

## Building and Strengthening Infection Control Strategies to Prevent Tuberculosis — Nigeria, 2015

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Tuberculosis (TB) is the leading cause of infectious disease mortality worldwide, accounting for more than 1.5 million deaths in 2014, and is the leading cause of death among persons living with human immunodeficiency virus (HIV) infection (1). Nigeria has the fourth highest annual number of TB cases among countries, with an estimated incidence of 322 per 100,000 population (1), and the second highest prevalence of HIV infection, with 3.4 million infected persons (2). In 2014, 100,000 incident TB cases and 78,000 TB deaths occurred among persons living with HIV infection in Nigeria (1). Nosocomial transmission is a significant source of TB infection in resource-limited settings (3), and persons with HIV infection and health care workers are at increased risk for TB infection because of their routine exposure to patients with TB in health care facilities (3–5). A lack of TB infection control in health care settings has resulted in outbreaks of TB and drug-resistant TB among patients and health care workers, leading to excess morbidity and mortality. In March 2015, in collaboration with the Nigeria Ministry of Health (MoH), CDC implemented a pilot initiative, aimed at increasing health care worker knowledge about TB infection control, assessing infection control measures in health facilities, and developing plans to address identified gaps. The approach resulted in substantial improvements in TB infection control practices at seven selected facilities, and scale-up of these measures across other facilities might lead to a reduction in TB transmission in Nigeria and globally.

To address the risk for TB transmission to uninfected persons, the World Health Organization (WHO) recommends implementation and scale-up of TB infection control measures, including managerial (leadership and commitment for establishing and implementing infection control policies at the health facility), administrative (prompt identification and separation of persons with presumptive TB, with timely diagnosis and treatment of TB patients), and environmental (optimization of building design and patient flow to reduce the concentration of TB droplet nuclei in the air and control directional flow of potentially infectious aerosols) measures and personal protective equipment (PPE) use, implemented in conjunction with other infection control measures, to reduce the risk for TB transmission in health care facilities

(6). Preventing nosocomial TB transmission, aimed at reducing the impact of TB on persons living with HIV, is also a priority for the U.S. President's Emergency Plan for AIDS Relief (PEPFAR) (7). However, infection control measures to prevent TB transmission in health care facilities have not been adequately implemented, especially in settings with high incidence of TB and limited resources (8,9).

A four-phase TB infection control initiative, *Building and Strengthening Infection Control Strategies* (TB BASICS), was developed by CDC to assess and improve health care facility infection control practices in countries with high numbers of TB cases, using a continuous quality improvement approach. The initiative includes 1) TB infection control training of health care workers, 2) baseline health facility assessments and development of intervention plans, 3) implementation, and 4) monitoring and evaluation through engagement of local health officials and health care workers to encourage commitment to the initiative. The pilot project was conducted in seven health care facilities in Ebonyi, Enugu, and Imo states that are supported by a PEPFAR implementing partner in southeastern Nigeria. These facilities provide services to 1.48 million persons and, during the past year, treated 1,600 TB patients.

A 3-day training workshop based on the WHO policy on TB infection control in health care facilities, congregate settings, and households (6) and delivered by MoH and CDC was conducted for 50 health care workers, including physicians, nurses, residents from the Nigeria Field Epidemiology and Laboratory Training Program (NFELTP), TB and HIV program coordinators, and TB/HIV program officers from the MoH. A precourse assessment identified environmental and administrative measures for infection control as the main gaps in participant knowledge. Training materials, videos, and job aids\* were provided to all participants to facilitate their training of other staff members in their respective health facilities.

Teams<sup>†</sup> conducted baseline assessments of TB infection control practices at each of the seven facilities using a standardized facility assessment tool that included staff interviews, observation of

\* <http://www.cdc.gov/globalaids/Resources/pmtct-care/tuberculosis-infection-control.html>.

