use of WGS for TB surveillance programs.

METHODS

We conducted semi-structured key informant interviews with policy makers and scientists working with WGS for TB surveillance, in Canada and globally. Interviews ran for approximately one hour, were audio-recorded, transcribed and coded using NVivo 11. Data were analyzed using Braun and Clarke's method of thematic analysis.

RESULTS

We identified four themes: (1) tension between private interests versus public good, e.g., balancing the need to maintain the privacy from whom the bacteria was collected with the contribution of this data to public databases to assist in future surveillance; (2) data sharing, e.g., logistical, political and ethical challenges associated with data sharing at provincial, federal and global levels; (3) equity challenges, e.g., WGS is a complex technology that requires expertise and infrastructure that low-burden, high-income countries may have but may not necessarily be present in high-burden, low-income countries; (4) governance of the data, e.g., lack of clarity around data ownership, and a dearth in global and national policy for data stewardship.

CONCLUSIONS

While respondents agreed WGS may hold immense promise for future surveillance and diagnostic efforts for TB, underlying ethical challenges must be considered to ensure the ethical implementation of WGS into public health systems, particularly in those high burden countries with marginalized populations. Moreover, given the scope and power of WGS, it heightens current concerns regarding the ethics of surveillance, including challenges associated with the protection of anonymity and the stewardship of surveillance databases.

D5. CREATING GUIDELINES FOR APPROPRIATE USE OF MOLECULAR DETECTION OF DRUG RESISTANCE (MDDR) IN WASHINGTON STATE

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BACKGROUND

In 2012, the Centers for Disease Control and Prevention (CDC) published guidelines for use of their molecular detection of drug resistance (MDDR) service in TB patients. However, these guidelines lack clarification of which countries have “high rates” for Multidrug-Resistant Tuberculosis (MDR-TB) and other risk factors that might be associated with MDR-TB patients. Due to this lack of specificity, states are encouraged to create evidence-based best practices to guide proper usage at a local level. Many states did this through determination of state-specific MDR-TB prevalence and evaluating relevant risk factors. Washington State did not have a formal guidance on MDDR requests.

INTERVENTION

Washington State-specific guidelines on MDDR requests were developed after a multi-step process. First, we performed a literature review to characterize MDDR use in other states. Next, a sample of state health departments were interviewed to learn about their state-specific guideline development process. Finally, we analyzed Washington State Department of Health data to identify local drug resistant patterns and risk factors.

RESULTS

We utilized lessons learned across the U.S. and local data to identify populations at high-risk of MDR-TB and to develop Washington State-specific guidelines for MDDR use.

CONCLUSIONS

Implementation of Washington State-specific guidelines for MDDR requests will increase the number of MDR-TB cases that are detected early, and improve appropriate TB treatment. The guidelines will be used for education about the process of requesting an MDDR and MDR-TB risk factors in Washington State.

D6. GENETIC DETERMINANTS OF RIFAMPIN PHARMACOKINETIC VARIABILITY: THE ROLE OF THE ABCC2 EFFLUX TRANSPORTER

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BACKGROUND

The contribution of pharmacogenetics to variability in rifampin pharmacokinetics is poorly understood. We recently conducted a population pharmacokinetic study of rifampin among tuberculosis patients co-infected with HIV in Botswana. We have previously demonstrated that single nucleotide polymorphisms (SNPs) in the hepatic uptake transporter gene *SLCO1B1* (rs11045819) were associated with differences in rifampin exposure. We sought to determine whether additional SNPs in *ABCC2*, a hepatic efflux transporter with rifampin affinity *in vitro*, also influenced rifampin pharmacokinetic exposures.

METHODS

We enrolled HIV/tuberculosis patients who had not yet initiated antiretroviral therapy. We measured serum rifampin concentrations at 0, 0.3, 0.9, 2.2, 4.5, and 8 hours after administration. Whole exome sequencing was performed to examine pharmacogenetic variability for *ABCC2* SNPs previously identified to impact pharmacokinetic exposures for substrate drugs (rs2273697, rs3740066, rs717620, rs17222723, rs8187710). In non-compartmental analysis we compared rifampin exposures across genotypes, including the maximum concentration (C_{max}) and the 24-hour area under the concentration-versus-time curve (AUC_{0-24}).

RESULTS

Thirty-nine HIV/tuberculosis patients completed an intensive pharmacokinetic study of rifampin prior to initiation of antiretroviral therapy. We found that rifampin C_{max} was significantly increased among 4 patients who were homozygous for the variant SNP rs8187710 compared to all other patients (p=0.02). In contrast, we did not observe differences between patients with heterozygous (n=20) and homozygous wild-type (n=19) rs8187710 genotypes for either C_{max} (p=0.22) or AUC_{0-24} (p=0.91).

CONCLUSION

Pharmacogenetic variability in *ABCC2* was associated with increased rifampin exposure among HIV/tuberculosis patients in Botswana. Future prospective studies should evaluate this relationship among different populations of tuberculosis patients.

E. TB AND NON-COMMUNICABLE DISEASES

E1. SCREENING MIGRANT POPULATIONS WITH LATE STAGE CHRONIC KIDNEY DISEASE FOR LATENT TUBERCULOSIS INFECTION: A COST-EFFECTIVENESS ANALYSIS

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BACKGROUND

Tuberculosis (TB) disproportionately affects migrant populations within low-incidence countries, predominantly due to reactivation of latent TB infection (LTBI) acquired prior to migration. Chronic kidney disease (CKD) increases risk of TB, however cost-effectiveness of LTBI screening in this at-risk population is uncertain. We evaluate the cost-effectiveness of LTBI screening in migrants diagnosed with late stage CKD (eGFR <30 ml/min) not requiring dialysis.

METHODS

Using administrative data, a retrospective cohort of 12,158 migrants to British Columbia, Canada, with late stage CKD were followed for development of TB for 5 years from identification. Using discrete event simulation, tuberculin skin test (TST) or interferon-gamma release assay (IGRA) screening was compared to no screening (standard of care); treatment was isoniazid. Costs (2016 CAD), quality-adjusted life years (QALYs), and TB cases were recorded using a 1.5% discount rate and healthcare system perspective. Incremental cost-effectiveness ratios (ICERs) for QALYs gained were calculated for migrants <60 or ≥60 years of age from low (<30 cases per 100,000 population) or high (≥30 cases per 100,000 population) incidence countries.

RESULTS

LTBI screening was only cost-effective in migrants ≥60 years of age from high-incidence countries. IGRA and TST screening resulted in ICERs of $35,941 and $83,103 and reduced 5-year TB incidence from 8.9 per 1000 migrants to 6.8 (24% reduction) and 7.3 (18% reduction), respectively. LTBI screening in migrants from low-incidence countries resulted in ICERs >$263,378.

CONCLUSIONS

IGRA screening of migrants ≥60 years of age with late stage CKD from high incidence countries can cost-effectively reduce TB incidence.

E2. MAJORA DEL CONTROL GLUCEMICO EN PACIENTES CON TUBERCULOSIS Y DIABETES EN JURISDICCION SANITARIA III MATAMOROS Y EL BINACIONAL "GRUPOS SIN FONTERAS"

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ANTECEDENTES Y RAZONES PARA SU IMPLEMENTACIÓN

Los estudios sobre el binomio TB-DM posicionan a México con una de las prevalencias más altas de DM en los pacientes con TB, entre 17.8% y 36%. La asociación de tuberculosis y diabetes en los casos con enfermedad pulmonar de Enero 2017 a Agosto 2017, los datos Matamoros se reportaron 141 casos de tuberculosis pulmonar de estos 46 reportaron también diabetes que corresponde a un 32% de asociación con esta enfermedad. El presenta estudio es fortalecer el control de la enfermedad de diabetes en los pacientes con tuberculosis, mediante la atención integral a las personas afectadas al proporcionarles herramientas para mejorar las cifras de glicemia.

INTERVENCIÓN

Al momento del diagnóstico de Tuberculosis se le recaban estudios complementarios para diabetes, glicemia capilar, glicemia en sangre, hemoglobina glucosilada, historia clínica, Somatometria completa. A partir de este momento se le entrega un glucómetro al paciente, para que recabe la glicemia durante 15 días en la mañana y en la noche momentos antes de acostarse, una vez recabadas las cifras de glucosa en sangre, se establece el tratamiento farmacológico para diabetes, insulina en monoterapia, metformina con glibenclamida, insulina y metformina, evaluación nutricional y recomendaciones, monitoreo diario y ajuste de dosis de medicamento

RESULTADOS Y LECCIONES APRENDIDAS

La revisión preliminar indica que los pacientes habían mejorado el control glucémico. Un programa dirigido para mejorar el control glucémico puede mejorar los resultados de la TB.

CONCLUSIONES Y PRINCIPALES RECOMENDACIONE

La colaboración para tratar simultáneamente casos de tuberculosis y diabetes se puede aplicar a otros entornos, y más investigación y estudio debe hacerse en esta intervención.

E3. TUBERCULOSIS AND DIABETES IN THE MARSHALLESE IN ARKANSAS: THE CASE FOR BIDIRECTIONAL SCREENING

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BACKGROUND

Over 12,000 Marshallese reside mainly in Northwest Arkansas. This population has a diabetes mellitus (DM) prevalence of 46.5% and latent tuberculosis infection (LTBI) prevalence of 30.0%. DM increases the risk of TB 3-fold and TB complicates DM. Consequently, implementing bidirectional screening as a public health protocol for such TB-prone patients is supported by numerous studies. We sought to assess the extent of screening for both diseases in the Marshallese community in Arkansas.

METHODS

We examined the Arkansas Department of Health TB registry to quantify DM screening status among Marshallese active TB cases from 2009-2017 by looking at random blood sugar levels (>200mg/dL). We also evaluated TB screening status for Marshallese DM patients by reviewing screening data from the University of Arkansas Medical Sciences – Northwest, AR and Community Clinic in Springdale, AR, two facilities that serve as the patient-centered medical homes for Marshallese DM patients in Northwest Arkansas.

RESULTS

Of 300 Marshallese patients with DM, 8 were screened for TB (2.7%) at UAMS Northwest. Of 4125 Marshallese patients with DM, 3 were screened for TB (0.83%) at Community Clinic. Of 57 TB cases reported in the Marshallese from 2009-2017, 45 (79.0%) were screened for DM.

CONCLUSION

There is a significant gap in screening for TB and DM in the Marshallese community, suggesting a high possibility of unidentified cases of the two diseases. Bidirectional screening for TB and DM should be established as a best practice protocol. Every Marshallese with TB (>18) should be screened for DM and every Marshallese with active TB and LTBI should be screened for DM; joint prevalence of LTBI-DM is around 14.0%. The HbA1c test should be the standard DM screening tool. Partnership between the Arkansas Department of Health and community providers is key to expanding bidirectional screening in this population.

E4. EFFECT OF MALNUTRITION ON TUBERCULOSIS MYCOBACTERIAL BURDEN IN PUDUCHERRY AND TAMIL NADU, INDIA

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BACKGROUND

The relationship between malnutrition and tuberculosis (TB) severity is understudied. We aimed to investigate the effect of malnutrition on mycobacterial burden.

DESIGN/METHODS

Subjects included newly diagnosed, smear-positive, culture-confirmed, pulmonary TB enrolled in the Regional Prospective Observational Research for TB (RePORT) cohort. Multivariate negative binomial regression was used to evaluate the relationship between body mass index (BMI) and mycobacterial growth indicator tube (MGIT) time to positive (TTP) at start of treatment. Severe malnutrition was defined as BMI<16.5 kg/m^2, moderate malnutrition as 16.5-18.4kg/m^2, and "normal"/overweight as ≥18.5 kg/m^2. Chest x-ray severity score is defined as percentage of lung affected plus 40 for cavitation (max =140).

RESULTS

Of 462 subjects, 353 (76%) were male. The median age was 45 years (range 15-81); 132 (28%) had severe malnutrition and 156 (34%) moderate malnutrition. Median MGIT TTP was 196 hours. Compared to those with normal BMI, MGIT TTP was not statistically different for individuals with severe and moderate malnutrition (aRR=0.94 [95% CI 0.80-1.1] and aRR=1.01 [95% CI, 0.85-1.16], respectively), after adjusting for confounders. Among 72 subjects with chest x-ray data, 53 (74%) had cavitation. Median percentage of lung affected was 40%. Severe malnutrition was associated with higher median x-ray severity score (85.5) compared to moderate malnutrition (78) and normal BMI (76), but the difference was not statistically significant.

CONCLUSION

This study found no significant association between BMI and MGIT but suggests an association between malnutrition and extent of disease on x-ray. Additional analyses of larger datasets are warranted.

E5. **DIABETES MELLITUS IS ASSOCIATED WITH INCREASED INTERFERON-GAMMA RESPONSE AMONG ADULTS WITH LATENT TB INFECTION: CROSS-SECTIONAL FINDINGS FROM THE NATIONAL HEALTH AND NUTRITION SURVEY 2011-2012**

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BACKGROUND

The effect of diabetes on immunopathology and susceptibility to latent TB infection (LTBI) is undetermined. We aimed to determine the association between hyperglycemia with interferon-gamma antigen response in adults with LTBI in the National Health and Nutrition Survey (NHANES).

DESIGN/METHODS

We used NHANES 2011-2012 data, where an association between diabetes and LTBI has been previously reported. Eligible patients included adults aged ≥20 with LTBI defined by interferon-gamma-assay. Diabetes was defined by glycated hemoglobin (HbA1c) as no diabetes (≤5.6%), pre-diabetes (5.7-6.4%), and diabetes (≥6.5%); self-reported diabetes diagnosis was used regardless of HbA1c. High interferon-gamma response was defined by the upper-quartile of antigen response among those with LTBI. We used logistic regression to estimate the association between diabetes and interferon-gamma response accounting for NHANES sampling design.

RESULTS

Among 2011-2012 NHANES participants, 513 adults (5.9%, 95%CI:4.9-7.0%) had LTBI and among them diabetes prevalence was 22.2% (95%CI:16.6-27.8%) and pre-diabetes was 25.9% (95%CI:22.1-29.7%). Median interferon-gamma response among adults with diabetes was 2.0 IU/mL (IQR:0.7-6.5) compared to 1.9 (IQR:0.6-5.9) among those with pre-diabetes and 1.3 (IQR:0.7-4.2) among those without diabetes (p=0.13). Adjusting for age and sex, high interferon-gamma antigen (≥6.5 IU/mL) response was significantly greater in patients with diabetes (aOR 2.13, 95%CI:1.1-4.3) compared to no diabetes. High antigen response was non-significantly greater in pre-diabetes (aOR 1.93 95%CI:1.0-3.8) compared to no diabetes.

CONCLUSION

Nearly half of adults with LTBI in the US are estimated to have either diabetes or pre-diabetes. Among adults with LTBI, a higher interferon-gamma antigen response was observed in those with diabetes compared to those without diabetes.

E6. THE ROLE OF NUTRITIONAL SUPPORT FOR TB PATIENTS AT THE HIGH BURDENED CHEST CLINICS IN GUYANA

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BACKGROUND

The World Health Organisation (WHO) has issued an official guideline in 2013 on nutritional care and treatment support for people living with TB. While experiences have shown that food support can be a critical component of enablers support packages for TB patients, the evidence that food support improves access and adherence to TB treatment is inconclusive. Food support as an enabler is not part of the guideline, however, WHO is assessing evidence to develop policy on social support for people with TB, which includes food support.

