

TUBERCULOSIS INFECTION CONTROL

PC-695-02 A continuous quality improvement approach to implementing tuberculosis infection control differently in Botswana

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Background: Botswana has a high TB incidence (455 cases/100 000 population in 2011) and nosocomial transmission of TB in clinical settings is of great concern. Despite availability of comprehensive infection control guidelines and didactic trainings for health workers since 2009, translating knowledge to practice has remained a challenge.

Intervention: In February 2012, Botswana piloted a training package developed by CDC in 10 health facilities. The package included didactic lectures, slides, video, hands-on site assessments tools and coaching to develop facility-specific infection control plans. Follow-up supervisory, support and mentorship visits were built into the program including feedback on progress to facility staff using a simple dash board matrix. Status of implementation on key infection control interventions were identified at baseline and at 6-month follow-up on the color-coded dashboard: RED was 'not being done'; GREEN 'being done and documented', BLUE 'being done but not documented' or YELLOW 'not applicable'.

Results: An average of 65% of the 37 key infection control interventions were flagged RED for all facilities at baseline; after 6 months an average of 19% were designated RED. Notably, 9 of 10 facilities were actively triaging patients and fast tracking coughers for early TB diagnosis and treatment initiation. Facilities were also actively monitoring daily interventions

Intervention	Process Matrix Hospital			Ntlopho Clinic		
	Baseline	1st visit	3rd visit	Baseline	1st visit	3rd visit
IC Committee formed	Green	Green	Green	Green	Green	Green
IC Practitioner assigned	Green	Green	Green	Green	Green	Green
Written IC plan available	Green	Green	Green	Green	Green	Green
TB IC practice monitored daily	Green	Green	Green	Green	Green	Green
Patients asked about cough when entering facility	Green	Green	Green	Green	Green	Green
Coughing patients separated and "fast tracked"	Green	Green	Green	Green	Green	Green
Staff receive evaluation for TB at least annually	Green	Green	Green	Green	Green	Green
Tracking mechanism to monitor sputum turn-around time	Green	Green	Green	Green	Green	Green
TB IC information available for all patients and visitors	Green	Green	Green	Green	Green	Green
Patient waiting areas outdoors or with cross-ventilation	Green	Green	Green	Green	Green	Green
Surgical masks available and worn by coughing patients	Green	Green	Green	Green	Green	Green
N-95 or P-P2 respirators readily available and used	Green	Green	Green	Green	Green	Green

Green: available or desired outcome
 Red: not done or not available, or not right
 Yellow: not applicable
 Blue: status being tracked but no recent progress

Figure TBIC implementation progress using dash-board matrix of two sample facilities.

such as opening of windows to ensure adequate ventilation in waiting areas/exam rooms in outpatient clinics. Nine of 10 facilities actively screened health-care workers for TB and provided N-95 respirators to protect them from acquiring TB.

Conclusions: The pilot program demonstrated positive change in infection control practice in facilities at 6 months after initial training using the CDC package. A simple dashboard was useful in tracking implementation and providing timely feedback to staff for continuous quality improvement. Botswana is considering rolling out this model to national scale.

PC-696-02 Pulmonary tuberculosis and associated factors: a systematic review and meta-analysis

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Background: Although *Mycobacterium tuberculosis* complex is a necessary cause for pulmonary tuberculosis (PTB), the existence of several other factors associated with PTB is undeniable. Associated factors and their respectively level of importance change over time. Therefore, synthesis of recent studies information can provide important evidence concerning PTB new/classic associated factors and consequently contribute for an improved TB control.

Objectives: To identify associated factors for PTB in studies published recently and to quantify significant combined measures for PTB risk factors previously identified.

Design/methods: A systematic review of published articles between 2002 and 2012 was done, following the Meta-analysis of Observational Studies in Epidemiology Group Guidelines. PUBMED and WEB OF KNOWLEDGE databases were searched to identify relevant papers. PTB corresponded to patients with sputum smear-positive or culture positive or abnormal X-ray. Meta-analysis was done to estimate pooled odds ratio (OR), for all associated factors analyzed in 3 or more studies. A random model was applied for all factors except alcoholism (P -value for Q statistics = 0.3).
Results: From the 421 articles initially identified, 185 were selected by title, 37 by abstract and 18 were considered for meta-analysis after quality assessment. Among these articles 11 associated factors were included in 3 or more studies and considered for meta-analysis: sex, HIV infection, alcoholism, diabetes, low body mass index (BMI), unemployment, smoking, previous TB contact, being illiterate, incarceration history and being unmarried.