<sup>†</sup> The seven teams included state, regional, and federal MoH officials, NFELTP residents, PEPFAR implementing partners, WHO staff members, and CDC staff members and were led by health care providers from the pilot health facilities.

routine practices, and review of available policies and procedures on infection control. After completion of the baseline assessments and identification of programmatic areas for strengthening, each team developed a facility-specific intervention plan with a timeline for implementation. Implementation of TB infection control measures at each facility was reassessed at 2, 4, and 6 months after the baseline assessment. Monitoring of 14 managerial measures, 13 administrative measures, seven environmental measures, and three PPE measures was conducted by NFELTP residents, and the final evaluations were performed by the teams that conducted the baseline assessments. Data were displayed in a color-coded dashboard (<http://stacks.cdc.gov/view/cdc/38109>) that indicated elements that were not implemented (and for which there was no implementation plan) in red, elements that were planned but not yet implemented in yellow, elements that were not applicable or assessed in blue, and elements that were fully implemented in green. Site-specific feedback and a copy of the dashboard were provided to the facilities immediately after the baseline assessment was completed and at each of the bimonthly evaluations so that staff members could visually track their own progress.

### Baseline Assessment of TB Infection Control Measures

At baseline, managerial measures were lacking in almost all facilities. Only one site had national infection control policy and guidelines or facility-specific plans available. There were no infection control committees or designated practitioners, no routine risk assessments or daily monitoring of infection control activities, no ongoing or planned operational research to improve infection control practices, and no occupational health programs. All facilities had systems in place for reporting all new TB diagnoses, and all patients with diagnosed TB disease were referred for treatment. In accordance with the national TB treatment policy, directly observed therapy was provided for TB patients; however, staff members did not know how to properly educate patients and their visitors or provide them with information on infection prevention. Administrative measures also were generally not in place. Only three facilities had posters describing proper cough etiquette, and most did not have tissue or hygiene supplies for coughing patients, staff members designated to identify coughing patients and separate them from other patients to reduce possible exposure to TB, or systems in place for patients with presumptive TB to be prioritized for clinical evaluation. None of the facilities provided routine TB evaluation, HIV testing or secure documentation of health information for their staffs, and most did not have WHO-recommended isoniazid preventive therapy available for staff members with HIV infection.<sup>§</sup>

<sup>§</sup>[http://www.who.int/hiv/strategy2016-2021/Draft\\_global\\_health\\_sector\\_strategy\\_hiv\\_01Dec2015.pdf?ua=1&ua=1](http://www.who.int/hiv/strategy2016-2021/Draft_global_health_sector_strategy_hiv_01Dec2015.pdf?ua=1&ua=1).

Collection of sputum in a designated location away from other patients and timely processing of sputum samples were in place in five of the seven facilities. Although all of the facilities had outdoor patient waiting areas with good ventilation, other environmental measures were poorly implemented. None of the facilities routinely checked airflow in examination rooms and waiting areas to ensure adequate air exchange; signage reinforcing the opening of doors and windows for cross-ventilation was not displayed, and the facilities did not have extractor fans to facilitate removal of infectious aerosols or use ultraviolet germicidal irradiation of TB droplet nuclei. PPE was not consistently used in any of the facilities. Coughing patients were not provided masks to cover the nose and mouth. Staff members had not undergone respirator fit testing and did not routinely wear respirators when interacting with patients with presumptive or diagnosed TB disease.

### Implementation of TB Infection Control Improvements

Interventions to improve infection control practices were carried out at each site to promote and enable facility-driven program changes. No-cost interventions were immediately put in place, and providers who had attended the training used workshop materials to train other staff members at their facilities. Posters and pamphlets with information on cough etiquette, hygiene, and handwashing were provided to each facility for display in patient waiting areas. Purchase of supplies and minor renovations, including the construction of designated sputum collection booths in remote areas of the facilities, were undertaken. Facilities developed plans to monitor average patient wait times and ensure that presumptive TB patients received expedited care to reduce the amount of time they spent around other patients and health care workers. Occupational health programs were established at each facility, including routine TB evaluations for health care workers, which led to the diagnosis of TB in three staff members at two of the pilot facilities.

