



# Health care workers' recommendations for strengthening tuberculosis infection control in the Dominican Republic

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## Suggested citation

Chapman HJ, Veras-Estévez BA, Pomeranz JL, Pérez-Then EN, Marcelino B, Lauzardo M. Health care workers' recommendations for strengthening tuberculosis infection control in the Dominican Republic. *Rev Panam Salud Publica.* 2018;42:e169. <https://doi.org/10.26633/RPSP.2018.169>

## ABSTRACT

**Objective.** To describe health care workers' practical recommendations for strengthening adherence to *Mycobacterium tuberculosis* infection control practices in their health institutions and elsewhere across the Dominican Republic.

**Methods.** In this qualitative study, 10 focus groups, with a total of 40 clinicians (24 physicians, 16 nurses), were conducted in 2016 at two tertiary-level institutions in the Dominican Republic. Grounded theory guided the analysis to expand on health care workers' recommendations for empowering clinicians to adhere to *M. tuberculosis* infection control practices. To ensure reliability and validity, the authors analyzed data and incorporated both peer debriefing with qualitative experts and participant feedback or validation on the final themes.

**Results.** Six emerging themes were described: 1) education and training; 2) administrative policy; 3) infrastructure policy; 4) economic allocations; 5) research; and 6) public health policy.

**Conclusions.** Future efforts may combine the health care workers' recommendations with evidence-based strategies in *M. tuberculosis* infection control in low-resource settings. This could pave the way for interventions that empower health care workers in their application of *M. tuberculosis* infection control measures in clinical practice.

## Keywords

Focus groups; grounded theory; health personnel; infection control; disease transmission, infectious; *Mycobacterium tuberculosis*; occupational exposure; Dominican Republic.

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Health care workers (HCWs) have an increased risk of *Mycobacterium tuberculosis* infection in their clinical workplace. For HCWs, when compared to the general population, the estimated annual incidence rate ratios range from 1.4 to 5.4

in tuberculosis (TB) incidence regions with low TB incidence (< 50 cases/100 000 population), intermediate TB incidence (50–100/100 000 population), and high TB incidence (> 100/100 000 population) (1). The provision of clinical care to TB patients, including those undiagnosed or noncompliant to recommended treatment, coupled with inadequate infection control practices in the health institution, can increase HCWs' occupational risk of *M. tuberculosis* infection or disease (2, 3). In order to safeguard the health and well-being of front-line HCWs in their clinical practice, the existence and application of robust *M. tuberculosis* infection control policies are essential to reduce risk of nosocomial TB transmission among HCWs or patients. Furthermore, it is important to understand HCWs' perceived risk of susceptibility, knowledge about *M. tuberculosis* epidemiology and burden on population health, and routine application of infection control measures in clinical practice (2, 4).

With more than 90% of TB deaths occurring in low- and middle-income countries, many health systems are challenged to implement international guidelines in TB prevention and control published by the World Health Organization and the United States Centers for Disease Control and Prevention (5, 6). HCWs may be unable to consistently adhere to these hierarchy-level practices in health care service delivery (5–7). These practices include: 1) administrative controls (e.g., implementing TB infection control plan; completing TB risk assessments); 2) environmental controls (e.g., controlling airflow in rooms; ensuring appropriate ventilation to remove contaminated air); and 3) respiratory protection (e.g., using protective masks for HCWs and patients; training patients about proper cough etiquette). These inconsistencies in applying scientific knowledge to clinical practice in infection control, sometimes described as the “knowledge–action gap,” may stem from barriers within the health provider or health system, and may impact service delivery (8), requiring significant attention in TB prevention and control initiatives.

In 2016, the Dominican Republic Ministry of Health (MoH) documented intermediate TB incidence (60/100 000), multidrug resistance (2.9% in new cases; 34% in previously treated cases), and

TB-HIV coinfection incidence (14/100 000) (9). Like in other low- and middle-income countries, in the Dominican Republic, health leaders face challenges that sustain hospital and community TB transmission. These challenges include social stigma that propagates myths, financial burdens for TB patients and families (10), overcrowded living conditions in urban areas and in rural settings saturated by sugarcane plantation (*batey*) communities of Haitian immigrants or persons of Haitian descent (11), and high levels of multidrug resistance and TB-HIV coinfection (9). However, the annual TB budget was US\$ 15 million in 2017, with 65% from domestic funds, 19% from international sources, and 17% as unfunded (9). This budget provides support for the National Tuberculosis Program (NTP) initiatives at local and national levels, such as health educational campaigns (e.g., school programs, community events), social programs (e.g., nutrition supplements, financial subsidies), and directly observed treatment, short-course (DOTS) management.