METHODS

A retrospective study was conducted at TB clinics in Regions 3, 4, 6 and 10 on new and relapse TB cases registered during March 2013 and February 2014. Gender; employment status; HIV status; and receipt of nutritional support were some of the variables collected through predesigned data collection template. Data analyzed using SPSS statistic 17.0.

RESULTS

Total cases reviewed were 448; unemployed and unknown work status accounted for over 50%; male to female ratio was 2.5:1; patients who received nutritional support and completed treatment were 36% as compared to 64% who did not receive nutritional support but completed treatment; HIV positive cases who received nutritional support and completed treatment were 83%; while HIV negative who did not receive nutritional support but completed treatment were 81%.

CONCLUSION

Nutritional support may not be a driver for completing treatment; in general, higher treatment success rate is associated with those who did not receive nutritional support, while in HIV positive patients significant treatment success is associated with those who received enabler support. More trend analysis studies are needed to make conclusions on the role of enabler support.

E7. **HELPING YOUR PATIENTS KICK BUTTS: AN EVALUATION OF THE KNOWLEDGE, PERCEPTION, AND AWARENESS OF TOBACCO EDUCATION, CESSATION AND COUNSELING AMONG TB HEALTHCARE PROVIDERS**

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BACKGROUND

The World Health Organization (WHO) reports that smoking substantially increases the risk of contracting and dying from Tuberculosis (TB). In the Southeastern United States, a majority of states have higher rates of tobacco use and TB cases compared to national averages. The purpose of this project is to better understand the current tobacco cessation practices of TB staff and their training in regards to tobacco education, cessation and counseling for TB patients.

METHODS

The study is a cross-sectional design. Data for this study was collected using an online survey administered through Qualtrics Survey and distributed through the Southeastern National Tuberculosis Center (SNTC) listserv. The survey asked a variety of questions related to knowledge, practice and perception of tobacco cessation, counseling, and education as well as availability of resources for providers and patients.

RESULTS

The survey was distributed to 5,404 people and there were 477 respondents. Mean comparisons were obtained for each group: Index Best Practices 1 (Mean=2.14, Cronbach's Alpha=.802); Index Best Practices 2 (Mean=2.00, Cronbach's Alpha=.857); Index Perceived Job Relevance (Mean=2.51, Cronbach's Alpha=.777); Index Attitudes Towards Tobacco Cessation (Mean=2.51, Cronbach's Alpha= .693). All categories contained questions related to tobacco cessation practices and perceptions. Low index means indicated TB healthcare providers are not meeting the standards for tobacco cessation and education.

CONCLUSION

Tobacco cessation counseling by TB Healthcare providers to their patients has room for improvement. Most providers have not been trained on tobacco cessation counseling but would like to receive such training to help aid in patient care.

E8. **PROJECTING THE COST EFFECTIVENESS AND IMPACT OF TOBACCO CONTROL ON THE TUBERCULOSIS EPIDEMIC IN INUIT COMMUNITIES**

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BACKGROUND

Tuberculosis (TB) remains a significant public health problem in Canadian Inuit communities. In 2015, the Inuit had an incidence rate of 166/100,000 population which is 36 times higher than the Canadian average. We aimed to estimate the potential impact and cost effectiveness of tobacco control in Inuit communities in the Arctic.

METHODS

We developed a decision analysis model that compared the baseline scenario of no specific tobacco intervention (Status Quo) with that of: 1) increased taxation of cigarettes (Taxation), 2) mass media campaigns (Mass Media), and 3) both strategies in combination (Tax and Media). All tobacco control scenarios were considered in the context of a comprehensive TB prevention and care program as currently in place in the Canadian Arctic. Models were informed using published literature and used local costs where possible. Estimates of effect for the impact of tobacco intervention on smoking prevalence, and the anticipated impact and cost of tobacco control strategies were also obtained from published literature. TB cases, TB related deaths, Quality Adjusted Life Years (QALYs) and costs from the health system perspective were projected for each scenario over a 20 year time period. Costs were expressed in 2015 Canadian dollars and all outcomes were discounted by 3% annually.

RESULTS

Projected outcomes per 1000 persons over a 20 year period

CONCLUSIONS

Smoking prevention strategies are projected to have a modest impact on epidemiologic outcomes but may be cost saving. However, even small gains may be valuable as an indirect way to strengthen TB prevention efforts.

Model projected Outcomes per 1000 persons				
Strategy	**Cost ($)**	**TB incidence**	**TB deaths**	**QALYs accrued**
Tax & media	$995,000	23.9	2.8	15,000
Taxation	$1,016,000	24.6	3.0	14,998
Mass media	$1,052,000	25.6	3.2	14,996
Status quo	$1,056,000	25.8	3.3	14,995

E9. **RISK FACTORS FOR INCIDENT DIABETES AMONG A COHORT OF PATIENTS PREVIOUSLY TREATED FOR TUBERCULOSIS IN TAIWAN**

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BACKGROUND

Substantial evidence demonstrates diabetes increases the risk of active-tuberculosis (TB). However, factors that increase the risk of developing diabetes following TB treatment are undetermined. We aimed to estimate the incidence rate of diabetes and determine factors associated with incident diabetes among patients previously treated for TB in Taiwan.

METHODS

We conducted a retrospective cohort study among patients previously diagnosed with active-TB in the Taiwan National Health Insurance Research Database during 2002-2013. All TB patients confirmed by ICD-9-CM codes and who received anti-TB drug prescriptions for ≥28 days were eligible. Incident diabetes was defined among patients who received anti-diabetes drug prescriptions for ≥28 days and a confirmed ICD-9-CM code for type-2 diabetes first indicated ≥2 years after TB diagnosis. Cox regression was used to estimate relative hazard rates of incident diabetes.

RESULTS

From 2002-2013 there were 157,444 patients diagnosed with active-TB, 26,677 (16.9%) were excluded due to pre-existing diabetes. Among 130,767 patients included in the analyses, 2,479 had incident diabetes during 651,605 person-years (age-adjusted incidence rate 3.9 per 1000 person-years; 95%CI 3.7–4.0). After adjusting for age, gender, site of TB disease, and TB treatment duration, patients with diagnosed dyslipidemia (adjusted hazard ratio [aHR] 1.4; 95%CI 1.2-1.6), hypertension (aHR 1.8; 95%CI 1.6-2.0) or overweight (aHR 2.7; 95%CI 1.7– 4.1) at the time of TB diagnosis were more likely to develop diabetes after TB treatment compared to those without diagnosed comorbidities.

CONCLUSION

Traditional non-communicable disease risk factors diagnosed at the time of TB were predictive of diabetes incidence following TB treatment.

Keywords: diabetes, incidence, tuberculosis, comorbidities

E10. META-ANALYSIS OF THE IMPACT OF SMOKING ON TUBERCULOSIS TREATMENT OUTCOMES

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BACKGROUND

Cigarette smoking is an important contributor to the global tuberculosis (TB) epidemic. However, evidence on the association between smoking and TB treatment outcomes remains limited. This study assessed the current scientific evidence on the impact of active cigarette smoking on unfavorable TB treatment outcomes.

METHODS

Articles regarding active cigarette smoking and TB outcomes were obtained from multiple databases. Studies were selected for analysis using standardized inclusion/exclusion criteria. Data were abstracted to standardized forms and study quality was assessed using internal/external measures of validity. Fixed effect models were used for analysis. The primary analysis, compared smokers (current smokers, ever smokers, heavy smokers) to non-smokers (never smokers, light smokers). Secondary analysis compared former smokers to never smokers. Unfavorable outcomes included any outcome other than cure or completion, including death, failure, loss to follow-up, and transfer. Pooled effect estimates of smoking on treatment loss to follow-up and delayed culture conversion were also examined.

RESULTS

The literature search identified 1,030 studies; 32 studies were included. Smokers had greater odds of unfavorable treatment outcomes compared to non-smokers (Pooled Odds Ratio (pOR) = 1.29, 95% CI: 1.22-1.37). Former smokers also had greater odds of unfavorable outcomes compared to never smokers (pOR= 1.39, 95% CI: 1.30-1.49). Smokers had greater odds of delayed culture conversion compared to non-smokers (pOR=2.49, 95% CI: 1.05-3.92) and greater odds of loss to follow-up (pOR=1.48, 95% CI: 1.30-1.66).

CONCLUSION

Smoking was associated with adverse TB treatment outcomes, including loss to follow-up and delayed culture conversion. Smoking cessation may be an important consideration for TB control programs.

F. TB EPIDEMIOLOGY

F1. RECENT TUBERCULOSIS TRANSMISSION AND CLUSTERING: AN EVALUATION OF CLINICAL AND MOLECULAR EPIDEMIOLOGICAL RISK FACTORS IN OHIO, 2006-2015

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BACKGROUND

Twenty-seven states reported an increase in number of tuberculosis (TB) cases from 2014 to 2015 in the United States. Identification of risk groups for recent transmission is critical to effective control measures. Mycobacterium tuberculosis genotyping can identify chains of transmission. We investigated clinical and molecular epidemiological characteristics to estimate the proportion of cases due to recent TB transmission and identify predictors of clustered cases in Ohio.

METHODS

We analyzed the Center for Disease Control's TB Genotyping Information Management System (TB GIMS) data for all confirmed adult patients (age ≥15 years) with TB and spoliogtype and 12-locus mycobacterial interspersed repetitive unit-variable number of tandem repeat typing data available, from 2006-2015 in Ohio. Univariable and multivariable logistic regression was used to examine sociodemographic and clinical risk factors for clustering of TB cases.

RESULTS

Of the 1471 cases occurring, 1210 (82%) were genotyped; 928 (79%) had pulmonary TB and 437 (37%) were clustered in 38 clusters that ranged from 2 to 38 cases. Annual prevalence of clustering ranged from 31%-41% (Figure1). Clustered cases were more likely to be younger, living in urban settings, US-born, HIV-infected, homeless, have pulmonary TB, and have history of drug and alcohol use, and time in correctional facilities. In adjusted analyses, odds of clustering among cases who were US-born (aOR 0.3, 95%CI: 0.2-0.4), homeless (2.0, 1.0-4.3) and had history of drug use (2.0, 1.1-3.7).

CONCLUSION

Approximately one-third of TB cases in Ohio are clustered due to recent transmission. Targeting high-risk groups for clustered TB cases may help prevent transmission of TB.

F2. **TUBERCULOSIS IN POPULATION DEPRIVED OF LIBERTY: EPIDEMIOLOGICAL ANALYSIS OF THE REGIÃO METROPOLITANA BAIXADA SANTISTA (SP), BRAZIL**

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BACKGROUND

To describe the number of prevalent and incident cases of pulmonary tuberculosis (TBP) in the population deprived of (PPL) in the Região Metropolitana Baixada Santista (RMBS).

METHODS

A descriptive study of secondary data, including the PPL with TBP prisons of RMBS, who started treatment between 2009 and 2013. The data source was the case reporting system (TBWEB) of the Epidemiological Surveillance Center of the State Sao Paulo. The variables of interest were the socio-demographic characteristics, current and previous history of tuberculosis, the aspects related to treatment, comorbidities and patient conditions. The descriptive analysis of the main features was made by comparing percentage of collected data.

RESULTS

Of the 582 cases included in the study, 64.09% (373/582) were the age group between 18-29 years; 79.21% (461/582) were new cases; supervised treatment was carried out in 86.60% (504/582) of cases; healing amounted to 83.51% (486/582) and 8.59% (50/582) abandoned treatment; serology for HIV was possible in 53.61% (312/582) with 7.37% (23/312) positive; the smear was performed in 95.53% (556/582) of the cases studied; of 34.19% (199/582) who underwent sputum culture, 72.36% (144/199) had positive results, these susceptibility testing was performed in 36.81% (53/144). The average annual incidence of TBP in PPL of RMBS corresponded to 1.237,08/100.000 population.

CONCLUSION

The results reinforce the need for effective measures that allow reducing the risk of transmission, as well as greater mobilization of entities responsible for the preventive and control measures are satisfactory in this population.

F3. **TUBERCULOSIS IN CANADA AND UNITED STATES: A REVIEW OF TRENDS**

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BACKGROUND

Canada and United States (US) are both high income, low tuberculosis (TB) incidence countries with similar TB control programs, yet explicit comparison of TB incidence over time is lacking. Comparing incidence thoroughly could provide clues in directing future interventions. This study explored TB incidence in Canada and US since 1953.

METHODS

TB incidence data from 1953-2014 were obtained for both countries. Joinpoint regression was fit with TB rates and case counts as primary outcomes and incidence years as independent variable. Average annual percent change (AAPC) with 95% confidence intervals (CIs) were estimated.

RESULTS

From 1953-1974, rates declined in Canada (AAPC=-7.8, 95% Cl -8.4 to -7.1) compared to US (AAPC=-6.2, 95%Cl -6.7 to -5.8). However, from 1975-2014, a reverse pattern was observed (US: AAPC=-4.3, 95%Cl -4.6 to -3.9; Canada: AAPC=-2.9, 95%Cl -3.3 to -2.6). After 1975 TB incidence case definition changed in US, both Canada and US cases declined at the same rate between 1975-1984 (AAPC=-4.1; 95%CI -5.0 to -3.3). From 1985-1992, while Canada decreased (AAPC=-0.9; 95%CI -2.2 to 0.4), the US rather increased (AAPC=3.0; 95%CI 1.7 to 4.2). Between 1993-2014 cases declined in US (AAPC=-4.7; 95%CI -5.2 to -4.1) whereas the marginal decrease in Canada remain unchanged. From 1975 onwards, major rate differences were observed between 1985-1997 while minor ones from 1980-1983 and 2004-2014.

CONCLUSION AND RECOMMENDATIONS

Further exploration of factors that may be responsible for the slow decreased in TB case counts especially in Canada in future research would help boost existing interventions and pave the way for improved TB control.

F4. **CASE STUDY OF THE NATIONAL TUBERCULOSIS PROGRAMME IN COSTA RICA, 2012-2015**

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BACKGROUND

The Pan American Health Organization establishes that the incidence rate of tuberculosis (TB) stopped to decrease in the last five years, and this behavior is mainly attributed by the concentration of cases in vulnerable populations that present inequities health and to the persistence of conditions such as poverty and migration.

DESIGN/METHODS

This case study investigates the situation of TB in Costa Rica. The sources of information are the medical databases of the National Tuberculosis Programme from 2012 to 2015, interviews with programme stakeholders and secondary sources. Indicator of the TB program were calculated based on the methodology of M&E1. Crude and adjusted incidence rate were calculated by year, province, age group and sex. The level of statistical significance was 0.05, and Stata IC 14, ArcGIS 10.3.1 and Excel 2016 were used.

RESULTS

In 2015, Costa Rica had an adjusted incidence rate of 9 cases per 100 000 inhabitants; However, Limón had an adjusted rate incidence of 23,86 cases per 100,000 inhabitants; while San Jose, presents a 7,49 adjusted rate incidence per 100 000 inhabitants. Also, there are two men for every woman suffering from TB, and people over 60 years of age are the most affected by the disease.

CONCLUSION AND RECOMMENDATIONS

Costa Rica should propose actions aimed at the vulnerable populations to achieve the elimination of TB. These actions can be mainly in areas of high incidence such as Limón that presents a higher incidence rate to the general.

Keywords: Epidemiology, Politics, Tuberculosis, Vulnerability

F5. **FACTORS RELATED TO CASES OF TUBERCULOSIS IN COSTA RICA, 2015**

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BACKGROUND

Tuberculosis (TB) is caused by Mycobacterium tuberculosis, a bacterium that usually affects the lungs and is transmitted from person to person through the air. According to the World Health Organization the absence of a cross-sectorial approach affects the increase in TB cases worldwide. For that reason, the aim of the research was to determine which socioeconomics factors can be related with cases of TB in Costa Rica during the 2015.