As measured by the dashboard, progress from predominantly red indicators at baseline (indicating nonimplementation of recommended measures), to almost all green indicators (indicating full implementation) at the 6-month evaluation reflected improvements made by the seven pilot facilities. At baseline, only two of the 14 managerial measures were implemented at all seven facilities. At the 6-month evaluation, 13 of the 14 managerial indicators had been implemented at all of the facilities. Of the 13 administrative measures, the number implemented increased from zero at baseline to 10 at the 6-month evaluation. Of the seven environmental measures, the number implemented increased from one to four, and of the three PPE measures, the number implemented increased from zero to three. As of February 2016, NFELTP residents, health care providers, and health officials from the initial training

**Summary****What is already known about this topic?**

Tuberculosis (TB) is the leading cause of infectious disease mortality globally. Nosocomial transmission is a significant source of TB infection and of particular risk for health care workers and persons living with human immunodeficiency virus infection. TB infection control measures to reduce the transmission of TB in health care facilities have not been well implemented in settings with high numbers of cases and limited resources.

**What is added by this report?**

An intervention in Nigeria that focused on training health care workers, identifying TB infection control gaps, and using continuous quality improvement measures to monitor strategies in health care facilities was effective in improving TB infection control.

**What are the implications for public health practice?**

Increasing health care worker knowledge and implementation of TB infection control measures in health facilities are key to preventing the nosocomial spread of TB and reducing the incidence of TB globally. Ongoing support will be required to ensure that gains are maintained and that the infection control program is sustainable.

workshop had trained approximately 200 health care workers, using materials and videos developed by CDC. The experiences of participants in the project helped to inform revisions being made to the TB infection control section of the Nigeria MoH guidelines for TB/HIV collaborative activities.

**Discussion**

TB prevention is a key element in the strategy to end the global TB epidemic (10) and an important component of prevention is TB infection control. In Nigeria, as in many countries with high numbers of cases and limited resources, implementation of TB infection control measures has been inadequate (8). An initiative aimed at increasing health care worker knowledge about TB infection control and implementing measures to reduce nosocomial transmission in Nigeria resulted in substantial improvement in managerial, administrative, environmental, and personal protective measures and in demonstrable country and facility commitment to the initiative during a 6-month implementation period. Managerial and administrative measures mainly involved implementation of existing policies and change in practices and were rapidly put into place. Environmental improvements and PPE use were instituted at minimal cost.

Commitment from MoH and the conscientiousness of participating health care workers were critical to the success of this project. The limited knowledge of health care providers and minimal implementation of infection control measures at baseline was challenging. However, country capacity was built by engaging local stakeholders in all aspects of the project,

including training, facility assessment, intervention planning and implementation, monitoring, and evaluation. In addition, many of the implemented practices required minimal intervention. Continuing education and training of health care workers, as well as monitoring of infection control practices, will help to ensure that the progress attained is sustained.

The findings in this report are subject to at least two limitations. First, the pilot project was conducted in PEPFAR-supported facilities in southeastern Nigeria and might not be representative of other facilities or sites in other parts of the country. Second, although the initial achievements have been encouraging, the long-term impact and sustainability of the TB infection control practices implemented have not yet been assessed.

The incidental diagnoses of TB among health care workers as a result of this project highlight the value of routine health care worker screening and underscore the importance of TB infection control in health care settings. The outcome of the pilot project and recommendations have been shared with the government of Nigeria and in-country TB stakeholders, and will guide ongoing capacity-building efforts, scale-up of infection control practices in other health facilities in Nigeria, and long-term monitoring plans.

Preventing TB infection is key to reducing the number of TB cases worldwide, but there are still critical infection control gaps in health facilities, posing a continued risk to persons living with HIV infection, health care workers, and uninfected persons. Widespread implementation of infection control measures, especially in settings with high numbers of cases, should help prevent further TB transmission and ultimately bring the global TB epidemic to an end.

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