

**Title:** Management of MDR TB Exposure in 2 Health Care Facilities

**Authors:** Bhatia G., Schechter G., Garcia N., Reyes V., Haines C., Eitzman S., Pham J., Ervin- King A., Curtis R., Fenstersheib M.

**Abstract:**

In July 2005 smear positive, cavitary, pulmonary MDRTB was diagnosed in a nursing assistant who was working concurrently at 2 health care facilities A and B (HCFA and HCFB).

An exposure evaluation was initiated at both facilities. Exposure was defined as being a coworker or patient on the ward where the index case was assigned to work for a single shift.

We identified 417 exposed individuals. They were grouped according to their risk for progressive disease and by date of exposure. Exposure notification and evaluation was prioritized based on the risk for active disease.

The number of persons in the identified cohorts in order of risk for progressive disease included:

Neonates (23), Maternal Unit Babies (MUB – 52), Immunocompromised Hosts (ICH - 4), Maternal Unit Mothers (MUM – 25), Health Care Workers (HCW) at HCFA (169), HCW at HCFB (4) and other low risk patients (LRP) at HCFA (132) and HCFB (4).

An exposure notification letter was sent to each high risk patient or parent and their physician with recommendations for evaluation or referral to the Santa Clara County TB Clinic. Initiation of Ethambutol and Pyrazinamide for prophylaxis was based on susceptibilities of the index case.

**Results:**

Overall, 255 / 277 (92%) high risk exposures were evaluated. There were 5 documented tuberculin skin test (TST) conversions. Two of 5 were overlapping household, worksite and car pool contacts. Three of 25 mothers converted their TSTs, one having delivered by caesarian section. (see Table 1)

One developmentally abnormal infant in the MUB cohort was presumptively treated for active disease because of an abnormal radiograph.

Drug related toxicity occurred in 10 / 24 (41%) of patients who were placed on preventative therapy. Severe hepatotoxicity attributable to pyrazinamide accounted for 2/10 (20 %) adverse events.

**Conclusion:**

A combined and ongoing effort involving the local health department, public health nursing, health care facility administration, infection control, employee health services and open access to the county TB clinic for all exposed persons, was crucial to our success in dealing with this large exposure within a community setting.

(Continued on next page).

(Continued from previous page.)

**TABLE 1**

Cohort	# Exposed	# Converted	LTBI Initiated	LTBI toxicity	# Pending Evaluation	# Refused Evaluation
Neonates	23^^	0	16	9	0	4
MUB	52	0/38 tested	3^	0	7	7 (lost / OOC)
ICH	4	0	0	NA	0	0
MUM**	25	3	3	1	0	1
HCW@ HCFA	169	0	0	0	3	0
HCW@HCFB	4	2 *	2	0	0	0
LRP @HCFA	132	ND	ND	ND	132	ND
LRP @HCFB	4	0	0	0	0	0

\*Also household and carpool contacts. ^ infants of the mothers who converted. ^^ 3 infants were deemed not exposed after review of NICU records, ND no data \*\* Only mothers with negative prenatal TSTs evaluated

**Name of Presenter & Contact Person for Project:**

Gulshan Bhatia, MRCP(UK), DTMH, MD  
 email: Gulshan.Bhatia@hhs.co.santa-clara.ca.us

**Title:** The Tuberculosis Indicators Project: A Successful Intervention to Improve Patient and Public Health Outcomes

**Authors:** Anne Cass, MPH; Melissa Ehman, MPH; Jan Young, RN, MS; Jenny Flood, MD, MPH; Tambi Shaw, MPH; Sarah Royce, MD, MPH

**Brief Description:**

The Tuberculosis Indicators Project (TIP) is a partnership between the California Department of Health Services Tuberculosis Control Branch (TBCB) and 16 local health departments (LHDs) reporting > 55 tuberculosis (TB) cases annually.

After 5 years of project implementation, long-term qualitative and quantitative outcome data demonstrate TIP's success.

**Methods:**

In TIP, staff from LHDs and the state use indicator data to engage in a collaborative program evaluation and improvement cycle that includes assessment, action plan development, implementation, and evaluation. For LHDs that have implemented action plans and for which outcome data are available, performance before and after action plan implementation for the targeted indicator(s) was compared.