To date, three studies have reported on the occupational risk of *M. tuberculosis* in tertiary-level health institutions in the Dominican Republic. One descriptive study, by the Dominican NTP, documented the scope of TB disease in 111 HCWs (39 nurses, 20 janitorial staff, 13 physicians, 7 laboratory personnel, 6 maintenance staff, 4 administrators, 1 dentist, and 21 persons of unknown job category) employed at 49 tertiary-level health institutions between 2005 and 2012 (12). Subsequently, two published qualitative studies examined adherence to *M. tuberculosis* infection control practices among HCWs in two tertiary-level health institutions in the Dominican Republic (13, 14). The authors of the latter two studies employed a grounded theory approach to first identify barriers to HCWs' consistent use of recommended *M. tuberculosis* infection control practices. Using semi-structured interviews with HCWs, the authors identified five barriers, which were categorized as either intrinsic factors (sense of invincibility of HCWs, personal beliefs of HCWs related to direct patient communication) or extrinsic factors (low provider-to-patient ratio at institutions, absence of TB isolation units for patients within institutions, limited availability of protective masks for HCWs). Then, the authors facilitated focus group discussions with HCWs to

further explore how each identified barrier influenced the HCWs' decision-making process in *M. tuberculosis* infection control practices, resulting in the development of a theoretical model.

Empowering HCWs to adhere to *M. tuberculosis* infection control measures in clinical practice and establish intersectoral collaborations with primary-, secondary-, and tertiary-level health institutions is indispensable to maximize TB prevention and control efforts and end TB transmission in high-risk population groups. In this qualitative study, we describe HCWs' practical recommendations for improving adherence to *M. tuberculosis* infection control practices in their health institutions and across other entities in the Dominican Republic.

## METHODS

### Setting and sample

During May 2016, a qualitative study was conducted to examine HCWs' recommendations for strengthening HCWs' adherence to *M. tuberculosis* infection control practices in their health institutions and elsewhere across the Dominican Republic. Two tertiary-level health institutions, in the cities of San Pedro de Macorís (Hospital A) and Santiago de los Caballeros (Hospital B), were selected, based on the MoH's report of high TB caseloads and established medical training programs in primary care and emergency medicine. In these two institutions, a purposive sample of 40 clinicians (24 physicians, 16 nurses) in emergency, family, and internal medicine specialties participated in 10 focus group discussions, of the same sex and occupation to minimize potential power dynamics (15). Inclusion criteria were clinicians with full-time employment and who had completed at least one year of postgraduate medical specialty (physicians) or nursing training (nurses).

### Procedure

Using a semi-structured interview guide, the first author (HJC) employed 13 questions to elaborate on five barriers identified from previously published studies (13, 14), eliciting the clinicians' practical recommendations for improving adherence to *M. tuberculosis* infection control practices. Interview probes were used to clarify responses (16). The first

author directed each focus group discussion, which was digitally recorded. Ranging in length from 45 to 60 minutes, the gatherings were held in a vacant conference room within the institution. These sessions allowed participants to reflect on the phenomenon (e.g., *M. tuberculosis* infection control measures) and discuss similar or conflicting viewpoints (17), based on recommendations to strengthen *M. tuberculosis* infection control practices. With their respective medical or nursing training, participants shared similar experiences yet exhibited sufficient diversity to facilitate group interactions (17, 18). After each session, the first author prepared field notes from jottings about interactions with HCWs and daily logs of institutional activities (16). To compensate them for their time, participants were provided a small assortment of office supplies. When no new information emerged from data collection, saturation was reached and data collection ceased (19).

## Data analysis

All interview data and field notes were transcribed verbatim in Spanish, de-identified for confidentiality, and confirmed by the second author (BAVE), a bilingual Dominican physician. QSR International's NVivo 11 qualitative data analysis software (QSR International Inc., Burlington, Massachusetts, United States of America) facilitated data management of transcripts during the coding process. We used grounded theory and dimensional analysis techniques to guide the analysis process (19, 20).

Prior to data collection, the first two authors (HJC and BAVE), who were knowledgeable about TB control and the five described barriers, created general coding categories. The two authors independently coded data transcripts and then met to discuss discrepancies in the analysis and to settle on emerging themes. Memo writing was used to further examine the phenomenon throughout the analysis process (21). The two authors used open coding to identify categories from data, axial coding to identify relationships between categories, and selective coding to develop the principal themes of the theoretical framework (22). In order to improve scientific validity and rigor, they used techniques such as comparative analyses to compare and contrast categories

in theory development (22), card sorting to examine relationships in emerging themes (23), and audit trails to record the data collection process (24). They also incorporated participant checking (25), for study participants to provide feedback or validation on the final themes and interpretations, as well as peer debriefing (26), with qualitative research experts of the University of Florida Qualitative Research Colloquium offering advice on study design and analysis.