METHODS

An ecological study was done about the 81 cantons of Costa Rica, and data were obtained from secondary sources. The outcome variable was cases of tuberculosis by total population by canton. And the statistical analysis used was a univariate analysis of all variables, analysis bivariate and multivariate analysis using a Negative Binomial Regression Model. The level of statistical significance was 0.05, and Stata IC 14 program was used.

RESULTS

The multivariate model indicated that the increase in the percentage of overcrowding is related to an increase of 13,5% in the rate of tuberculosis cases, also that the increasing of the percentage of unemployment increases 19,5% the rate of TB and for every case of HIV increases 2% of TB rate of cases, adjusting the model for the other variables.

CONCLUSION AND RECOMMENDATIONS

To control the tuberculosis in Costa Rica this country should include measures that go beyond the health sector and to address the social determinants of health, so these interventions can help to reduce poverty, improve living conditions and working populations.

Keywords: Epidemiology, life conditions, social determinants, and tuberculosis

F6. EXPEDITED TUBERCULOSIS CONTACT INVESTIGATION IN HIGHLY MIGRATORY POPULATION

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BACKGROUND

A circus train with contacts to an active Tuberculosis (TB) case arrived in Indianapolis 3 days before the circus was due to perform. The Marion County Public Health Department (MCPHD) had 24-48 hours to rule out infectious TB in 327 circus performers and staff, as well as in 6 elephants.

INTERVENTIONS

- Monday
  - Circus train arrives
  - Decision is made that no one is permitted entrance until cleared of infectious TB
- Tuesday
  - IGRA and chest x-rays (CXR) on 14 close contacts
  - 119 CXR done
    - 1 abnormal, admitted to hospital
  - 239 TB Skin Tests (TST) placed
- Wednesday
  - 18 CXR done
- Thursday
  - 238 TST read
  - 23 CXR done
    - 2 abnormal
      - 1 ruled out for TB, 1 admitted to hospital
  - Reviewed 2 years of trunk washing cultures and serologies for 6 elephants

RESULTS

Of the 327 individuals that were tested, 73 tested positive for TB.

- 2 additional cases identified, not linked to index case

- 71 LTBI
  - 23.46% infected with TB
  - 95.1% were foreign-born

All elephants deemed non-infectious.

CONCLUSIONS/RECOMMENDATIONS

- Nearly a quarter of the performers had a positive TB test, but only three of the closest contacts to the index case. The high rate of positive TB tests was likely related to the large number of foreign-born employees.
- Circus trains should be considered a travelling congregate setting and therefore should include annual TB testing.
- Additionally, there may be a role for the use of CXR to rule out TB, pending TB test results.

F7. **PREDICTING THE LIKELIHOOD OF ADULT-TYPE PULMONARY TUBERCULOSIS AMONG THE FOREIGN-BORN IN A HIGH-INCOME, LOW-INCIDENCE COUNTRY: A COHORT STUDY TO DERIVE A CLINICAL HEURISTIC**

Heffernan C[1], Doroshenko A[1,2], Egedahl ML[1], Barrie J[1],Senthilselvan A[2], Long R[1,2]. [1]Department of Medicine, University of Alberta; [2]School of Public Health, University of Alberta, Edmonton, AB, Canada.

BACKGROUND

To investigate 1) whether pulmonary tuberculosis (PTB) among foreign-born persons can be predicted from basic historical and laboratory information and, 2) to generate a useful teaching heuristic.

METHODS/DESIGN

Observational cohort study. Multiple logistic regression analysis was used to derive prediction equations for PTB. Seven clinical and laboratory predictors were used as explanatory variables.

Setting: Edmonton Tuberculosis Clinic.

Participants: 391 foreign-born adult (>14 years) persons were recruited into the study: 170 had, and 221 did not have, PTB.

Main outcome measures: The influence of each predictor was tested on two main outcomes: “positive culture” and “positive smear”. Receiver operating curves were generated and the area under the curve for each logistic regression model was quantified.

RESULTS

Among PTB patients (n=170), a combination of respiratory and constitutional symptoms, a sub-acute duration of symptoms, risk factors for the reactivation of latent tuberculosis infection, and anemia were predictive of having a positive culture (odds ratios of 1.79, 2.24, 1.72, and 2.28 respectively, p-value < 0.05)). Among smear-positive PTB patients (n=69), a combination of respiratory and constitutional symptoms, inappropriate prescription of broad-spectrum antibiotics, and features ‘typical’ of adult-type PTB on chest radiograph were predictive (odds ratios of 2.91, 1.55, and 12.34 respectively, p-values <0.05).

CONCLUSION

In high-income, low tuberculosis incidence countries where the majority of cases are foreign-born, PTB can be predicted from readily available information. This should raise the threshold of suspicion to make more timely diagnoses and incline clinicians to ‘think tuberculosis’ in settings where the disease is rare.

F8. **TUBERCULOSIS GENOTYPING IN NEW YORK CITY: A DESCRIPTIVE ANALYSIS OF RESULTS AND CLUSTERING ACROSS THREE GENOTYPING METHODS, 2009-2016**

Knorr J, Foerster S, Ahuja SD, Shashkina E, Kreiswirth B, Sullivan Meissner J. New York City Department of Health and Mental Hygiene, Long Island City, NY, USA.

BACKGROUND

The New York City (NYC) Health Department uses a combination of genotyping methods to characterize tuberculosis (TB) strains and better understand transmission.

METHODS

Genotyping results from IS*6110*-based restriction fragment length polymorphism (RFLP) analysis, spacer oligonucleotide typing (spoligotyping), and 24-loci mycobacterial interspersed repetitive unit analysis (MIRU) were reviewed for all culture-positive TB cases counted in NYC between 2009 and 2016 to characterize TB strains and examine consistency of clustering across genotyping methods. We defined an RFLP cluster as two or more cases with identical spoligotype and RFLP patterns and a MIRU cluster as two or more cases with identical spoligotype and MIRU24 patterns.

RESULTS

Among 5,161 TB cases counted in NYC from 2009-2016, 3,865 (75%) were culture-positive, and 829 spoligotypes, 2,582 RFLP patterns, and 2,554 MIRU patterns were identified. Among 3,591 (93%) cases with results available across all methods, 54% had a unique strain, 33% were clustered into 328 RFLP clusters, and 35% were clustered into 355 MIRU clusters. Overall, 56% of RFLP clusters were associated with multiple MIRU patterns (range: 2 to 26 MIRU patterns), and 57% of MIRU clusters were associated with multiple RFLP patterns (range: 2 to 32 RFLP patterns).

CONCLUSION

In this large sample of TB cases spanning 8 years, high strain diversity was observed. Most culture-positive cases had genotyping results available, and 46% had a clustered strain. More than half of clusters did not match across all three genotyping methods. Further analysis of clustering differences across genotyping methods and implications for detecting transmission is warranted.

F9. **A PICTURE OF LOCALLY-ACQUIRED TUBERCULOSIS IN TORONTO: IMPLICATIONS FOR PRACTICE**

Leung T[1], Corallo A[1], Blot S[1], Rea E[1,2]. [1]Toronto Public Health; [2]University of Toronto, Toronto, ON, Canada.

BACKGROUND

Although most tuberculosis (TB) cases in Canada are a result of latent TB infection reactivation acquired abroad, an understanding of endemic transmission is essential in order to tailor local prevention and control measures. We describe the epidemiology of locally-acquired TB cases in Toronto as a first step to validating current public health program measures.

METHODS

Tuberculosis cases reported between July 1st, 2014 and December 31st, 2016 among Toronto residents were included. Data were extracted from the provincial notifiable disease reporting system and genotyping database, and Toronto Public Health program data. Local transmission was determined by review of epidemiological and genotyping evidence.

RESULTS

During this study period, there were 667 cases in Toronto; of these, 48 (7.2%) were locally-acquired. The source case was known for 42 (87.5%) cases. The most common acquisition setting for locally-acquired cases was within the household (n=22, 45.8%). There were 26 non-household cases: shelter/drop-in (n=8), close non-household (n=6), worksite (n=4), out-of-country visitor (n=3), and other settings (n=5). Of the non-household cases, 20 (76.9%) were smokers at diagnosis and among those with a known source case (n=16), 14 (87.5%) indicated smoking with the source case.

CONCLUSIONS

Endemic transmission of TB in Toronto is low. The most common source of locally-acquired cases is within the household, supporting our current program practice of more intensive household follow-up. The high proportion of smoking-related transmission among non-household cases in this study has led the program to re-evaluate contact investigation approaches and to increase focus on public health smoking cessation interventions.

F10. **PUBLIC HEALTH DETECTIVE WORK: TRACING THE STEPS OF TWO SUPER SPREADERS. MORE QUESTIONS THAN ANSWERS.**

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BACKGROUND

Genotyping is a useful tool for both confirming known epidemiological links and detecting unknown potential relationships between tuberculosis (TB) cases. We describe an unusual cluster where genotyping helped expose complex links and highlighted challenges in conducting contact investigation.

METHODS

Data were extracted from an electronic reporting database and from the Ontario Universal Typing of Tuberculosis genotyping database. Case interviews were conducted by TB staff.

RESULTS

Eleven cases were identified in this cluster: 10 identical genotype matches and one clinical case. Five were Canadian-born and six were foreign-born. The index case (sputum smear 4+, cavitary chest x-ray, heavy marijuana user) generated five secondary cases. Four were not named contacts but were identified through genotyping. Based on multiple re-interviews, the epidemiological links identified were: lived in same building but no known contact, girlfriend of index case's son who was not previously disclosed, and two cases with known marijuana use and circumstantial evidence supporting a connection with the index case. One of the secondary cases (sputum smear 4+, cavitary chest x-ray) subsequently transmitted to five additional secondary cases. Of these, one was identified through genotyping only and follow-up investigation revealed that both went to the same shisha lounge.

CONCLUSION

Genotyping alone is not enough to determine transmission mechanisms nor interventions. Building trusting client-nurse relationships using respectful and innovative interview techniques are useful, but do not always reveal the complete picture of transmission. When used in conjunction, both can reveal patterns in TB transmission and opportunities for refinement in approaches.

F11. **A BIBLIOMETRIC ANALYSIS OF TUBERCULOSIS RESEARCH INDEXED IN WEB OF SCIENCE, 2007-2016**

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+ These authors contributed equally to the work.

BACKGROUND
A bibliometric analysis of TB research over the last decade was conducted to study growth of publications, contribution of countries, and international collaboration.

METHODS
The Web of Science database was searched for publications with "tuberculosis" in the title from 2007 to 2016, inclusive. References were analysed using the R bibliometrix package. A year-stratified 5% random subset was drawn, and articles were used to extract funding sources and classify publications into research domains.

RESULTS
A total of 34,512 references were found. The average annual growth rate was 7.3%. The journal most commonly published in was The International Journal of Tuberculosis and Lung Disease. The USA was the most productive country, accounting for 18.4% of references. Together, BRICS member countries produced 30.7% of references in 2016, with an average annual growth rate of 13.1% since 2007. Research collaborations between high-income countries and LMICs increased from 15.8% of all collaborations in 2007 to 23.1% in 2016. In contrast, a network analysis showed that collaborations among BRICS countries were less frequent. In the subset analysis, the most common research domains were 'Fundamental Research' (33.8%) and 'Epidemiology' (29.6%). While many of the most frequently acknowledged funders were US and EU-based (e.g. NIH, USAID, Wellcome Trust), China and India also emerged as top funders.

CONCLUSION
The past decade has seen a continued increase in TB publications. Notably, BRICS countries have emerged as major research producers. Ideally, this trend of increased research output will be followed by one of increased collaboration among high TB burden countries.

F12. **EPIDEMIOLOGY OF PULMONARY TUBERCULOSIS IN MIGRANT POPULATION**

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BACKGROUND

To know the epidemiology of pulmonary tuberculosis in migrant population.

METHODS

We reviewed the databases of cases reported as suspected of pulmonary tuberculosis (TBP), and those confirmed with positive culture during the period from September 2007 to December 2016. The search for TBP was conducted based on the 2009 CDC Immigration requirements: Technical Instructions for Tuberculosis Screening and Treatment of the US. Descriptive analysis of the migrant population diagnosed with TBP was performed, using measures of central tendency and frequency, as well as Chi square significance tests, using the software STATA 12.

RESULTS

According to the medical and radiographic evaluation of 394,482 applicants to emigrate to the United States, 8,775 (2.2%) were patient with suspected TB, of which, 157 (1.8%) were positive for TBP. In 99%, the suspicion of TBP was by chest X-ray, 1.18% because of HIV and the remaining 0.05% because of clinical data. Of the TBP cases, 86 (54.8%) were males and 71 (45.2%) were females. The average age was 50 years. Sixty-four patients (40.76%) were asymptomatic and 82 (52.22%) had clinical data. Cough was the main symptom. Eighty-five percent of patients with culture positive had negative smear. The average incidence rate in the period was 39.8 cases per 100,000 migrants, with a peak of 74.3 in 2013.

CONCLUSIONS

Tuberculosis is a serious public health problem, prevalent in certain population groups and with significant sub-registries, so it is necessary to have adequate diagnostic resources to obtain a prompt and expeditious diagnosis, and start an early treatment.

F13. **CHARACTERIZATION OF TUBERCULOSIS (TB) IN LEBANON: EPIDEMIOLOGY AND RISK FACTORS FOR EXTRAPULMONARY TB**

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BACKGROUND

Lebanon is strengthening their National Tuberculosis Programme (NTP) since 2014 and asked for assistance in analyzing their data on all TB cases collected in 2014 and 2015 to identify risk factors for developing extrapulmonary tuberculosis (EPTB) and in assessing the impact of Syrian refugees on TB rates.

METHODS

Line listed data of all cases reported to the NTP between 2014-2015 were tested for differences between pulmonary (PTB) and EPTB, using Chi-square and Student's T tests. Factors significantly associated with EPTB were assessed using stepwise multivariable logistic regression models comparing EPTB cases with PTB cases. To evaluate trends, aggregate TB data from 2011-2013 were assessed along with 2014-2015 line listed data.

RESULTS

For 2014-2015, 1347 cases were reported; of those, 507 (37%) were EPTB cases. Modeling identified being female (OR: 1.79, 95% CI: 1.34-2.67), Lebanese (OR: 2.43, 95% CI: 1.85-3.18), and between 5-15 years old (OR: 3.05, 95% CI: 1.33-6.98) as independent risk factors for having EPTB. The proportion of all cases of TB among Syrians increased from 3% in 2011 to 29% in 2015; however, the proportion of EPTB cases among Syrians decreased relative to Lebanese in these same years (2011: 33%, 2015: 24%).

CONCLUSION

Although the proportion of Syrian all form TB cases increased, their contribution to EPTB decreased. Given the high rates of EPTB among Lebanese, additional reasons, such as collecting the prevalence of chronic diseases and immunosuppression, and etiology, such as contribution of *Mycobacterium bovis* and BCG need exploring.

F14. **MTB LINEAGE DISTRIBUTION IN SEATTLE-KING COUNTY, WASHINGTON, 2003-2016**

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BACKGROUND
Studies of the genome of MTB have become essential in the development of prevention strategies. We look into the MTB lineage distribution in Seattle-King County to explore new approaches to the prevention of TB.