As shown in the Table, only employment and education did not show significant associations with

Risk Factor	Odds Ratio (95% Significant Odds Ratio)	Homogeneity test		Publication bias tests Begg's or Egger's (CI 90%)
		I ² statistics (p-value)	I ² (%)	
HIV Status (HIV+)	5.9 (3.7-9.3)*	17.5 (<0.001)	81.3	Yes (Egger's test)
Incarceration (previous incarceration)	5.8 (2.5-13.5)*	9.7 (0.02)	69.1	No
Alcohol (alcoholic)	3.8 (3.1-4.5)*	3.7 (0.30)	18.0	No
Contact with TB patient	3.2 (2.0-5.3)*	57.0 (<0.001)	84.2	No
BMI (<18.5/underweight)	3.2 (1.0-10.1)*	25.1 (<0.001)	92.1	No
Smoking (smoker)	2.5 (1.4-4.3)*	52.7 (<0.001)	85.2	No
Employment (unemployed)	2.1 (0.8-5.8)	77.0 (<0.001)	94.8	No
Sex (male)	2.0 (1.0-3.8)*	72.7 (<0.001)	92.9	No
Diabetes (diabetic)	1.8 (1.2-2.8)*	21.4 (<0.001)	81.3	No
Marital Status (single/separated/widowed)	1.7 (1.2-2.3)*	12.1 (0.02)	67.1	No
Years of schooling/illness	1.2 (0.9-2.2)	12.0 (0.02)	66.4	No

PTB. HIV and incarceration history were the strongest significant PTB associated factors. Alcoholism was the most consistent associated factor found. There was evidence of publication bias related with HIV results. Heterogeneity of studies, assessed through I^2 , was in general high, in part due to the small number of studies considered for each associated factor.

Conclusion: The 9 significant associated factors identified can be grouped as socio-demographic factors (sex, marital status), behavioral factors (incarceration, alcohol, smoking and contact with TB patient) and disease-related (HIV+, diabetes, low BMI). Because of the small number of studies included in the analysis and their general heterogeneity results must be interpreted cautiously.

PC-697-02 Demonstration model for scale-up of tuberculosis infection control in Ndola, Zambia

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Background and challenges to implementation: In 2011, the Zambia TB CARE I project received funding to support a demonstration of TB infection control (IC) measures in one high TB burdened district called Ndola district, in the Copperbelt province. The goal of the project is to provide safe work practices to reduce TB transmission among people living with HIV and health care workers.

Intervention or response: Infection control interventions were introduced to 15 health facilities between January 2012 and March 2013 including baseline facility assessment, training and development of facility specific TB IC plans, provision of a pocket guide with standards and procedures for work practices,

the FAST strategy, health care worker screening, IEC materials and implementation of minor renovations enhancing ventilation of high risk patient areas. A facility data capture form was developed and data captured using an electronic data management system for key indicators. Quarterly reports were given to the Ministry of Health at national and district level and implementing partners.

Results and lessons learnt: IC safe work practices are being implemented in all fifteen facilities with a 61% improvement observed by December 2012 from a baseline of 27%. District Medical Office upheld the importance of IC and took ownership of implementation processes, with innovative ideas of providing incentives to six community volunteers to support sputum transportation efforts to diagnosing facilities. Facility level IC plans were incorporated in annual facility action plans and budgets for annual district support and funding. The number of patients identified with symptoms of TB rose from 381 in the first implementation quarter to 831 in the fourth implementation quarter, while the average turnaround time to diagnosis and treatment came down from a range of 1–21 days in 9 facilities with an average of 6 days to an average of 4 days.

Conclusions and key recommendations: The project provides a focused and stepwise implementation of TB IC measures in a high burdened TB and HIV environment, emphasizing administrative controls and supporting environmental changes within the framework of the existing national and district health system. Implementation was in line with the national infection control guidelines and infection prevention and control policy that the district can continue to implement in an affordable approach.

PC-698-02 Tuberculosis exposure of patients admitted to the medical ward of a referral hospital in sub-Saharan Africa

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Background: Nosocomial transmission of pulmonary tuberculosis (PTB) is a major problem in resource-limited settings. Cohorting of patients with known or suspected TB has been recommended but its impact on TB exposure remains to be determined.

Methods: To determine the extent to which cohorting of suspected PTB patients results in non-PTB patients being exposed, consecutive admissions to the female medical ward were followed. An index of