## Ethical considerations

This study was authorized by the institutional review boards of the University of Florida (Gainesville, Florida, United States) and O&M Medical School (O&Med) (Santo Domingo, Dominican Republic). The protocol was approved by the Dominican Republic NTP, the Department of Academics of Hospital A, and the institutional review board of Hospital B. All participants signed written informed consent for study participation. Measures to maintain confidentiality of participants and their responses were strictly maintained, using standard survey codes (e.g., A) or standard focus group codes (e.g., FG-01).

## RESULTS

A total of 10 focus group discussions were conducted with 40 participants (24 physicians, 16 nurses). Of the 24 physicians, 4 were trained in internal medicine, 6 in family medicine, and 14 in emergency medicine. Eight physicians were second-year medical residents, and 16 were third-year medical residents. Of the 16 nurses, 4 were employed in the department of internal medicine, and 12 worked in the department of emergency medicine. Four nurses had one year of nursing training (e.g., certificate level), two had two years of nursing training (e.g., associate level), and 10 had four years of nursing training (e.g., bachelor level).

Five emerging themes were described at the institutional level: 1) education and training; 2) administrative policy; 3) infrastructure policy; 4) economic allocations; and 5) research. A sixth theme (public health policy) emerged only at the national level. Table 1 displays six emerging themes described at the national level. Table 2 presents six

categories of proposed recommendations described by HCWs.

## Education and training

Participants described the need to educate, train, and empower HCWs and patients in their institutions, including in terms of understanding TB disease and preventive measures, dispelling myths about transmission, and reducing TB-associated stigma or discrimination. One family physician suggested that pre-employment training seminars that incorporate scientific and social aspects of TB pathology and infection control would be ideal for HCWs: "Orientation workshops can be conducted when [health care workers] start their employment . . . . If there is any stigma or bias, then it can be eliminated . . . . They can be reminded of appropriate biosecurity measures, review pathology, and then they will be prepared to work."

One family physician mentioned that daily health campaigns would reduce misconceptions regarding the importance for TB infection control and adherence to medications: "When TB patients are admitted to the hospital, we can go in teams to educate them with proper facts . . . . This can raise awareness with patients and families." Also, participants highlighted that nonclinical HCWs, such as administrators or janitors, are frequently overlooked in educational programs. One internal medicine physician said that regardless of their previous training, HCWs are employed in a workplace where they may have close daily interactions with TB patients: "Mandatory workshops should be offered for every employee [in the health institution]." Participants also described the importance of HCWs' comprehension of the current TB health burden in the Dominican Republic and their regular contemplation of their role in delivering preventive health care services.

## Administrative policy

Participants emphasized that administrative policies should be strengthened to promote the intertwined factors in TB infection control and patient management that are essential for reducing disease propagation in hospitals and communities. Many described the need for health institutions to recognize multiple workplace hazards, and, in effect, prioritize

**TABLE 1. Emerging themes, as described by health care workers in 2016, to improve *Mycobacterium tuberculosis* infection control measures at the national level in the Dominican Republic**

Topic/Theme description	Comments from participants <sup>a</sup>
Education and training	
Increasing TB <sup>b</sup> awareness and community buy-in	<ol style="list-style-type: none"> <li>1. "Larger campaigns and promotions... on the OMSA [bus], you can educate the public about TB preventive measures." (P-EM)</li> <li>2. "If you attend a <i>junta de vecinos</i><sup>c</sup> meeting, you will be able to more easily reach and build rapport [regarding promotion and education]." (P-EM)</li> </ol>
Administrative policy	
Expanding supervisory infection control teams	<ol style="list-style-type: none"> <li>1. "I would form a general supervisory team to evaluate all hospitals with patient isolation wards." (N-IM)</li> </ol>
Providing periodic health assessments for employees of high-risk occupations	<ol style="list-style-type: none"> <li>1. "Go to each company and conduct biannual exams for each employee, including sputum samples. If you can detect TB, then transmission will not continue." (N-EM)</li> </ol>
Infrastructure policy	
Designating specific hospitals or subcenters <sup>d</sup> for TB management	<ol style="list-style-type: none"> <li>1. "Prepare another hospital to receive patients with respiratory diseases in order to rule out pulmonary TB." (P-FM)</li> <li>2. "There should be a subcenter model, where all who go to subcenters know that they will be discharged cured of TB." (N-EM)</li> </ol>
Establishing strong community links with hospitals and UNAPs <sup>e</sup> for TB management	<ol style="list-style-type: none"> <li>1. "Contact other centers, making a network between us and nearby public and peripheral centers so that we can work together and not overload hospital capacity." (P-EM)</li> </ol>
Economic allocations	
Prioritizing population health indicators to achieve SDG <sup>f</sup> targets	<ol style="list-style-type: none"> <li>1. "Inform federal authorities of the high TB incidence in this hospital." (P-EM)</li> </ol>
Assessing the national health budget	<ol style="list-style-type: none"> <li>1. "Without emphasizing politics, there should be an increase in the gross domestic product that provides health resources." (P-FM)</li> </ol>
Research	
Emphasizing epidemiologic studies to examine TB burden	<ol style="list-style-type: none"> <li>1. "This type of study and analysis can help contribute to eradicate TB because of its prevention focus." (P-EM)</li> </ol>
Public health policy	
Identifying limitations in local or national political leadership	<ol style="list-style-type: none"> <li>1. "Decentralize health policy. These programs have not been successful because politics is prioritized over patient health due to economic interests." (P-EM)</li> </ol>