**Findings:**

Thus far, nine LHDs have data that can be evaluated for a total of 16 action plans. Of the 16 action plans, 14 have shown a positive increase in indicator performance following implementation.

**Highlights:**

- Three localities increased their use of directly observed therapy (DOT) treatment for their highest risk patients. (Average increase = 195%)
- Two localities improved their timeliness of reporting of cases to the health department (Average increase = 13%)
- Three localities improved documentation of culture conversion (Average increase = 24%)
- Two localities increased the proportion of patients completing TB therapy in a timely manner. (Average increase = 16%)

To date, key informant interviews have been performed with four of nine LHDs that have long-term outcome data. LHD staff consistently report great satisfaction regarding participation in the process and outcomes received to date.

**Limitations:**

Improved indicator performance among TIP LHDs is temporally associated with TIP interventions; however, a causal attribution cannot be made without further analysis. LHDs participating in TIP that don't yet have long-term evaluation results may have different results than the "early adopters."

**Conclusion:**

TIP's success is demonstrated by improvement in program performance data as well as positive feedback from project participants on the structured evaluation process.

**Name of Presenter & Contact Person for Project:**

Anne Cass, MPH

Phone: (619) 692-8642

Address: 3851 Rosecrans St., P511D, San Diego, CA 92110

Email: [acass@dhs.ca.gov](mailto:acass@dhs.ca.gov)

**Title:** Collaboration between a homeless healthcare program, TB control office and homeless shelters to prevent shelter-related TB transmission.

**Authors:** Cook, Davis, Bellfield, Toutant, Thomas, Miskel, Porter, Levin, Lorenz

**Brief Description:**

The homeless population is at risk for TB and homeless shelter settings have been shown to facilitate TB transmission. Screening for active TB in homeless individuals prior to shelter entry is a method of potentially diminishing TB transmission in shelters. The poster is a descriptive analysis of a program for screening clients of county homeless shelters prior to shelter entry in an effort to decrease the possibility of TB transmission in shelter settings. The program involved collaboration between the county healthcare for the homeless program, the TB control office, the county winter shelters and the homeless community to carry out PPD testing and CXR screening of shelter clients. The pertinent steps of the program included devising screening guidelines; education outreach to shelter staff; an information campaign within the homeless community; the screening and documentation process and screening enforcement.

**Methods:**

Described above.

**Findings:**

Through the collaboration of the of the interested parties (the homeless healthcare program, TB control office, winter shelters and the homeless population) a successful TB screening program was carried out with minimal inconvenience or undo burden to any of the participants.

**Conclusion:**

The successful implementation of TB screening of residents of homeless shelters prior to shelter entry can be accomplished most successfully by the collaboration between the homeless population, homeless shelters and the health agencies involved in homeless healthcare and TB control.

**Name of Presenter & Contact Person for Project:**

Kurt Cook, MD, MSc

Phone: 805-320-8574

Email:kurt.cook@ventura.org

**Title:** Diabetes and Kidney Disease Among Tuberculosis Cases in San Joaquin County, 1999-2003

**Authors:** Karen Pfister, Karen Furst, Pam Costamagna, Kathleen Tully, Jayapriyaa Shanmugham, Ashley Miller, Melanie Estarziau

**Brief Description:**

An assessment was conducted of the prevalence of diabetes and kidney disease/dialysis co-morbidities in verified cases of tuberculosis (TB) reported in San Joaquin County (SJCo) over a five year period.

**Methods:**

Information regarding a history of diabetes and kidney disease/dialysis was noted in the comments section of the Report of Verified Case of Tuberculosis (RVCT) for all TB cases reported from 1999-2003, by public health nurses in the SJCo TB Control Program. This data was then entered into the Tuberculosis Information Management System (TIMS) by TB Control Program staff. Data was extracted from TIMS by the Public Health epidemiologists and analyzed using Excel and SPSS.