METHODS
We used the TB Genotyping Information Management System (TB GIMS) on reported TB cases from January 2003 to December 2016. The study population included all TB cases with culture-positive specimens that have assigned lineage. We analyzed the association of MTB linage distribution with age, gender, By WHO region of birth, time since arrival to the US, site of infection and MDR status.

RESULTS
The most prevalent lineages were Euro-American (34.5%), Indo Oceanic (29.5%) and East Asian (25.0%). Euromerican lineage was associated with individuals born in European (OR 44.6, 95%CI 15 to 132, <0.0001), Americas (OR 9.67, 95% CI 6.47 to 14.45, <0.0001) and African regions (OR 8.66, 95% CI 5.97 to 12.55, <0.01).East Asian lineage was strongly associated with pulmonary disease (OR 4.18, 95%CI 1.64 to 10.67, <0.001). For non-US born, the interval between arrival to the US and TB diagnosis was longer in patients with the IndoOceanic (median 13.5 yrs., IQR 5-24) compared to those with the East African Indian lineage (median 6 yrs., IQR 2-9).

CONCLUSION
The East Asian MTB lineage accounts for one-fourth of the lineages observed in Seattle-King County, and is mostly associated with pulmonary disease. Targeted LTBI testing and treatment of sub-populations from the regions with high prevalence of MTB East Asian lineage may be a useful approach in prioritization of TB prevention.

F15. **DEMOGRAPHIC AND RISK FACTOR ASSESSMENT OF FOREIGN-BORN ACTIVE TUBERCULOSIS CASES DIAGNOSED ≤2 YEARS AFTER ARRIVAL IN CANADA, 2011-2015**

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BACKGROUND

Despite accounting for one-fifth of Canada's population, two-thirds of active tuberculosis (TB) cases are foreign-born. The objectives of this study were 1. to provide a descriptive overview of the demographic, diagnostic, clinical and treatment outcome characteristics for foreign-born cases, and 2. to examine associations between certain demographic and risk factors and the time interval from arrival in Canada to diagnosis (TAD).

DESIGN/METHODS

An analysis was conducted on the demographic and diagnostic data for all (5,360) foreign-born active TB cases diagnosed from 2011-2015 as captured by the Canadian Tuberculosis Reporting System. Multivariate logistic regression compared demographic and risk factors after stratification by TAD between those with TAD≤2years and those with TAD>2years.

RESULTS

One-quarter (1,375) of foreign-born cases were diagnosed within two years after arrival into Canada. Cases with TAD≤2years were more likely to be younger ($p<0.05$), temporary residents or refugees ($OR_{adj}=6.8$, 95%CI=4.2-11.1), identified through active surveillance ($OR_{adj}=17.6$, 95%CI=9.1-34.1), and have recently travelled to a high-incidence TB country ($OR_{adj}=1.8$, 95%CI=1.3-2.7) compared to cases with TAD>2years. Cases with TAD≤2years were also less likely to have known TB contacts ($OR_{adj}=0.2$, 95%CI=0.1-0.5). Medical risk factors (such as diabetes and HIV status) and high-incidence birth country did not differ between outcome groups ($p>0.1$).

CONCLUSION AND RECOMMENDATIONS

Certain factors are associated with a higher likelihood of being diagnosed with active TB within two years versus after two years of arrival into Canada. More comprehensive reporting of risk factor data may be useful for TB prevention and control efforts in Canada.

F16. **TWO U.S. SURVEILLANCE SYSTEMS — A COMPARISON OF TUBERCULOSIS-RELATED MORTALITY, 2010–2013**

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BACKGROUND

Tuberculosis (TB) is the world's leading infectious cause of death. Because most TB cases are curable, understanding TB-related mortality informs targeted efforts to reduce poor outcomes. In the United States, two CDC systems separately collect TB-related death information, Vital Statistics (VS) and National TB Surveillance System (NTSS). However, TB-related mortality reported to these two systems varies greatly. To inform refinements to TB mortality surveillance, we compared TB-related deaths in both systems.

DESIGN/METHODS

Because identifying information was not available, we used a probabilistic matching algorithm to match NTSS death records with VS records reported during 2010–2013. TB-related deaths were those for which TB contributed to deaths in either system. We used Chi-square tests to compare characteristics of deaths between systems.

RESULTS

A total of 2,683 death records from NTSS and VS matched; both systems considered 705 (26.3%) TB-related and 1,161 (43.3%) not TB-related. Of the remaining 817 (30.4%), 282 (34.5%) were TB-related only by NTSS and 535 (65.5%) only by VS. Among cases with pulmonary TB, NTSS significantly classified fewer deaths as TB-related compared to VS ($p<0.001$). In contrast, among cases with HIV, NTSS significantly classified more deaths as TB-related compared to VS ($p<0.001$).

CONCLUSION

NTSS and VS agreed for <50% of TB-related deaths. Agreement was particularly poor for pulmonary cases and those with HIV coinfection. Misclassification of TB-related deaths can mislead efforts to design targeted efforts to reduce TB mortality. Therefore, efforts to improve measurement of TB-related mortality should focus on reconciling cause-of-death classifications for patients with pulmonary TB and TB-HIV coinfection.

G. LTBI

G1. FACTORES RELACIONADOS CON LA RECEPCIÓN DE TERAPIA PREVENTIVA CON ISONIAZIDA EN NIÑOS CONVIVIENTES DE ADULTOS CON TUBERCULOSIS PULMONAR EN SANTO DOMINGO, REPÚBLICA DOMINICANA

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INTRODUCCIÓN
Tuberculosis (TB), segunda causa mundial de mortalidad por agente infeccioso. La OMS promueve la Terapia Preventiva con Isoniazida (TPI) en menores de 5 años, contactos de casos de TB bacteriológicamente confirmados (TB-BK+). Mundialmente, en 2015, el 7.1% de niños identificados como contactos recibió TPI y en República Dominicana, solo 35%. El objetivo de este estudio es identificar factores relacionados con la recepción de TPI.

METODOLOGÍA
Estudio descriptivo de corte transversal con abordaje mixto. Se presentan resultados de la fase cuantitativa, partiendo de datos clínicos, socioeconómicos y demográficos registrados en el sistema de información del Programa de Control de TB durante 2015 y 2016. Se realizó análisis univariado y bivariado utilizando STATA-v14.

RESULTADOS
fueron identificados 238 niños contactos de casos TB-BK+, 36% (85/238) recibió TPI y 11% (26/238) no contiene datos sobre TPI. La media de edad fueron 2.7 años (DE 1.58). El 41% (97/238) residía en barrios con alta densidad poblacional, 53% (126/238) vivía en condiciones de hacinamiento, 29% (70/238) asistía a centros especializados en TB, 16% (37/238) se les realizó prueba de tuberculina (PPD) y un 78% (180/238) tenía evidencia de vacunación con BCG. El 55% (132/238) de los padres estaban desempleados. Las variables sexo, edad, barrio de residencia, centro especializado en TB, PPD, evidencia de vacuna BCG y hacinamiento tuvieron diferencias estadísticamente significativas.

CONCLUSIONES
La poca disponibilidad de datos completos se identifica como una brecha que contribuye al bajo suministro de TPI. Hubo escaso suministro de TPI y aplicación de PPD. Los niños que no recibieron TPI provenían de zonas con marginación social. Para obtener un cuadro completo, es preciso realizar el análisis cualitativo y relacionarlo con estos resultados.

Palabras claves: Terapia preventiva con isoniazida, tuberculosis pulmonar bacteriológicamente confirmada, niños.

G2. FACILITATORS AND BARRIERS TO COMPLETING LATENT TB INFECTION TREATMENT (LTBI)

Badhwar S, Cocja A, Davis S, Fernandes L, Lane A, Persaud S, Saleh M. Region of Peel, Mississauga, ON, Canada.

BACKGROUND

Peel Region has a diverse population of 1.4 million, 49.6% from TB endemic countries. Peel receives an average of 1,267 annual Latent TB Infection (LTBI) reports. 46% of cases begin treatment and 22% complete. Completion rates fall below the program indicator of 80% treatment completion.

INTERVENTION

To determine effective interventions to support treatment completion, nurses surveyed clients to assess treatment outcomes, barriers and enablers and client communication preferences. Consent was obtained and data was collected and analyzed in Excel. Data was de-identified and reported as aggregate.

RESULTS

Of 208 clients contacted in 2015, 50% (104) completed treatment; 7.7% (16) never started; 16.3% (34) weren't reached; 25.5% (53) didn't complete treatment and one restarted (0.5%). 80% of clients completing treatment had a specialist.

Highest ranked strategies to complete treatment included daily routines (76%), pre-booked physician appointments (81%) and appointment reminders (81%).

Of the 53 who did not complete treatment, 56.6% reported side effects, non-compliance (26.4%), lack of education (9.4%) and other (7.6%).

In 2016, 80% of 214 clients surveyed found monthly nurse contact helpful (80%). Clients preferred calls to their cell (51%), email (21%), text (18%) and land line.

In response to findings, Public Health Nurses increased client contact frequency. Treatment completion in 2015 was 59%; an increase of 37%.

CONCLUSIONS AND KEY RECOMMENDATIONS

TB specialist care and remaining in close contact with clients throughout treatment improves completion rates. LTBI programs should facilitate access to TB experienced physicians and implement mechanisms to contact clients regularly throughout treatment.

G3. **TARGETING THE BIRTH-COHORT OF THE PRE-ANTIBIOTIC ERA; A PROPOSAL TO SCREEN FOR TUBERCULOSIS IN SENIORS IN ARKANSAS**

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BACKGROUND

Approximately 13 million (4.7%) people in the US have Latent TB infection (LTBI). Persons born prior to 1951 have disproportionately higher LTBI prevalence, and frequently experience delays in TB diagnosis and TB deaths. Nevertheless, this birth-cohort was overlooked in the 2016 US Preventive Service Task Force (USPSTF) recommendation for LTBI screening. The aims of this project are to (1) determine the LTBI prevalence in this birth-cohort, (2) assess TB complications prevented by LTBI screening in this birth-cohort, and (3) raise TB awareness among providers and the community.

METHODS

We will: (1) Develop educational pamphlets for the physicians and community. (2) Screen 10,000 members of the target birth-cohort during their routine clinical visits for one year, using T-SPOT.TB. County health officers, the partners of Arkansas Department of Health, will enroll physicians in their jurisdictions to participate in TB screening. LTBI prevalence in the birth cohort will be determined, and TB complications will be compared among cohort TB cases that were screened to those not previously screened. (3) Incorporate LTBI and birth-cohort status in patient medical forms.

RESULTS

In our preliminary study, for the period 2009-2014, 142 of 326 TB cases (43.6% of all US-born TB cases) were reported from the target birth-cohort; 72.6% of the cases had unique genotype strains.

DISCUSSION

If the LTBI prevalence in this birth cohort exceeds 8-10%, we recommend a nation-wide screening program for this birth-cohort. Even without treatment, we believe that screening and noting diagnosis of LTBI in the patient record will impact delayed diagnosis and mortality.

G4. **LATENT TUBERCULOSIS INFECTION TREATMENT COMPLETION WITH SELF-ADMINISTERED, ONCE WEEKLY ISONIAZID-RIFAPENTINE UNDER PROGRAMMATIC CONDITIONS**

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BACKGROUND

A recent randomized controlled trial found that treatment completion with 12 doses of once-weekly isoniazid and rifapentine (3HP) by SAT was non-inferior to directly observed therapy (DOT) in the U.S. Based on these results, 3HP-SAT was added as a treatment option in our clinic. We reviewed our experience over a 12 month period and now report on our findings.

METHODS

We conducted a retrospective cohort study of patients treated for LTBI from 4/2017-3/2017. Data was obtained from the electronic medical record and reasons for non-completion were reviewed for 3HP-SAT. Patients received 1 month of medications with refills dispensed at follow-up visits. Treatment completion was determined by the pharmacy dispensing data: 12 doses for 3HP-SAT and 4 months for 4R, our first line LTBI regimen since 2009.

RESULTS

561 patients started LTBI treatment. Treatment with 4R was initiated in 367 (65%); 278 (76%) completed treatment. 160 (29%) initiated treatment with 3HP, with 13 as DOT, and 147 SAT. 3HP-DOT completion was 11/13 (85%) compared to 119/147 (81%) with 3HP-SAT, p=1.0. SAT treatment was stopped due to the following: 5/28 (18%) adverse effects; 2/28 (7%) pregnancy; 3/28 (11%) patient preference; 6/28 (21%) transferred care; 1/28 (4%) developed active TB; 12/28 (43%) lost to follow-up. Of those who received 3HP-SAT, completion did not significantly differ from 4R, (p=0.20).

CONCLUSIONS

LTBI treatment completion with 3HP-SAT was similar to 4R and 3HP-DOT under programmatic conditions. Additional options for self-administered short course LTBI regimens may allow for increasing the number of patients treated for LTBI.

G5. THE LATENT TB INFECTION CONTINUUM OF CARE AMONG PREGNANT AND POST-PARTUM WOMEN

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BACKGROUND

The American College of Obstetrics and Gynecology and The Centers for Disease Control and Prevention recommend screening and testing pregnant women for latent TB infection (LTBI), however the prevalence of screening is not well characterized. We evaluated the LTBI continuum of care for pregnant and post-partum women at Denver Health's Women's Care Clinic (DHWC).

METHODS

We performed a retrospective cohort study of pregnant women seen at DHWC from 2012-2014 and who were born in a country with a TB incidence of >20/100,00. Data was extracted from the electronic medical record. LTBI was defined as a positive interferon-gamma release assay (IGRA) and no diagnosis of active TB. Post-partum treatment initiation and completion were determined by pharmacy refill. LTBI prevalence, treatment initiation and completion rates were estimated for the entire cohort.

RESULTS

Of 4543 pregnant women identified, 3012 (66%) had no prior history of LTBI testing. 826/3012 (27%) had IGRA testing in the period. 113/826 (14%) were positive. Chest radiography was performed in 88/113 (78%). Treatment was initiated in 35/88 (40%), n=6 isoniazid, n=29 rifampin. As shown in **Figure 1,** 27/35 (77%) completed therapy or 27/118 (24%) of women with a positive IGRA. Based upon LTBI prevalence of 14%, 520 additional women are estimated to have LTBI with an estimated overall completion rate of 27/633 (4%).

CONCLUSIONS

The largest gaps in the care continuum for pregnant and post-partum women are in testing for LTBI and initiation of LTBI therapy. Strategies to scale up testing and initiation of LTBI therapy in pregnant/post-partum women are needed.