**Source:** Prepared by the authors, using the study data.

<sup>a</sup> The coding in parentheses for the participants is for the profession and the area of work. The professions are: N, nurse; P, physician. The areas of work are: EM, emergency medicine; FM, family medicine; IM, internal medicine.

<sup>b</sup> TB = tuberculosis.

<sup>c</sup> A *junta de vecinos* is a community-based council that facilitates interactions between community members and local government offices of the provinces. It aims to improve community development and protect the collective interests of community members.

<sup>d</sup> Subcenters are health centers, with fewer than 40 beds, that provide basic health services to local communities.

<sup>e</sup> UNAPs = *unidades de atención primaria* (primary care units).

<sup>f</sup> SDG = Sustainable Development Goal.

health and well-being of HCWs through stricter policies. One emergency physician suggested that daily workplace stressors can affect HCWs' physical and mental health, and called for periodic assessments: "There should be biannual medical evaluations for all health care workers . . . We evaluate patients, but they do not evaluate us." Participants acknowledged stressors related to heavy work schedules, reasoning that having more HCWs in clinical areas could reduce their individual workloads. Another emergency physician proposed decreasing cumulative work hours per HCW as a way to cut the risk of workplace hazards: "Reduce work schedule hours for health care workers, since the longer the time spent in clinical areas, the greater the risk of infection." Finally, several participants said that *M. tuberculosis* infection control

strategies should be compulsory, and that clinical staff should be monitored for adherence to those guidelines. One emergency physician suggested that HCWs sign an employee contract laying out graded punishments, with a maximum of three offenses allowed before removal from the institution: "An employee has a first offense, and they would deduct three pesos from the salary. On the second offense, they would deduct a greater amount from the salary. On the third offense, the employee would be fired."

### Infrastructure policy

The participants believed that health institutions should improve the physical infrastructure, such as by having adequate ventilation in exam rooms and TB isolation wards and reducing patient

overcrowding. These changes would cut the risk of nosocomial *M. tuberculosis* transmission among HCWs and patients. One internal medicine physician said that TB isolation wards are essential "as a specific area for patients with respiratory symptoms, under clinical evaluation for tuberculosis," to separate out and assess patients with TB or suspected of having active TB from susceptible patients. Participants stated that separate wards—without additional stigma or shame—would be appropriate and fair for TB patients, since TB is a curable disease. Another internal medicine physician said that modifications in infrastructure should be in line with the number of admissions and external consultations: "I would create an [isolation] area that matches the size of the health center."

**TABLE 2. Recommendations made by health care workers (HCWs) in 2016 to improve *Mycobacterium tuberculosis* infection control measures at the institutional and national levels in the Dominican Republic**