**Findings:**

Of 318 cases of TB reported in SJCo from 1999-2003, 36 (11.3%) had diabetes and 14 (4.4%) had kidney disease/dialysis. Five individuals (1.6%) had both co-morbidities. In univariate analysis, individuals with kidney disease/dialysis were more likely to die before completing treatment (5/14 versus 15/304,  $p < 0.001$ ). No such association was found for cases with diabetes. There was also no statistically significant difference in time for culture conversion between TB cases with diabetes or kidney disease/dialysis and those without.

**Conclusion:**

Information on diabetes and kidney disease/dialysis is not currently captured on the RVCT. We uncovered a high percentage of individuals in our TB cases over a five year period with these co-morbidities. Since the presence of kidney disease/dialysis was found to have an impact on the outcome of the disease, it may be useful for other jurisdictions to track this information. Additionally, steps should be taken to modify the RVCT to capture this data, as it is vital to the prognosis and treatment of TB patients. This data can also serve as a tool for educating medical care providers on the importance of screening and treating latent tuberculosis infection in their patients with diabetes or kidney disease.

**Name of Presenter:**

Pam Costamagna, PHN  
Phone: 209-468-3889  
Email: pcostamagna@sjcphs.org

**Contact Person for Project:**

Karen Pfister Phone: 209-468-9841  
Address: San Joaquin County Public Health Services, 1601 E. Hazelton Ave, Stockton, CA 95205  
Email: kpfister@sjcphs.org

**Title:** Group treatment program of LTBI provides more efficient, higher quality care at a Community Health Clinic

**Authors:** Luz Hernandez FNP, Juan Martinez, and Robert Moore MD MPH

**Brief Description:**

Background: In California, a large percentage of patients with Latent Tuberculosis Infection (LTBI) receive their care from Community Health Clinics. Patients with LTBI who are treated by Community Health Clinics are usually scheduled to see a variety of providers during individual appointments. In this setting, there is often inconsistent medical treatment and patient education, and a low rate of completion of therapy.

**Objective:**

To develop a process for caring for patients with LTBI in a group setting to improve the management of these infections through a cost effective and consistent method that results in improved medication compliance and completion of treatment.

**Methods:**

Using current Quality Improvement methodologies, the process of providing care to patients with LTBI was re-designed, and the program was further improved using weekly PDSA cycles.

**Findings:**

All members of the health-care team involved with TB care were involved in a detailed flow-charting of ideal care processes. Support materials were developed, based on this analysis. A TB-focus team then designed and piloted a weekly group education and treatment program for LTBI. The program was improved weekly, as the team analyzed weaknesses in the program and designed and implemented improvements. A computerized chronic disease tracking system aided in case management. The program increased access to care in general, by freeing up scheduled appointments that had been used by patients with LTBI. The consistency of medical care improved, and the percentage of patients with LTBI who were treated rose from 17% before the program to 47% afterwards. Surveys show a high level of satisfaction in the program by patients.

**Conclusion:**

A group education and treatment program for patients with LTBI offers many advantages over the traditional care model for Community Health Clinics.

**Name of Presenter:**

Luz Hernandez, FNP  
Phone: 707-254-1780  
Email: lwaganer@clinicole.org

**Contact Person for Project:**

Robert L. Moore, MD  
Phone: 707-254-1780  
Address: 1141 Pear Tree Lane, Suite 100, Napa CA 94558  
Email: rlm3md@clinicole.org

**Title:** Evaluation of the California Department of Health Services Tuberculosis Control Branch's A/B Notification Adverse Events Reporting Program

**Authors:** Rachel H. Jervis, MPH; Anthony Marfin, MD, MPH, MA; Janice Westenhouse, MPH; Phil Lowenthal, MPH; Jennifer Flood, MD, MPH

**Brief Description:**

In July 2004, the California Department of Health Services Tuberculosis Control Branch (CDHS TBCB) implemented an A/B Notification Adverse Events Reporting Program. This passive surveillance program was designed to identify tuberculosis (TB) cases in foreign-born individuals diagnosed upon United States (U.S.) arrival that could have been identified and cured or prevented prior to U.S. entry. Almost two years after this surveillance system was implemented, a program evaluation was conducted to assess the system's effectiveness and recommend future changes.