Figure 1

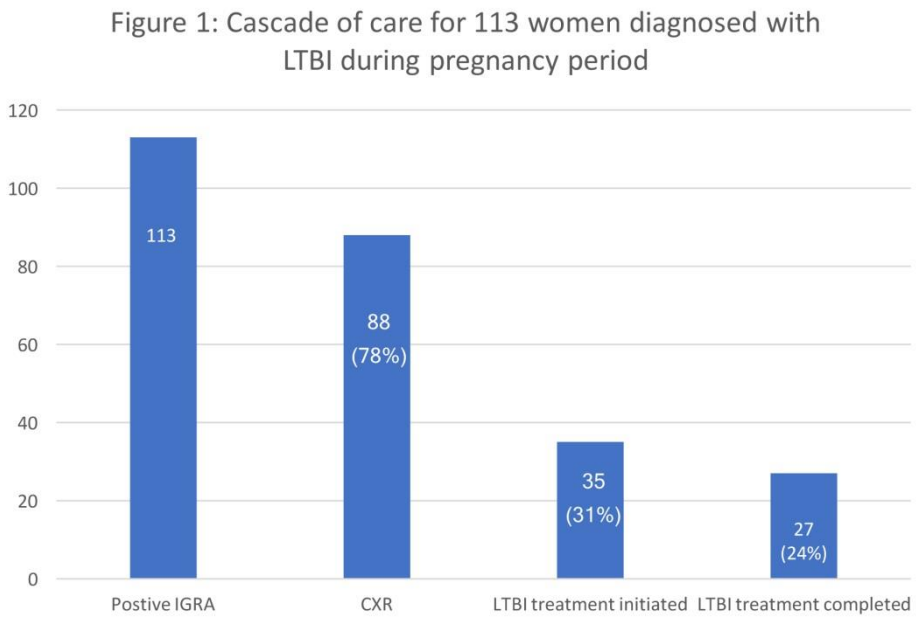
Figure 1: Cascade of care for 113 women diagnosed with LTBI during pregnancy period
120
100
80
60
40
20
0
113
88
(78%)
35
(31%)
27
(24%)
Postive IGRA
CXR
LTBI treatment initiated
LTBI treatment completed

G6. **ESTIMATING THE IMPACT OF WORLD HEALTH ORGANIZATION LATENT TUBERCULOSIS SCREENING AND TREATMENT GUIDELINES ON TUBERCULOSIS RISK IN MIGRANTS TO BRITISH COLUMBIA, CANADA**

Ronald LA[1,2], Campbell JR[1], Balshaw RF[3], Romanowski K[2], Roth DZ[2], Marra F[1], Cook, VJ[1,2], Johnston JC[1,2].
[1]University of British Columbia; [2]BC Centre for Disease Control, Vancouver, BC; [3]University of Manitoba, Winnipeg, MB, Canada.

BACKGROUND
Latent tuberculosis infection (LTBI) screening and treatment of high-risk populations is a key component of the WHO End-TB Strategy. Our objective was to estimate how many active TB cases could have been prevented among migrants to British Columbia, Canada through targeted LTBI screening according to WHO guidelines.

METHODS
This retrospective cohort included all Canadian permanent residents (N=1,081,016) who landed and became resident in BC at any time between 1985 and 2013. Multiple administrative databases and disease registries were linked to the provincial TB registry. We identified when a person was a TB contact or had co-morbidities recommended for LTBI screening ('risk factors'): HIV, dialysis, TNF-alpha inhibitors, organ or haematological transplant, or silicosis. We identified 'preventable' TB when diagnosed more than 6 months after a risk factor diagnosis. We estimated the number of active TB cases that could have been prevented given optimal LTBI screening and treatment.

RESULTS
In total, 16,071 people had a risk factor diagnosed over the 29-year follow-up period (median follow-up 10 years), including TB contact (n=11,879), dialysis (n=1,810), HIV (n=1,443), TNF-alpha inhibitors (n=843), transplant (n=653), and silicosis (n=12). Of 2,924 active TB cases diagnosed in the cohort, 272 (9.3%) occurred in people with WHO-identified risk factors and 118 (4.0%) were considered 'preventable'.

CONCLUSION
Application of WHO LTBI screening guidelines would have prevented a small proportion of active TB cases. Further high-risk populations will need to be identified to develop a TB screening strategy for low-incidence regions to meet the elimination goals of the End-TB strategy.

H. LTBI DIAGNOSIS

H1. COMPARISON OF RESULTS OF QUANTIFERON GOLD-IN-TUBE (QGT-G) AND QUANTIFERON PLUS (QFT+) ASSAYS USING DIRECT BLOOD DRAW OR TRANSFER

Agarwal S, Lew JD, Nguyen DT, Graviss, EA. Houston Methodist Hospital, Houston, TX, USA.

BACKGROUND
The recently FDA approved QFT+ has 2 approved methods for blood collection: direct in-tube collection (direct QFT+) or transfer blood in a lithium heparin tube (LiHp) collected from a single phlebotomy (transferred QFT+). Currently, there is little data comparing the results of QFT+ based on blood collection methods.

METHODS
Healthcare workers (HCWs) are tested for tuberculosis infection (TBI) annually at Houston Methodist Hospital (HMH; Houston, TX). HCWs were consented and enrolled in a research study comparing the QFT-G to direct QFT+ and transferred QFT+.

RESULTS
A total of *N*=213 HCWs were included in the analysis. The proportion of positive test results for the QFT-G, direct QFT+ and transferred QFT+ were 7.0% (15/213), 8.0% (17/213) and 14.0% (30/213), respectively. The agreement (95% confidence interval, Kappa [κ]) in the results of QFT-G versus direct QFT+, QFT-G versus transferred QFT+, and direct QFT+ versus transferred QFT+ was 91.6% (87.0, 94.9), κ= 0.36; 90.1% (85.3, 93.8), κ= 0.47; and 84.5% (78.9, 89.1), κ= 0.22, respectively.

CONCLUSION
Among HCWs is a low prevalence TB setting, QFT+ using direct or LiHp tube and blood transfer had a higher proportion of positive QFT test results than the QFT-G assay. Fair agreement was found between the QFT-G and QFT+ direct draw and between the direct and transferred QFT+ assays. Use of a LiHp tube and blood transfer may decrease the proportion of indeterminate QFT test results, but it may increase the proportion of positive test results due to variability, laboratory errors or vigorous shaking.

H2. LABORATORY COST ANALYSIS: COMPARING THE NEW QUANTIFERON PLUS ASSAY TO THE QUANTIFERON GOLD-IN-TUBE ASSAY

Agarwal S, Lew JD, Nguyen DT, Graviss, EA. Houston Methodist Hospital, Houston, TX, USA.

BACKGROUND

The FDA approved QuantiFERON Plus assay (QFT+) has 4 tubes and 2 approved blood collection methods: direct in-tube collection or Lithium Heparin tube (LiHp) transfer. The blood transfer procedure to the assay tubes by trained laboratory staff may reduce the indeterminate rate in a hospital. The purpose of this analysis was to compare the costs associated with the QFT+ to the QuantiFERON Gold-in-tube (QFT-G) assays.

METHODS

The laboratory operational costs for the QFT-G and QFT+ assays in the CLIA/CAP certified Tuberculosis Molecular Laboratory at Houston Methodist Hospital (HMH, Houston, TX) were generated using 2016-2017 data. Assay costs including the price of the QFT+ using direct blood collection or LiHp blood transfer were estimated and compared to QFT-G.

RESULTS

The HMH laboratory runs approximately *n*=9,000 QFT-G assay per year. The mean cost difference between the QFT-G and QFT+ was US $1.05 with the QFT-G being slightly more expensive. Blood transferring methodology added an estimated US $0.74 to each QFT+ sample. The largest source of cost discrepancy was due to using a 4 point standard curve for the QFT+ compared to the 8 point standard (US $0.44) currently used for the QFT-G.

CONCLUSIONS

The QFT+ assay has US $0.32 - $1.05 less in laboratory costs compared to the QFT-G assay despite costs associated with the blood transfer. In addition to having the potential of a lower rate of indeterminate results due to a reduction in phlebotomy errors, QFT+ also has potential cost savings compared to QFT-G in a hospital setting.

H3. **COMPARISON OF INTERFERON-GAMMA RELEASE ASSAYS QuantiFERON®-PLUS AND QuantiFERON® GOLD-IN-TUBE PERFORMANCE FOR TUBERCULOSIS TESTING IN U.S. HEALTH CARE WORKERS**

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BACKGROUND/OBJECTIVE

Our objective was to compare the interferon-gamma-release-assay QuantiFERON®-TB Gold-in-Tube (QFT®, Qiagen Corp.) with QFT®-Plus performance in US healthcare workers. Approved January 2017, QFT-Plus replaces QFT for tuberculosis testing. QFT-Plus adds a second antigen tube (TB2).

METHODS

Participants were employees of the Veterans Affairs Palo Alto Health Care System. All completed risk-factor questionnaires and were tested with QFT and QFT-Plus from a single blood sample. QFT was drawn into specialized tubes; QFT-Plus into lithium-heparin tubes and aliquoted into QFT-Plus tubes in the laboratory.

RESULTS

535 employees were enrolled from October 2015-September 2017, 8 were excluded. There was 94.3% (95%CI, 92.0-96.1) agreement between QFT and QFT-Plus, with 10.8% and 15.6% overall positives, respectively. Among those without identified risk-factors for TB, the positive rate in QFT and QFT-Plus was 8/527(1.5%) and 6/527(1.1%) and not statistically significantly different ($p<0.216$). 52/82(63.4%) QFT-Plus that were positive in both TB1 and TB2 had mean values of 2.11 and 2.12 International Units/milliliter (IU/ml). The means of 30/82 (36.6%) with one positive tube were 1.10 and 0.54 IU/ml, respectively.

CONCLUSION

QFT-Plus has strong agreement with QFT. The overall positive rate in this low-risk healthcare worker population increased, but if QFT-Plus tests with discrepant positive TB1 and TB2 results were considered negative, the overall positive rate would decrease. This approach could be considered in line with the 2016 ATS/CDC/IDSA TB Diagnostic Guidelines.

H4. POTENTIAL CLINICAL UTILITY OF THE T-SPOT®.*TB* TEST'S BORDERLINE RESULT

Rego K[1], Pereira K[1], MacDougall J[2], Cruikshank W[1]. [1]Oxford Immunotec, Marlborough; [2]Biobridges, Wellesley, MA, USA.

BACKGROUND

Accurate identification of individuals with *M. tuberculosis* (MTB) infection, likely to progress to active disease, is required to achieve the WHO's End TB Strategy goals. While there is general acceptance that the T-SPOT.*TB* test borderline category reduces likelihood of false positive/negative results, this has not been investigated.

METHODS/DESIGN

645,000 tests were analyzed to determine frequency of borderline results, effect of age and time between tests and associations between subjects' clinical risk factors and retest results.

RESULTS

645,000 tests produced 93.5% negatives (≤ 4 spots), 4% positives (≥ 8 spots), 0.6% invalids, and 1.8% borderlines (5, 6, or 7 spots). Within the borderline results, 5,044 were repeated, with 59.2%, 20.0% and 20.2% resolving to negative, positive and borderline, respectively. Age of subject did not affect retest results; however, time between tests indicated that maximal resolution occurred after 90 days. MTB risk factors were provided by draw locations on test requisitions for 2640 subjects and 17% of low risk subjects with a high initial borderline (7 spots) resolved to negative while 27.6% of subjects with high risk and an initial low borderline (5 spots) resolved to positive, suggesting that these subjects could have been inaccurately diagnosed. CDC and drug manufacturers recommend MTB screening for subjects requiring immunosuppressive treatments. A similar analysis of this group indicated that 37 of 161 individuals could have been inappropriately treated if using a single cut-off point test without a borderline category.

CONCLUSION

This study demonstrates the potential clinical benefit of the borderline category thus increasing test accuracy.

H5. **PERFORMANCE OF THE T-SPOT®.*TB* TEST IN THE ELDERLY**

Rego K, Cruikshank W. Oxford Immunotec, Marlborough, MA, USA.

BACKGROUND

The greatest burden of TB disease is in individuals ≥65 years old (incidence rate 4.8 cases/100,000) suggesting importance for identifying infected elderly likely to progress. Current diagnostic methods assess immune responses, which can be confounded in an age group that demonstrates reduced immune capacity. In this study T-SPOT.*TB* test results from all age groups were analyzed to determine positivity trends as well as test performance.

METHODS/DESIGN

844,000 tests conducted at Oxford Immunotec's centralized lab during a 13 month period were categorized by age and result type (negative, positive, borderline or invalid). Subjects' ages ranged from 1 year to 100 years and were grouped by decade.

RESULTS

It was determined that, consistent with the incidence rate, the highest positivity rates were seen in the elderly (6.4% in ≥ 70 years versus 3.6% in < 70 years), with a corresponding decrease in negativity rates with increasing age. Test performance was evaluated by addressing the invalid and borderline rates within in each age group. Invalid rates were extremely rare for all age groups with the elderly demonstrating a slightly higher rate (1.2% in ≥ 70 years versus 0.8% in < 70 years). Similarly, borderline results were rare for all age groups with the elderly again demonstrating only a small increase in borderline rates (2.6% in ≥ 70 years versus 1.7% in < 70 years)

CONCLUSION

This study demonstrates that the T-SPOT.*TB* test performs consistently well in all age groups and confirms TB positivity in the age group that exhibits the highest TB burden.

I. TB/HIV

I1. IDENTIFYING CRITICAL FACTORS ASSOCIATED WITH SUCCESSFUL ISONIAZID PREVENTIVE THERAPY (IPT) DELIVERY IN SWAZILAND: A MIXED METHODS STUDY

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BACKGROUND
Despite its proven efficacy, uptake and treatment completion of isoniazid preventive therapy (IPT) has been poor in most high tuberculosis-(TB)-burden settings. In our prospective cohort study in Swaziland in 2015-16, a self-selected IPT delivery model aligned with antiretroviral refills yielded 89.4% treatment completion. We sought to determine the factors that enabled patients to successfully complete treatment.

METHODS
In this retrospective, mixed methods study, trained researchers interviewed participants who completed IPT during the prior study stratified across delivery model, enrollment site, and basic demographics. Qualitative data were analyzed using thematic analysis.

RESULTS
We interviewed 129 participants between June and September 2017. We excluded 10.9% of participants who did not recall being offered a delivery choice. Of the remaining 115, 66% were female and median age was 42.5 years (IQR 26.5-60.0 years). Successful IPT completion appeared associated with trust in facility-based delivery, positive social norms at facilities, authentic relationships with clinicians, and strong social support systems. Study-based education improved understanding of TB susceptibility and the importance of treatment. Most reported that linking their IPT to their antiretroviral refills and having a choice of delivery models contributed to their ability to complete their IPT (98.3% and 86.1%, respectively).

CONCLUSION
Integrated TB and HIV care and offering patients a choice in their IPT delivery enabled them to successfully complete a 6-month regimen of IPT. This approach can be used elsewhere in Swaziland and in similar high TB/HIV burden settings. Scaling-up IPT implementation may require assessment of local healthcare delivery norms to inform successful IPT delivery strategies.

I2. PERFORMANCE OF THE Xpert® HIV-1 VIRAL LOAD ASSAY: A SYSTEMATIC REVIEW AND META-ANALYSIS

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(+ these authors contributed equally to this work)

BACKGROUND
Viral load (VL) is the preferred treatment monitoring approach for HIV-positive patients. However, more affordable, technologically simpler assays are needed to ensure VL testing is widely and routinely available. The Xpert HIV-1 VL assay (Cepheid, Sunnyvale) is a new, automated molecular test, and can leverage the GeneXpert systems that are now being used for TB diagnosis. The objective of this study was to systematically summarize the evidence on the performance of this novel tool in comparison to current gold standards.

METHODS/DESIGN
Using OVID, we systematically searched Medline (1946-2017), Embase (1947-2017) and Global Health (1973-2017) for studies evaluating the performance of the Xpert HIV-1 VL assay in adult HIV-positive patients. No geographic or language restrictions were applied.

RESULTS
A total of 13 studies, conducted in both high- and low-income countries, were included in our analysis. Correlation coefficients between Xpert and reference assays were high with a pooled Pearson correlation (n=8) of 0.94 [0.89,0.97] and Spearman correlation (n=3) of 0.96 [0.86, and 0.99]. Bland-Altman metrics (n=8) were all within 0.35 log copies/mL of perfect agreement. Study quality was generally high but substantial variability was observed in the number and type of agreement measures reported.

CONCLUSIONS
Overall, Xpert HIV-1 VL performed well in comparison with current gold standard VL assays. The minimal training and infrastructure requirements for the Xpert HIV-1 VL assay make it attractive for use in resource constrained settings, where point-of-care VL testing is most needed.

I3. PREDICTIVE MODEL FOR MORTALITY DURING TB TREATMENT IN HIV CO-INFECTED PATIENTS IN A LOW TB PREVALENCE POPULATION

Nguyen D, Agarwal S, Graviss EA. Houston Methodist Research Institute, Houston, TX, USA.

BACKGROUND

HIV has been identified as a strong predictor for mortality in TB patients. Making an accurate prognosis during TB treatment of HIV co-infected patients remains a challenge for health professionals especially in a low TB prevalence population, due to the lack of a standardized prognostic system.

METHODS

De-identified surveillance data between 01/2010 and 12/2016 from the US CDC's TB Genotyping Information Management System was analyzed. All confirmed TB/HIV patients ≥15 years of age from Texas and having a treatment outcome of either "completed" or "died" were included in the analyses. Univariate and multiple logistic regression models were used to determine prognostic factors associated with patient mortality. All analyses were performed with Stata MP14.2 (StataCorp LP, TX).

RESULTS

Among the 450 patients included in the analysis, 57 (12.7%) died during TB treatment. Age ≥45 years, resident of long-term care facility, meningeal TB, positive culture, and culture non-conversion or unknown conversion status had the strongest association with mortality with an adjusted odds ratio (95% confidence interval) of 4.57 (1.96, 10.65), 14.15 (2.37, 84.38), 6.61 (1.96, 22.27), 21.68 (7.27, 64.69), and 27.4 (10.41, 72.15), respectively. The final model had excellent performance with a C statistic of 0.85 in the development and bootstrap validation steps.

CONCLUSIONS

The prognostic factors for mortality determined by multivariate modeling provide a practical tool for clinicians in appropriately allocating treatment, follow-up and medical support among TB/HIV co-infected patients during TB treatment. Our results lay the foundation for developing and validating a prognostic scoring system for TB mortality in the future.

I4. EVOLUTION OF THE COINFECTION TB/HIV IN HAITI

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BACKGROUND

Haiti has the Highest HIV prevalence, TB incidence and coinfection TB/ HIV rate in the Caribbean; during the last decade to reverse the death trend among coinfected patient, policy had been changed to provide HIV testing and appropriate care to TB/HIV patient; however very few is known about the results of this strategy.

METHOD

Retrospective data were collected from TB registers from 2011 to 2016; focus were put on this period, because complete data was available and most of the resources were used at that time to implement the new strategy, the policy in testing, managing and reporting data coinfection data. The strategy consisted mostly in testing all TB patients after inform consent, concomitant TB and HIV treatment, reporting and validation of data in primary source at the TB and VCT sites. Data were analyzed with Epi info 7after being entered with MS Excel.

RESULT

With the implementation of the collaborative activities in all the ten departments, the percentage of TB patients who know their HIV status increased from 73% to 90%, the percentage of coinfected TB/HIV patients on ART from 25% to 84% from 2011 to 2016 while the prevalence of HIV among TB patient decreased from 21% to 15% and death rate from 7% to 5%.

CONCLUSION

Adding appropriate resources to implement collaborative activities with simple and clear policy could succeed even difficult settings like Haiti.

I5. RISK PROFILES IN MONO INFECTED TB PATIENTS AND THOSE CO-INFECTED WITH HCV AND/OR HIV

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BACKGROUND

Mono-infected TB cases differ with respect to demographic and risk characteristics from those co-infected with HIV and/or HCV. Characterizing these subpopulations is required for targeted prevention.

METHODS

We describe active TB cases diagnosed in British Columbia (BC) (1990-2013) in the BC-Hepatitis Testers Cohort, which includes -1.5 million individuals tested for HCV or HIV, or reported with HCV, HIV, HBV, and/or TB. TB mono-infected, TB/HIV, TB/HCV, and TB/HIV/HCV co-infected were compared using multinomial logistic regression.

RESULTS

Of 6587 individuals with TB, 5927 had TB only, 144 had TB/HIV, 294 had TB/HCV, and 222 had TB/HIV/HCV. TB mono-infected cases were 73.5% foreign-born (FB), with low injection drug use (IDU) (3.2%), problematic alcohol use (10.1%), and mental illness (12.4%). The adjusted odds of TB/HIV was greater in Canadian-born (CB) than in FB (OR: 1.7 (1.12-2.58), in those with mental illness (OR: 2.00 (1.29-3.00)), who report IDU (OR: 2.9 (1.72-4.75)), or belonging to the lowest socioeconomic quintile (OR: 3.3 (1.79-6.19)). The odds of TB/HCV was greater in CB (OR: 3.6 (2.53-5.20)), IDU (OR: 6.3 (4.48-8.87)), problematic alcohol users (OR: 2.53 (1.83-3.50), and those from the lowest socioeconomic quintile (OR: 2.6 (1.58-4.30)). TB/HCV/HIV was associated with CB (OR: 6.3 (3.40-11.92)), mental illness (OR: 1.90 (1.30-2.86)), IDU (OR: 33.5 (2.00-55.72)), and belonging to the lowest socioeconomic quintile (OR: 4.2 (1.80-9.96)).

CONCLUSIONS

Social disparities, mental illnesses and substance use are associated with TB, HCV and HIV co-infections in BC. Syndemic prevention, care and treatment approaches that include harm reduction, mental health and addictions support are needed for provincial TB programming.

J. PEDIATRIC TB

J1. MISSED OPPORTUNITIES TO DIAGNOSE INFECTIOUS TUBERCULOSIS IN A PEDIATRIC EMERGENCY DEPARTMENT SETTING

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*Contributed equally

BACKGROUND
Failure to appropriately identify and isolate adolescent patients with suspected tuberculosis (TB) in Emergency Department (ED) settings may lead to community and nosocomial transmission. We reviewed characteristics of pediatric patients presenting to SickKids ED who were subsequently diagnosed with pulmonary tuberculosis.

METHODS
We reviewed the charts of patients aged 12 to 18 years who presented to the ED at SickKids and were subsequently diagnosed with respiratory-specimen culture-positive TB.

RESULTS
A total of 9 patients met inclusion criteria; the mean age at presentation was 15.6 years (range 13-17 years). Airborne isolation was instituted in 5/17 visits at Sickkids ED prior to diagnosis (29%). In 5 instances, droplet/ contact isolation was instituted. All patients were born in TB-endemic countries. The median number of ED visits before diagnosis was 2 (range 1-5 visits) and the median duration of any symptom at presentation 3 weeks (range 2-17 weeks): 8 patients had symptoms for > 2 weeks (89%). Recorded symptoms included: cough [9 (100%)], fever [8 (89%)] night sweats [6 (67%)], chest pain [6 (67%)], hemoptysis [3 (33%)]. On first chest radiograph, upper-lobe airspace disease was found in 7 patients (78%): 4 patients with known upper lobe changes were not isolated during 5 ED visits. When sputa were obtained, 4/5 expectorated samples (80%) and 2/5 induced samples (40%) were smear positive.

CONCLUSIONS
An algorithm based on symptom duration, country of origin, and radiologic findings may avoid unnecessary exposures. Failure to send sputa for TB smear and culture and consider chest X-ray findings may have delayed diagnosis and appropriate isolation.

J2. **A REVIEW OF MYCOBATERIUM TUBERCULOSIS CULTURE YIELD FROM THREE DAILY GASTRIC ASPIRATE SPECIMENS VERSUS MULTIPLE SAMPLES OBTAINED IN ONE DAY (2013-2017)**

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BACKGROUND

The Pediatric TB Service adopted an hourly (QH1) gastric aspirate (GA) method to obtain secretions for tuberculosis (MTB) studies in 2016 - hoping to effect a change in practice to one that is less traumatic, one that can lead not only to earlier anti-TB medication treatment initiation but also shorter hospital stay and earlier return to the community.

METHODS

We compared MTB culture yield from GA specimen obtained once daily on three consecutive days (ODx3) and those taken from multiple samples in one day (MSx1), Demographic, epidemiologic, clinical information, investigations – Q1H versus daily gastric aspirates and mycobacteriologic results, and chest x-ray (CXR) findings on patients seen by the Pediatric TB Service from January 2013 to June 2017 were reviewed, tabulated and described.

RESULTS

Fifty-one patients (29 males: 22 females) were admitted for GA. Ages ranged from 3 to 94 months. CXRs results were: 24 adenopathy, 26 parenchymal opacity, 4 pleural effusion. Thirty had samples ODx3 (interval of ≥ 24hrs between samples), 5 had MSx1 sampling (interval of ≥ 2hrs between samples), 16 had Q1H X 3 sampling after 6 Hrs NPO early morning. Five of the 30 ODx3 patients had positive MTB cultures, while 1 of the 5 MSx1 patients cultured positive and 7 of 16 Q1H patients cultured positive. Culture positivity was strongly associated with CXR parenchymal changes more than adenopathy.

CONCLUSION

Q1H GA sampling is a less traumatic, better yielding process to obtain specimen for MTB culture in young children compared to ODx3, offering earlier treatment start, and faster discharge home.

J3. **ENHANCED COMPLETION AND SAFETY FOR TREATING PEDIATRIC TUBERCULOSIS INFECTION USING SHORTER REGIMENS**

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BACKGROUND

The traditional treatment for tuberculosis infection (TBI), 9 months of daily isoniazid (9H), is safe, but completion rates of < 50% are reported. Shorter regimens [3 months of once-weekly isoniazid/rifapentine (3HP) or 4 months of daily rifampin (4R)] are associated with improved adherence in adults.

METHODS

This was a retrospective cohort study (2014-2017) of children (0-18-years-old) seen at a children's tuberculosis clinic in a low-incidence nation. We compared the frequency of completion and adverse events (AEs) in children receiving 3HP, 4R, and 9H; the latter 2 regimens could be administered by families (termed SAT) or as directly-observed therapy (DOPT); 3HP was always administered under DOPT.

RESULTS

TBI treatment was started in 667 children: 283 (42.4%) 3HP, 252 (37.8%) 9H, and 132 (19.8%) 4R. Only 52% of children receiving 9H via SAT completed therapy. Children receiving 3HP were more likely to complete therapy than the 9H (SAT) group (OR 27.4, 95% CI: 11.8-63.7). Multivariate analyses found receipt of medication under DOPT (OR 5.72, 95% CI: 3.47-9.43), increasing age (OR 1.09, 95% CI: 1.02-1.17) and the absence of any adverse event (OR: 1.70, 95% CI: 0.26-0.60) to be associated with completing therapy. Complaints of any AE was more common in the 9H group compared to 3HP and 4R groups (OR 2.51, 95% CI: 1.48-4.32). Two (0.9%) children receiving 9H developed hepatotoxicity; no child receiving 3HP or 4R developed hepatotoxicity.

CONCLUSIONS

Shorter regimens are associated with increased completion rates and fewer AEs than 9H. Providers should shift to using shorter-course regimens.

J4. **WHOLE GENOME SEQUENCING OF *Mycobacterium tuberculosis* IDENTIFIES TRANSMISSION TO PEDIATRIC PATIENTS IN BRITISH COLUMBIA, CANADA, 2005–2014**

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BACKGROUND
Significant public health resources are required for treatment, follow-up, and contact investigation related to tuberculosis (TB) in children–often considered an indicator of community transmission. Whole genome sequencing (WGS) can enhance pediatric TB investigations by confirming or refuting transmission between cases.

METHOD/DESIGN
Mycobacterium tuberculosis (Mtb) isolates from all patients <18 years with culture confirmed TB in British Columbia (BC) from 2005-2014 (n=49), were subjected to 24-locus MIRU-VNTR (MIRU) genotyping followed by WGS for all MIRU-clustered cases (n=24). The results were compared to all genotyped and sequenced Mtb isolates in BC (adult and pediatric) during the same time period and linked to relevant clinical, demographic, and contact tracing data to characterize the epidemiology of pediatric tuberculosis transmission in BC.

RESULTS
Twenty-three children (47%) were Canadian-born (median age 5.8 years); the remaining 26 were foreign-born (median age 14.8), from Asia (81%) or Africa (19%). Six children were identified through contact investigation, while the majority (82%) were diagnosed after presenting with TB symptoms. The median number of contacts was five (IQR: 2–19), with three children having >50 contacts. Twenty-four children (49%) belonged to a genotypic cluster, and WGS identified potential local transmission for 14 patients. A single multi-drug resistant (MDR) pediatric case was detected and confirmed through WGS as transmission from parent (also MDR) to child.

CONCLUSIONS
Genotyping can refute transmission; however, it overestimates true local transmission. WGS is better tuned to detect transmission when interpreted in the context of epidemiological data, and represents an important tool for investigation of pediatric TB.

J5. **TESTING OF REFUGEE CHILDREN FOR TUBERCULOSIS INFECTION**

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BACKGROUND

Refugee children are tested for tuberculosis infection (TBI) during immigration (TSTs for immunized children. We describe the epidemiology of TBI in refugee children in Harris County and correlates of positive test results.

METHODS

Retrospective cohort study of children (<18-years-old) evaluated for TBI at a large urban refugee resettlement program (2010-2015), evaluating test positivity by age, test type, and region of origin.

RESULTS

4,172/4,246 (98.3%) children were tested for TBI: 1,381 (33.1%) TST, 2,608 (62.5%) IGRA, 183 (4.3%) TST+IGRA. TSTs (167/1,564, 10.7%) were 2.3 times as likely to be positive in all children (CI: 1.8-2.9) as IGRAs (138/2,791, 5.0%), in children < 2-years-old (OR: 2.4, CI: 1.6-3.5) and in children from Southeast Asia (OR 2.1, CI: 1.4-3.1). Neither TST nor IGRA positivity was associated with parasite carriage (OR 1.1, CI: 0.6-2.0, OR 1.7, CI: 0.86-3.4 respectively). IGRA positivity was more common in children ≥ 5-years-old (OR 2.7, CI: 1.4-5) and those from Africa (OR 3.9, CI: 2.3-6.7) and Southeast Asia (OR: 3.4, CI: 2.0-5.8). Indeterminate IGRAs (0.9%) were more common in children < 5-years-old (OR 6.2, CI: 2.7-14.0).

CONCLUSIONS

Positive tests for TBI were common among refugee children. IGRA positivity was associated with known epidemiologic risk factors for TBI (increasing age and birthplace), whereas TST positivity was associated with younger age, likely reflecting cross-reactivity with BCG vaccination. Using IGRAs in BCG-immunized children allows TBI therapy to be targeted to children who would most benefit from treatment.

J6. **TUBERCULOSIS AMONG SCHOOL CHILDREN BORN OUTSIDE THE UNITED STATES; TACKLING MISSED OPPORTUNITIES**

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BACKGROUND

In 2016, Arkansas ranked 10th in Tuberculosis (TB) incidence in the US; 50% of all TB cases were reported among non-US born persons. Arkansas implemented a regulation to screen for TB in all international college students from TB endemic countries in 2004. However, students in grade school are not covered by the regulation. We propose targeted TB screening of these children in the setting of immunization visits that are required for registration.

DESIGN/METHODS

We reviewed the TB Registry for years 2009-2017, and identified pediatric (age <19) cases by county. Vaccine for Children Provider clinics in counties that reported TB among non-US born children were surveyed using a 5-item questionnaire (Survey Monkey).