**Methods:**

This evaluation was conducted by observing the Adverse Events Reporting Program as data was entered, assessing data quality by comparing it to other California TB databases, creating a logic model of the program, and speaking with stakeholders. The system was evaluated for completeness, simplicity, ease of use, outcomes, impact, and value of data. All sixty-one reports received July 1, 2004 - April 15, 2006 were analyzed.

**Findings:**

The Adverse Events Reporting Program is easy for local health jurisdictions (LHJ) to use, and CDHS TBCB staff are able to adapt it to changing needs. However, the data sources (overseas and U.S. medical records) are complicated and make aspects of data collection challenging. Adverse events are reported promptly, though are dependent on waiting for lab results. Communication and support of the Centers for Disease Control and Prevention (CDC) and LHJ stakeholders has been strong, though the recent TB outbreak in Hmong has put a strain on resources at all levels, while stressing the importance of this program. The program could benefit from more explicit data collection and data entry standards, and annual reporting of data to LHJ and CDC.

**Conclusion:**

The A/B Adverse Events Reporting Program has fostered communication between LHJ and CDHS TBCB regarding important cases, while collecting valuable data on adverse events in California. The program is too young to assess long term outcomes such as changes in overseas screening policy and reduced number of foreign born TB cases in California.

**Name of Presenter & Contact Person for Project:**

Rachel H. Jervis, MPH

Phone: 510-620-3121

Address: 850 Marina Bay Parkway Building P, 2nd floor Richmond, CA 94804-6403

Email: [rjervis@dhs.ca.gov](mailto:rjervis@dhs.ca.gov)

**Title:** Tuberculosis Evaluations of Hmong Refugees, June 2004-February 2006:  
Results from a Newly-implemented Surveillance System in California

**Authors:** Phil Lowenthal, Janice Westenhouse, Jennifer Flood, Mina Lai, Arleen Ervin-King, Michael Joseph, Sarah Royce

**Brief Description:**

More than 5,600 Hmong refugees were resettled in California between June 2004 and February 2006. Despite overseas screening, California's local health departments reported an elevated number of tuberculosis (TB) cases in this group during the first months following arrival. In January 2005, refugee resettlement was halted for one month while an enhanced overseas screening program was implemented.

**Methods:**

In February 2005, a surveillance system was implemented by the TB Control Branch (TBCB) and the Refugee Health Section of the California Department of Health Services (DHS), and local health departments to assess outbreak containment and the effectiveness of overseas interventions to prevent further imported TB. This system requires reporting of TB cases within one week of confirmation, includes a detailed review of cases reported from June 2004 through February 2006, and employs a new report form to ensure complete evaluation of all newly-arrived Hmong refugees.

**Findings:**

Prior to enhanced overseas screening, 27 TB cases (8.3 cases/1,000 refugee arrivals) were detected; 4 (15%) of these were multidrug-resistant (MDR), 7 (26%) were smear positive, and 7 (26%) had B notifications. Following overseas screening enhancement, 3 cases (1.3 cases/1,000 refugees) were detected; 1 (33%) was MDR, none were smear positive, and all 3 (100%) had B notifications. The proportion of B notifications that were found to be cases of active TB before and after the enhanced overseas screening evaluation was 15% (7/46) and 1.3% (3/226), respectively. Among contacts to infectious cases, <1% (1/249) were found to be cases.

**Conclusions:**

The reduction in TB cases among newly-arrived refugees following enhanced overseas screening suggests progress in preventing case importation. The effectiveness of the enhanced overseas screening is evidenced by the fact that all cases identified in the US following the enhancement arrived with a B classification. Continued focus on the prompt evaluation of remaining California-bound Hmong refugees, many of whom are currently undergoing TB treatment in Thailand, will be crucial to preventing the spread of TB.

**Name of Presenter & Contact Person for Project:**

Phil Lowenthal, MPH

Phone: (510) 620-3045

Address: 850 Marina Bay Parkway, Bldg. P, 2nd floor      Richmond, CA 94804-6403

Email: plowenth@dhs.ca.gov

**Title:** Fast acetylators in a population that initiates prophylactic treatment with isoniazid

**Authors:** CABALLERO OLIN G1(\*), VILLARREAL GALLEGOS D1, GONZALEZ RAMÍREZ D.2, HERNÁNDEZ S.2, SALINAS MOLINA G.2, Unidad de Medicina Familiar No 28 en la Ciudad de Monterrey,1, Centro de Investigación Biomédica del Norte2, Instituto Mexicano del Seguro Social, Delegación Regional Nuevo León

**Objective:**

To evaluate the proportion of fast acetylators in a segment of a population that initiates prophylactic treatment for pulmonary tuberculosis after a single dose of Isoniazid (INH).

**Methods:**

INH was administered to 136 close relatives of patients with diagnosis of pulmonary tuberculosis. Six hours after that, urine was obtained from these patients. Urine samples with glucose were excluded from the study. It was spectrophotometrically determined the elimination of both, metabolized and free INH; the ratio of these two compounds was considered as an indicator of the degree of acetylation. When the relation AcINH/INH in the sample was greater than 70 %, that person was considered as a fast acetylator.

Results: 67 patients (60.4 %) could be categorized as fast acetylators whereas 44 patients (39.6%) were slow metabolizers. The group of fast acetylators presented  $85 \pm 9$  % of average activity and the slow ones had an average of  $48 \pm 13$  % activity. The differences were not influenced by gender since a statistically significant interaction between the acetylator activity and sex was not found ( $p \geq 0.05$ ).

**Findings & Conclusion:**

In this study it was observed a larger proportion of fast acetylators. INH was administered singly as a prophylactic therapy of pulmonary tuberculosis. A consideration is given to the possible optimal dosing of INH implemented by taking into consideration the phenotypic metabolic characteristics of acetylation that any patient has. Also, the possibility exists that, when these differences are not taken into account, the acquired resistance to INH in mycobacteria can appear sooner.

**Name of Presenter & Contact Person for Project:**

Guillermo Caballero Olín, MD  
Unidad de Medicina Familiar No. 28 IMSS,  
Monterrey N.L.  
E-mail versustbp@yahoo.com.mx

**Title:** A novel laminin-binding surface organelle produced by Mycobacterium tuberculosis during human infection.

**Authors:** Guillermo Caballero. Olín\*, Chistopher J Alteri\*\*, Richard L. Friedman\*\*, & Jorge A. Girón\*\*David Villarreal G\*\*Department of Microbiology and Immunology, Arizona Health Sciences Center, University of Arizona College of Medicine, 1501 N. Campbell Avenue, Tucson, AZ 85724, USAUnidad de Medicina Familiar No 28, Instituto Mexicano del Seguro Social, Monterrey, Mexico

**Description:**

Tuberculosis (TB) is the major bacterial infectious disease that afflicts humankind, with over 3 million reported deaths each year<sup>1</sup>. Even though TB is a predominant world-wide health problem the picture of its molecular mechanisms of pathogenesis is incomplete. A large number of pathogenic bacteria produce pili, or fimbriae that mediate close interactions with host cells. These interactions often involve adherence, colonization, and in some instances invasion, all of which can be critical for the pathogen's ability to cause disease. Here we report that the bacteria Mycobacterium tuberculosis produces surface appendages morphologically identical to characterized pili from other microorganisms. We found that these appendages called Mtp (for M. tuberculosis pili) are recognized by antibodies from sera obtained from TB patients indicating that Mtp are produced during human TB infection. We demonstrate that purified Mtp has a strong binding affinity for the extracellular matrix protein laminin suggesting that Mtp may play a role in M. tuberculosis adherence to host tissues.

**Findings & Conclusion**

First description of a laminin-binding pili from M. tuberculosis that is produced by the bacillus *in vivo*

**Name of Presenter:**

Guillermo Caballero Olín, MD  
Unidad de Medicina Familiar No. 28 IMSS,  
Monterrey N.L. E-mail versustbp@yahoo.com.mx

**Title:** Cost-effectiveness of interferon gamma release assay (IGRA) use in testing for M. tuberculosis infection

**Authors:** Puneet Dewan, MD (1), Travis Porco, PhD (2), Jennifer Flood, MD MPH (2), Sarah Royce, MD MPH (2), L. Masae Kawamura, MD (3)

- (1) Centers for Disease Control and Prevention, Division of Tuberculosis Elimination, Atlanta, Georgia
- (2) California Department of Health Services, Tuberculosis Control Branch, Richmond, California
- (3) San Francisco Department of Public Health, Tuberculosis Control Section

**Background:**

Compared to the tuberculin skin test (TST), blood-tests for detection of M. tuberculosis infection known as interferon-gamma release assays (IGRA) may offer improved specificity and operational advantages. However the cost-effectiveness of IGRA-based testing strategies is unknown.