RESULTS

From 2009-2017, 28 of 81(34.6%) pediatric cases were reported from 9 of the 75 counties in Arkansas. Of the 28 cases, 25(89%) had one or more immunization visits sometime before TB diagnosis. Forty-four of 95 (46.3%) clinics responded to the survey. Forty percent of clinics did not identify non-US born children; 42% did not screen for TB; 33% had never reported a case of TB/LTBI, and 76% had not received guidance on TB screening from Arkansas Department of Health. Median time to TB diagnosis was 9.6 [4.8-12.2] years among 80 cases who arrived in US as children.

CONCLUSION

Almost 90% of TB cases could have been prevented by prior screening. The TB Program needs to conduct an education campaign to promote targeted screening for non-US born children. Collaboration between pediatricians, school health, and the Arkansas Department of Health is essential.

J7. THE TRANSMISSION OF TUBERCULOSIS TO CHILD-AGED CONTACTS OF INDIGENOUS CASE PATIENTS ON THE CANADIAN PRAIRIES

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BACKGROUND

Children are at risk for tuberculosis (TB) infection and vulnerable to progression to disease. We identify risk factors for these outcomes among child-age (< 15 years) contacts of adult, Indigenous pulmonary (PTB) case-patients on the Canadian prairies.

METHODS

Associations between risk factors for infection and progression to disease among child-aged contacts were assessed from prospectively collected data on PTB cases and their contacts. Descriptive statistics and multiple logistic regressions were conducted using STATA.

RESULTS

Of 582 fully assessed child-aged contacts of 223 PTB case-patients, 311 (53%) were infected; of 311 infected contacts, 54 (17%) progressed to active disease. Infection was more likely among close contacts (OR: 1.65, CI: 1.07, 2.53), or for those who had a smear positive source case (OR: 2.08; CI: 1.34, 3.22). Having an older (35-64 years of age) source case was protective (OR: 0.64, CI: 0.43, 0.95] or >64 years of age (OR: 0.09, CI: 0.01, 0.79), relative to those with source cases aged 15-34 years. Infection was less likely if the source case resided north of the 53rd parallel (OR: 0.57, CI: 0.35, 0.92). Infected contacts were less likely to progress to active disease if they were aged 5-9 years relative to those under 5 years (OR: 0.44, CI: 0.20, 0.98); or if they were living on reserve (OR: 0.30, CI: 0.15, 0.59).

CONCLUSION

Pediatric infection and disease is occurring among Indigenous children in the Canadian Prairies; this has important implications for TB programming.

J8. **LOW RATES OF SAMPLE ACQUISITION FOR DIAGNOSTIC TESTING AMONG YOUNG CHILDREN WITH TB DISEASE IN GEORGIA, USA**

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BACKGROUND

Microbiologic confirmation of TB disease in children <5 years is challenging because acquisition of samples requires invasive procedures and bacterial yield is lower compared to adults. Georgia has the 4th highest incidence of TB among children <5 in the U.S., but a lower proportion of microbiologically-confirmed cases compared to other high-incidence states (10 % vs. 31%). We evaluated differences in microbiologic testing among children <5 compared to older children and adults with TB in Georgia.

DESIGN/METHODS

We reviewed all clinically-defined cases of TB in Georgia between 2009-2015 and compared microbiologic testing across age groups. Co-factors associated with sending samples for microbiologic testing were assessed using Chi-squared tests.

RESULTS

There were 104 TB cases among children <5, of 2521 total cases. Culture or PCR was performed on 37% (38/104) of children <5, versus 82% (55/67) of children age 5-14 and 98% (2299/2351) of adults (p <0.01). Of TB cases where culture/PCR was sent, microbiologic confirmation was achieved in 34% (13/38) of children <5, 36% (20/55) of children age 5-14, and 79% (1819/2299) of adults (p<0.01). Children <5 were more likely to have microbiologic testing if they presented with symptoms (16/28, 57%), had extrapulmonary TB (15/23, 65%), or negative radiography (10/17, 59%). Three of nine children <5 with culture-confirmed TB had rifampin resistance.

CONCLUSION

Young children were unlikely to have samples sent for microbiologic confirmation, but yield was similar compared to older children. While samples may be difficult to obtain in young children, microbiologic testing allows for drug sensitivity testing and confirmation of clinical diagnosis.

K. SYSTEMS

K1. ECHO FOR US-MEXICO BINATIONAL TUBERCULOSIS CONTROL COLLABORATION

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BACKGROUND AND REASON FOR IMPLEMENTATION

The United States and Mexico share a dynamic border region, due to social and economic ties between the two nations. Coordination of TB care for binational patients is essential for the health of patients and the public in both countries.

INTERVENTION OR RESPONSE

The US-Mexico Binational TB ECHO (teleECHO™program) was developed as a pilot collaboration between the New Mexico Office of Border Health, the ECHO Institute™at the University of New Mexico Health Sciences Center, and with support by the Centers for Disease Control and Prevention and the National TB Program in Mexico. Objectives for US and Mexico border states include: 1) increasing understanding of resources available for US-MX binational TB case management; 2) improving systems through discussion of current cases; and 3) improving collaboration and communication on behalf of US-MX binational TB patients. Sessions include simultaneous translation via a live interpreter as well as live captioning in Spanish and English.

RESULTS AND LESSONS LEARNED

A 3-month pilot launched in April 2017. Positive participant feedback led us to extend the program through December 2017. To date, we have completed five teleECHO sessions with five patient cases presented and 124 total attendees. The clinic's reach is greater than anticipated, with participation from non-border states in the United States, Mexico, and Central America.

CONCLUSION

Providing a bilingual virtual platform for discussion of binational TB cases engages multiple stakeholders and offers the opportunity for improved understanding and better care coordination. The unique offering of simultaneous bilingual translation has fostered robust participation from colleagues on both sides of the border.

K2. APPLICATION OF PREDICTION METHODS TO INFORM PUBLIC HEALTH PROGRAM ACTIVITIES

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BACKGROUND

Decline in allotted resources, the increased complexity of cases, and the decreasing number of healthcare providers with knowledge of TB contribute to a more challenging task of TB prevention and control. The purpose of this study is to establish a readily available prediction tools that can help TB programs achieve TB elimination, to reach an incidence rate of 1 per 1,000,000 population by 2050.

METHODS

This is a retrospective cohort study using existing data from the state reportable diseases database. Age- and gender- adjusted incidence rates per 100,000 population were calculated. Linear estimation function (LINEST) is performed to predict future incidence rates, from 2005 to 2015 incidence rates. Period percent and annual percent changes were calculated to compare between population groups.

RESULTS

Based on the current trends in TB incidence, TB elimination in Illinois will not be achieved by 2050 but maybe achieved by specific groups. Asian Americans contribute the most to the incidence rate for Illinois. The TB incidence rate among who were born outside of the US is significantly higher than those born in the country.

CONCLUSION/RECOMMENDATION

TB prevention and control resources can be leveraged by understanding the differences among different population groups.

Prediction methods can be used as a tool to focus program activities to leverage available resources and tools for this analyses are readily available to TB programs.

Additional analyses will provide information on how to provide culturally competent TB prevention and control activities.

K3. HOW TO FACILITATE PEER SUPPORT TOWARDS CARE, CURE, AND TB ELIMINATION

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BACKGROUND

TB is a disease of poverty and stigma, with repercussions that go beyond the physical. Evidence demonstrates that social support is necessary to overcome TB-related psychosocial barriers and peer-support may be a sustainable way to provide this. However, evidence guiding its implementation is limited.

INTERVENTION/RESPONSE

Patients starting TB treatment in 32 communities in Callao, Peru, were recruited with their contacts into the Community Randomised Evaluation of Socioeconomic Intervention to Prevent TB (CRESIPT) study. Households in the intervention arm are invited to participate in empowerment and educational workshops and are assigned a "*Consejero*" (peer-mentor). *Consejeros* are CRESIPT participants who are finishing or have finished treatment. *Consejeros* lead workshops and facilitate assigned households with treatment adherence, and contact screening and chemoprophylaxis. We describe the results from regular feedback meetings held with study nurses and *Consejeros*.

LESSONS LEARNED

18% (89/506) patients have become *Consejeros* to 38% (190/506) households. Most nurses matched *Consejeros* to households based on geographical proximity (9/12), and patient demographics (9/12). Nurses offered the role of a *Consejero* during the workshops but used different criteria for assessing readiness. A training booklet has been developed with current *Consejeros* to specify objectives and code of conduct. To validate their role, *Consejeros* are presented a certificate (see figure) and pin on graduation. *Consejeros* have expanded their roles towards advocacy, holding local meetings independent of the CRESIPT study.

CONCLUSION

Peer-mentoring schemes provided by ex- or non-infectious patients with TB to newly diagnosed individuals were feasible in this resource-constrained setting and facilitated the development of civil society and community advocacy.

Figure: The *Consejero* certificate that is presented to all new *Consejeros* in a graduation ceremony during the workshops

K4. **PROMOTING COMMUNICATION THROUGH TEXTING AT BRITISH COLUMBIA CENTRE FOR DISEASE CONTROL (BCCDC) TUBERCULOSIS (TB) SERVICES**

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BACKGROUND

Timely and effective communication among clinicians and active tuberculosis (TB) patients can be challenging when care is provided "in the field". Many patients need extra supports for successful completion of TB treatment. BCCDC's TB Services provides case management and Directly Observed Therapy (DOT) within a defined geographic setting. Due to the ubiquity of mobile phones, text-messaging was used to promote and enhance communication among our team of nurses, outreach workers, and active TB patients.

INTERVENTION

Text message correspondence between clinicians and patients was centralized in a secure, browser-based application, WelTel. Acceptability was evaluated through focus groups with nurses. Second, feasibility was measured systematically within TB services. Finally, transferability was evaluated to plan expanded reach through video DOT. The course of action included using change management techniques to implement this digital health technology within the Provincial TB Services.

RESULTS

This project provided lessons on the convergence of health care and technology. Addressing concerns such as language barriers and technical issues early on encouraged confidence and interest among the clinicians. Factors contributing to success included frequent training and feedback sessions, ongoing support, local champions, and buy-in. Twenty clinicians were using the platform and there was a patient recruitment rate of 68%.

CONCLUSION

We are currently in the knowledge translation stage to operationalize the study within TB Services. Rapid identification of patients who require more or fewer resources aligns with practicing precision public health. Future opportunities include eventually expanding video DOT. Greater patient and provider engagement is modeled using novel digital technologies at TB Services, BCCDC.

Keywords: Tuberculosis, Mobile Health, Implementation

K5. **OUR LAND, OUR AIR: TB FREE TOGETHER CAMPAIGN**

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BACKGROUND

In Nunatsiavut, TB has been endemic since the 1950's and continues to be a major health concern. Since 2009 there have been 3 TB outbreaks which have caused significant community anxiety and fear because of the historical context of TB in the region. The most recent outbreak involved young adults sharing smoking devices. During a community engagement session in Hopedale, it was identified by the community that a TB education campaign was needed to reach out to high risk groups.

INTERVENTIONS/RESPONSE

In response to the community engagement meeting, a collaborative team was pulled together to design and implement a TB campaign for Nunatsiavut which focused on a harm reduction approach. Youth were engaged to provide direction around the content of the campaign and promotional items that youth would use to start the conversation about the spread of TB.

RESULTS

A TB campaign was rolled out to celebrate World TB day to raise awareness about the spread of TB during high risk activities. Community events included education, and a community feast with prizes and promotional items bearing the new TB logo and slogan. Youth were vocal and asked questions which reflected their genuine interest and engagement. Media coverage throughout the campaign complimented the community celebrations and helped to raise TB awareness.

CONCLUSION

All of the community events were well attended. Youth engagement in the planning stages proved critical in the success of the campaign and further highlights the need for future engagement on TB promotion activities.

K6. **LOSS OF FOLLOW-UP IN THE TREATMENT OF PULMONARY TUBERCULOSIS IN A PRIORITY REGION, SÃO PAULO, BRAZIL**

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BACKGROUND

The Metropolitan Region of Baixada Santista (RMBS) stands out for the high incidence of tuberculosis and high rates of treatment abandonment. The study proposes to evaluate the incidence and epidemiological profile of loss of follow-up in treatment.

METHODS

A descriptive study of secondary data, including new cases of pulmonary tuberculosis (TBP) resident in the RMBS reported between 2010 and 2015. The data source was the case reporting system (TBWEB) of the Epidemiological Surveillance Center of the State Sao Paulo. The variables of interest were the socio-demographic characteristics, current and previous history of tuberculosis, the aspects related to treatment, comorbidities and patient conditions.

RESULTS

Of the 7,263 new cases of TBP, annual incidence of 72.7/100 thousand inhabitants. Of this total, 809 (11.1%) treatment was abandoned, 77.3% (625/809) were male; 82.9% (671/809) were between 20 and 49 years of age; 6.2% (50/809) had AIDS; 3.5% (28/809) were diabetic; 39.2% (317/809) were found in the emergency/urgency; the smear was performed in 79.1% (640/809) and 80.6% (652/809) did not undergo an effective supervised treatment.

CONCLUSION

The rates of loss of follow-up of the TBP treatment in the 9 municipalities of the RMBS are higher than those described for Brazil, for the state of São Paulo and for the one established by the MS (5%). This study continues to evaluate the factors associated with loss of follow-up treatment, seeking to contribute as actions to control the disease in the region.

K7. MOVING TOWARDS TUBERCULOSIS ELIMINATION IN NEW YORK CITY THROUGH GEO-TARGETED, COMMUNITY-BASED OUTREACH AND TESTING

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BACKGROUND

From 2010-2015, there was ongoing, recent tuberculosis (TB) transmission among young, foreign-born persons in Sunset Park, New York City1 (NYC); this neighborhood continues to have the highest TB rate (20.2/100,000) of all NYC neighborhoods. Sunset Park is home to a diverse community where 29% live in poverty and 27% are uninsured.

INTERVENTION/RESPONSE

The NYC Health Department conducted TB testing events in Sunset Park from March to June 2017 in partnership with community-based organizations. NYC epidemiologic data was used to geographically focus testing locations near sites associated with TB transmission. Testing events were conducted using a Health Department mobile van or as health fairs. Event marketing strategies included culturally-sensitive, linguistically appropriate radio announcements, web-based ads, press conferences, and flyer distribution. Persons with a positive test were referred for evaluation.

RESULTS

Across seven testing events, 171 persons were screened; 45 (26.3%) tested positive for TB infection and 35 (78%) were linked to care (e.g., medical evaluation and chest radiograph). Among the 17 persons evaluated at the Health Department clinic, 13 (76%) are currently on treatment for latent TB infection (LTBI).

CONCLUSION

Targeted testing efforts in a neighborhood with increased TB prevalence revealed a high proportion of persons with LTBI. This indicates geo-targeted, community-based outreach is a worthwhile method to identify persons who would benefit from LTBI treatment. However, efforts are challenged due to inadequate case management resources to ensure linkage to follow-up. This is a population that may not readily seek healthcare, so non-traditional approaches may serve as a significant adjunct to mitigating TB disparities.

K8. **EFFECTS OF IMMIGRATION TUBERCULOSIS HEALTH SCREENING IN CANADA: IMPLICATIONS FOR CLINICAL PRACTICE**

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BACKGROUND

We conducted a critical qualitative study to understand the organization, procedures and social dimensions of mandatory pre-departure Immigration health screening and post-arrival re-screening for tuberculosis (TB) as part of the migration and settlement process in Canada. We address the implications of this process for TB specialists and clinical practice.