**Objective:**

To estimate the cost-effectiveness of IGRA-based testing strategies for detection and treatment of persons with M. tuberculosis infection

**Methods:**

Design: Decision analysis.

Data sources: Published literature, Medicare, and cost analysis of IGRA options.

Data analysis:

We modeled costs and health outcomes in a hypothetical cohort of 10,000 persons (0.10 baseline M. tuberculosis infection prevalence). All persons were tested either by IGRA, tuberculin skin test (TST), or a sequential TST-IGRA where positive TST results required IGRA confirmation. We assumed identical sensitivity and specificity for TST and IGRA, and explored different assumptions through sensitivity analysis. The least-costly commercial IGRA option (Quantiferon-®TB Gold in-tube) was modeled.

**Outcome measures:**

The discounted number of TB cases averted over 20 years, and the incremental discounted future cost (2004 USD\$) per case averted.

**Results:**

From a societal perspective, the model predicted that IGRA use was the least costly and most effective testing strategy and was economically preferable over diverse model assumptions. Operational variables including the proportion of patients completing evaluation and LTBI treatment heavily influenced the testing strategy cost effectiveness, but did not alter the relative economic advantage of the IGRA strategy. When patient-time costs were not included, from a health care-systems perspective the sequential TST-IGRA strategy was cost-saving relative to the TST and similarly effective.

**Conclusions:**

Our model predicted that IGRA would be more cost-effective than the TST for detecting M. tuberculosis infection, with cost savings achieved primarily through reduced patient time costs. If patient time costs were ignored, then health care systems may realize cost savings relative to the TST alone by confirming positive TST results with IGRA.

**Contact Person and Presenter:**

Travis Porco, PhD

(510) 620 3039 tporco@dhs.ca.gov

**Title:** Multidrug resistance acquired during therapy, California 1995-2002

**Authors:** Porco T, Oh P, Flood J

**Introduction and Methods:**

We used logistic regression to examine tuberculosis surveillance (RVCT) data from 1995-2002 (the last year for which complete follow-up data were available) to determine how many cases of TB became multidrug-resistant during therapy.

**Findings:**

Out of 1113 initially non multidrug-resistant cases with follow-up drug susceptibility results, 27 cases of TB became multidrug-resistant. Four individuals were initially rifampin-resistant and added INH resistance, 17 were initially INH-resistant and added rifampin resistance, and six were initially sensitive to both and became resistant to both. We found that cavitory cases of pulmonary TB who were treated without DOT throughout therapy were more likely to develop acquired multi-drug resistance (OR: 2.65,  $p=0.039$ ); for the 17 who added rifampin resistance, the association with cavitory disease without DOT throughout therapy was stronger (OR: 3.88,  $p=0.012$ ). We found that being located in a high or low morbidity jurisdiction, sex, race/ethnicity, provider type, age, injecting drug use, noninjecting drug use, alcohol use, homelessness, previous history of TB, and smear positivity were not statistically significant (the small number of cases, however, provides little statistical power).

**Conclusion:**

In California during 1995-2002, failure to provide DOT among cavitory patients was a risk factor for the development of acquired multi-drug resistance, and baseline resistance to either INH or rifampin was strongly associated with the development of resistance to the other. These findings support recommendations that patients with cavitory disease should receive directly-observed therapy, particularly if they exhibit initial drug resistance.

**Name of Presenter:**

Travis Porco, PhD  
Phone: (510) 620-3039  
Email: tporco@dhs.ca.gov

**Contact Person for Project:**

Travis Porco, PhD Phone: (510) 620-3039  
Address: 850 Marina Bay Parkway Bldg P Floor 2, Richmond CA 94804  
Email: tporco@dhs.ca.gov