DESIGN/METHODS

15 participants were recruited between July 2015 and May 2016 from two sites: a TB clinic and a public health unit in Toronto, Canada. Data were generated through a) observations of TB clinic appointments and b) semi-structured interviews with newcomers undergoing post-arrival TB screening. Participants' immigration journeys were transformed into visual maps. A Foucauldian Discourse Analysis of study data revealed the various ways in which the overlap of immigration, public health and clinical practice policies and guidelines shaped relational dimensions of medical encounters between immigrants and TB specialists.

RESULTS

Medicalization of immigration requirements unwittingly implicates Canadian TB healthcare providers, shifting the focus of the TB medical encounter from the provision of care to the State management of 'risky' newcomers. Participants' decision-making around TB screening and treatment was driven by immigration requirements rather than health care concerns, resulting in conflicting approaches and goals during the clinical encounter. Lack of transparency and confusion about the Immigration screening processes challenged both participants and clinicians.

CONCLUSION

To provide optimal care to this patient population, TB clinicians must understand their location within the immigration and settlement process and need to be aware of their dual role as both TB healthcare providers and medical authorities for state immigration processes.

K9. **THE MEDIUM IS THE MESSAGE: EFFECTIVE TB EDUCATION THROUGH CREATIVE AND CULTURALLY AGILE EDUCATION MATERIALS – MULTNOMAH COUNTY, OREGON, 2017**

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BACKGROUND

Client-centered care is a priority for Multnomah County Health Department (MCHD) TB program. The majority of our clients are born outside of the United States and have limited English comprehension. They also have varying levels of literacy in their primary languages. Commonly used TB education materials are mostly written with few pictures. Conversations with immigrant community representatives highlighted a desire for verbal health education, augmented with pictures, rather than written materials.

INTERVENTION

Our TB program created a set of education tools which prioritize health literacy, cultural appropriateness, accurate information and an engaging presentation. After reviewing current TB education materials and compiling input from program staff and clients, we developed four tools: a pictorial flipbook, a patient booklet, a medication instruction sheet and a step-by-step sputum collection guide. We collaborated with MCHD communications team to develop storyboards, scripts, illustrations and layouts for the new tools. Pictures were prioritized and written information was minimized and put into plain language. Written materials were translated into the five most common languages spoken by our clients.

RESULTS

Role play and informal interviews were used to test the new tools, both in English and with an interpreter. Results from the testing showed that participants found the tools useful in providing TB education. Suggestions for improvement included best practices for implementation and interpreter training.

CONCLUSION

A client-centered approach to TB treatment and disease prevention requires informative, relatable, and culturally agile education materials. Ongoing collection of user and client feedback is needed to further refine materials for maximal usefulness.

K10. **PEEL PUBLIC HEALTH (PPH) TUBERCULOSIS (TB) PROGRAM REVIEW: AN EVALUATION OF THE TUBERCULOSIS CASE MANAGEMENT CONTACT INVESTIGATION PROCESS**

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BACKGROUND

PPH TB program investigated their current contact management process to determine its effectiveness in achieving the goals of TB contact management and to determine appropriate use of staffing resources.

METHODS

A review of the contact management outcomes from the integrated Public Health Information System (iPHIS) during the period January 1, 2010 - December 31, 2015 was conducted for Peel cases of active TB. Exposure setting type (e.g., household vs. non-household) was also explored to determine effect on increased risk of progression to LTBI among contacts of active TB cases in Peel.

A chart review of all pulmonary TB cases diagnosed in 2015 was also conducted to determine if the number of attempts to reach identified contacts and the method of contact had any impact on screening completion and the identification of LTBI and/or secondary TB cases.

PRELIMINARY RESULTS

During the six year period, there were 6,514 identified TB contacts. Of the contacts who were screened (n=4,551), 0.6% were identified as additional active cases (n=26), and 29.1% were identified as having LTBI (n=1,324). Further analysis is underway to determine if exposure type (close and casual settings) has an influence on LTBI outcome and LTBI treatment completion.

CONCLUSION

Additional case identification through contact investigation in Peel results in low yield with contact follow up outcomes well below the current targets outlined in relevant TB guidelines. This review highlights the resource intensive nature of contact tracing weighed against actual additional case finding.

K11. **HIGH QUALITY HEALTH SYSTEMS: QUALITY OF TUBERCULOSIS CARE**

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BACKGROUND

Tuberculosis (TB) continues to affect 10.4 million people annually, and kills 1.8 million. The emergence of drug resistance (DR-TB) and the slow decline of TB incidence emphasizes the need to focus on the quality of TB care. A framework describing quality of care has been developed by *The Lancet Global Health* Commission on High-Quality Health Systems to understand drivers of quality. Objectives: (1) synthesize current evidence on quality of TB care in high burden countries (HBCs), (2) frame available data within the HQSS quality framework, (3) identify gaps in quality of TB care.

DESIGN/METHODS

The findings of international reports and systematic reviews on quality of TB care were synthesized. PUBMED was searched to identify patient experience. Studies were selected using pre-specified criteria and analyzed by two independent researchers.

RESULTS

Average diagnostic delay for drug susceptible TB (DS-TB) is 67.8 days in LMICs. Cascade of care analyses show 53% of DS-TB patients and 22% of DR-TB patients are adequately diagnosed and treated. Of individuals eligible for latent TB screening, 18.8% completed treatment. Pre-treatment loss to follow-up for DS-TB ranges from 4 to 38%. 28-45% of providers correctly manage TB cases. Patients report long wait times, high costs, and limited confidentiality while seeking TB care. Data on patient satisfaction were limited.

CONCLUSION

Published evidence indicates large gaps in the foundations of TB care, as well as cascades of care. Due to limited studies on the patient experience, future TB research and practice should focus on patient perspectives of care and improving the quality of healthcare services.

K12. A PUBLIC-PUBLIC COLLABORATION FOR THE PROVISION OF TB CLINICAL CARE IN CHICAGO

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PROBLEM

In 2012 Chicago Department of Public Health (CDPH) ceased providing primary care, resulting in closure of its TB clinics. CDPH needed to identify another provider of outpatient care for individuals needing evaluation and treatment of TB disease and infection in Chicago.

RESPONSE

Leadership from CDPH and the Cook County Health and Hospitals System (CCHHS) Division of Pulmonary Medicine crafted an intergovernmental agreement for TB clinical care plus case management and directly observed therapy (DOT) of individuals diagnosed with TB at CCHHS facilities. CDPH sets an annual funding amount through which CCHHS provides all necessary diagnostic, monitoring, and pharmaceutical services at no-cost for patients referred by the CDPH TB Program. CDPH provides case management and DOT for non-CCHHS case-patients and performs all contact investigations. National TB Indicators pre-transition (2009-2011) and post-transition 2013-2015) were compared as broad measures of program effectiveness.

RESULTS AND LESSONS LEARNED

Completion of therapy among case-patients [pre-, 89.4% (380/425); post- 90.4% (301/333)] and completion of treatment among infected contacts [pre- 73.1% (367/502); post- 76.4% (198/259)] remained stable. Information exchange can be challenging because of lack of a shared electronic patient data system; however, other mechanisms (e.g. case conferences, paper records, and phone calls) have been developed.

CONCLUSIONS and KEY RECOMMENDATIONS

This collaboration has ensured a consistent source of quality TB care in Chicago and has not adversely affected program effectiveness. Patients may benefit from increased access to other specialized services (e.g., diabetes care). A substantial limitation is that diagnosis and treatment of TB infection among the general population is not possible given current funding levels.

K13. **FACTORES ASOCIADOS CON LA DEMORA EN EL DIAGNÓSTICO DE TUBERCULOSIS PULMONAR EN UNA CIUDAD DE COLOMBIA**

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ANTECEDENTES

El retraso en el diagnóstico es un impedimento importante para el control de la TB en Medellín.

MÉTODOS

Estudio transversal. Se aplicó un cuestionario mediante entrevista a 180 adultos notificados como casos nuevos de tuberculosis pulmonar en Medellín, Colombia entre mayo y septiembre de 2017. Se midieron algunas variables sociodemográficas, clínicas y de comportamiento de búsqueda de atención en salud. La demora del paciente fue definida como intervalo de tiempo entre el inicio de síntomas y el primer contacto con un proveedor de servicios de salud. La demora del sistema de salud fue definida como intervalo de tiempo entre la primera consulta con un proveedor de servicios de salud y el inicio de tratamiento. Se estimaron Hazard Ratio con intervalos de confianza al 95% mediante un análisis de supervivencia multivariado.

RESULTADOS

La mediana de la demora del paciente fue de 36,5 días [RIQ:14-68] y la del sistema de salud 29 días [RIQ: 8-96,5]. La demora del Paciente fue menos prolongada en personas con nivel educativo superior [HR=2,36 (1,37-4,089)], hemoptisis [HR=1,84 (1,045-3,240)] y estrato socioeconómico medio-alto [HR=2,09 (1,060-4,151)]. Fue más prolongada en pacientes HIV positivos [HR=0,40 (0,181-0,911)]. La demora del sistema de salud fue más prolongada después de 2 consultas médicas [HR=0,23 (0,127-0,429)] y menos prolongada en afiliados al régimen subsidiado [HR=1,26 (1,021-1,564)] y en los pacientes hospitalizados [HR=4,23 (1,830-9,786)].

CONCLUSIONES

La medición rutinaria del retraso en el diagnóstico y la ubicación de grupos de riesgo es una actividad programática importante en un contexto de mediana incidencia.

K14. TUBERCULOSIS TRAINING AND EDUCATION NEEDS ASSESSMENT OF THE U.S.-AFFILIATED PACIFIC ISLANDS AND HAWAII

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BACKGROUND
The CDC Division of Tuberculosis (TB) Elimination conducted a TB training and education needs assessment of the U.S.-affiliated Pacific Islands and Hawaii. Results will inform the development of a training plan for the region.

DESIGN/METHODS
The needs assessment methods included key informant interviews to identify overall program needs and an online survey to identify individual training needs. Key informant interviews with TB program staff began in April 2017. The online survey was open from July – September 2017. The survey contained Likert-scale questions on training needs regarding TB diagnosis, treatment, and programmatic activities. Other questions included barriers to trainings, preferred formats for educational materials, and preferred training methods.

RESULTS
There were 112 respondents to the online survey. While the most needed training topics varied by jurisdiction, overall survey respondents indicated a high need for training regarding treatment of TB patients with co-morbidities, molecular detection of drug resistance, and outbreak detection and response. The most preferred formats for educational materials were fact sheets and brochures, online courses, and self-study materials. The most preferred training formats included in-person conferences and classroom trainings.

CONCLUSIONS
There is a high need for TB training and education in the entire region. Each jurisdiction has unique training needs that will be addressed in individualized training plans. Conducting a needs assessment helps to ensure that future training and education efforts are appropriate for the target audiences.

K15. **ASSESSMENT OF THE CDC TUBERCULOSIS LABORATORY AGGREGATE REPORT**

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BACKGROUND

The Centers for Disease Control (CDC) Division of Tuberculosis (TB) Elimination Laboratory Capacity Team (LCT) analyzes laboratory data each year provided by 58 public health laboratories (PHL) as part of the CDC TB Elimination and Laboratory Cooperative Agreement. Analyses are presented in a biennial TB Laboratory Aggregate Report to assess PHL benchmarks and provide an opportunity for peer comparison. Providing these data back to the PHL in a useful format is an important mission of LCT.

RESPONSE

To determine if the reports were useful tools, a survey was sent to representatives from the 58 PHL to gain insight on perceptions regarding the Fourth Edition of the TB Laboratory Aggregate Report issued in April 2017.

RESULTS

The assessment response rate was 84%. Responses indicated that 92% of PHL used the Aggregate Report to compare their performance to others and 45% used the report to support changes in their laboratory's activities. 95% of respondents felt the information provided was 'Important' or 'Moderately Important'. Respondents provided suggestions for other data and analyses that might be included in future reports.

CONCLUSIONS

Overall, PHL felt the CDC TB Laboratory Aggregate Report was important to receive, well-written, and easy to understand. Respondents used the report to compare their PHL culture positivity and turnaround time data to other U.S. PHL, to document accomplishments, and to increase awareness of their laboratory services for TB and impact within their state. Suggestions made by respondents will be explored for the Fifth Edition of the TB Laboratory Aggregate Report to be published in 2019.

K16. **RISK FACTORS FOR TUBERCULOSIS AND BARRIERS TO HEALTHCARE ACCESS AMONG FARMWORKERS IN THE MEXICAN BORDER STATE OF NUEVO LEON**

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BACKGROUND

Farmworkers experience high exposure to tuberculosis (TB), due to their living and working conditions. This study describes knowledge and risk factors for TB as well as broader health access issues among farmworkers in the Mexican border state of Nuevo Leon.

METHODS

Data were collected through clinical examination of the participants (*N* = 127), blood samples, a 45-to-60-min one-on-one semi-structured interview and two focus groups.

RESULTS

Due to lack of insurance and incorrect beliefs about how to access health services, only 19.7% of participants report having being treated in health services when sick and 71.6% reported medicating themselves or not seeking treatment at all.

A poor level of knowledge on TB illness, treatment, prevention and transmission mode, led to various misconceptions (e.g. working hard would prevent them from getting sick). Substance abuse and risk factors for TB were also reported with high prevalence: marijuana (8.7%), tobacco (43.3%) and alcohol use (48.8%).

Unsafe work practices were commonly reported, including handling hazardous tools (68.5%); excessive sun exposure (62.2%); excessive working time (38.7%); handling chemical products without personal protective equipment (26.7%); and exposure to poisonous reaction plants (13.4%). Only 10.2% received training to use pesticides appropriately. Despite being aware of the risks, the participants were willing to provide their services for reasonable compensation.

CONCLUSION

The results demonstrate a lack of knowledge regarding TB and access to health care, combined with hazardous work conditions and unhealthy lifestyles. Further ethnographic studies might be conducted to develop appropriate prevention interventions.

K17. CURETB: TRANSNATIONAL CONTINUITY OF CARE FOR GLOBALLY MOBILE POPULATIONS

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BACKGROUND

Continuity of care for tuberculosis (TB) patients assures timely completion of therapy and cure, which reduces transmission and development of drug-resistance. In 2013, 367, or 3.8% of newly diagnosed TB patients in the United States (US), were reported as moving outside the United States before completing therapy. The San Diego TB Control Program (SDTBC) created CureTB to enhance continuity of care between San Diego and Mexico. Over time, the program expanded to serve all US jurisdictions.

INTERVENTION

In 2016, CureTB moved core operations to CDC's Division of Global Migration and Quarantine (DGMQ) and offered services for all US TB patients bound for any destination country. CureTB maintains direct linkage to SDTBC through a formal agreement. CureTB has increasingly leveraged established relationships between the CDC and its public health partners, domestic and international, to expand its service model. New linkages with partners such as countries' National Focal Points (NFP), clinics serving US-bound immigrants, quarantine stations, and the Immigration Health Service Corps (IHSC) strengthens connectivity for mobile patients.

RESULTS

CureTB developed linkages to IHSC and NFPs, developed new tools, and engaged new partners. In 2015, CureTB received referrals for 100 patients with verified TB bound for 9 countries. From Jan-June 2017, referrals increased to 101 individuals bound for 24 countries. Verified linkage to TB programs in receiving countries is greater than 80%.

CONCLUSION

The expanded CureTB model strengthens care continuity for transnational patients. Combining TB control program expertise with established notification networks can improve connectivity for patients and contributes to global progress in TB eradication.