Topic/Theme description	Institutional recommendations	National recommendations
Education and training	<ol style="list-style-type: none"> <li>Develop orientation training seminars on tuberculosis (TB) for new employees and hospitalized patients that highlight:               <ol style="list-style-type: none"> <li>facts about TB disease, diagnosis, and treatment adherence</li> <li>importance of psychological support for TB patients and families</li> <li>factors about TB as a social disease and associated myths</li> </ol> </li> <li>Implement daily health seminars to educate patients and families about TB treatment adherence</li> <li>Initiate regular and active training programs and workshops for nonclinical and clinical HCWs to critically analyze and reflect on the current TB health burden</li> </ol>	<ol style="list-style-type: none"> <li>Verify that all HCWs receive regular continuing education programs</li> <li>Promote national TB educational campaigns through daily programming (television, radio, social media) and transportation (bus, informal taxi)</li> <li>Develop a health education television or radio channel or require channels to promote one hour of health education topics (e.g., educational announcements during commercial breaks)</li> <li>Implement monthly community education campaigns (seminars, activities) in primary, secondary, and postsecondary institutions</li> <li>Form relationships with community centers (e.g., <i>junta de vecinos</i><sup>a</sup>) and local industries for participation in TB health promotion activities</li> <li>Prioritize the role of family physicians at community primary health centers to improve TB diagnosis and management</li> </ol>
Administrative policy	<ol style="list-style-type: none"> <li>Strengthen surveillance program to identify patients who have respiratory symptoms &gt; 2 weeks</li> <li>Complete appropriate and timely diagnostic work-up (smears, cultures) for suspected TB patients</li> <li>Evaluate the quality of disposable resources (type of mask, gloves) for infection control</li> <li>Require monthly reports from each department to identify necessary provisions of disposable materials and equipment for TB management</li> <li>Strengthen psychological support for patients and families</li> <li>Require orientation and annual periodic health evaluations for HCWs</li> <li>Assign one HCW to each specific clinical area to supervise HCWs and patients, observe compliance with infection control measures, and verify sufficient supply of disposable materials</li> <li>Designate one HCW to maintain hygiene and disinfection in emergency and hospital wards</li> <li>Increase number of HCWs in clinical areas and reduce cumulative work hours</li> <li>Implement disciplinary acts in the form of sanctions, salary reduction, or firing for HCWs who fail to adhere to infection control measures</li> </ol>	<ol style="list-style-type: none"> <li>Require orientation and annual medical evaluations for HCWs and employees in other high-risk occupations</li> <li>Form national supervisory teams to observe HCW adherence to TB infection control measures across all health institutions</li> <li>Strengthen links between community primary health centers and hospitals in order to improve TB case finding, patient referral, and directly observed treatment, short-course (DOTS) management</li> </ol>
Infrastructure policy	<ol style="list-style-type: none"> <li>Build TB isolation wards to meet capacity</li> <li>Confirm that clinical areas have adequate ventilation</li> </ol>	<ol style="list-style-type: none"> <li>Develop TB isolation wards at select hospitals to manage suspected TB patients</li> <li>Build various regional centers to focus care on patients with respiratory diseases</li> </ol>
Economic allocations	<ol style="list-style-type: none"> <li>Assign administrative personnel or team to develop fund-raising campaigns (e.g., telethons, medical outreach) for disposable materials and equipment</li> <li>Request sponsorship from private companies</li> </ol>	<ol style="list-style-type: none"> <li>Request that the Ministry of Health increase the annual health budget for tertiary-level health institutions</li> <li>Educate national health authorities about the high national TB burden</li> <li>Increase the portion of the gross domestic product allocated for health expenditure</li> </ol>
Research	<ol style="list-style-type: none"> <li>Conduct annual epidemiologic studies to examine TB incidence in each health institution</li> </ol>	<ol style="list-style-type: none"> <li>Conduct annual epidemiologic studies to examine TB incidence across geographic regions</li> <li>Design baseline studies that can provide a framework to:               <ol style="list-style-type: none"> <li>identify barriers in continued health care service delivery</li> <li>describe influences of stigma and discrimination</li> <li>understand the impact of social determinants of health</li> </ol> </li> </ol>
Public health policy		<ol style="list-style-type: none"> <li>Confirm that policy decisions are based on technical content and align with health priorities</li> <li>Ensure that decision-making in health policy is depoliticized and decentralized to the extent possible.</li> </ol>

**Source:** Prepared by the authors, using the study data.

<sup>a</sup>A *junta de vecinos* is a community-based council that facilitates interactions between community members and local government offices of the provinces. It aims to improve community development and protect the collective interests of community members.

## Economic allocations

Participants described the critical need to identify available funding to maintain adequate supplies of disposable

materials and other equipment and to sustain overall health expenditures for TB control. One emergency physician stated that this challenge could be resolved by modifying administrative staff

responsibilities, rather than clinical staff duties: "Administrative personnel can be selected and assigned to seek solutions for this challenge." Participants mentioned that the evaluation of institutional

budgets, compared to proposed and actual health expenditures, could support financial requests to the country's MoH. An emergency physician emphasized that institutions with increased health expenditures (due to substantial annual patient admissions, external consultations, and emergency visits) should have increased funding to meet the demand for services: "This hospital receives larger numbers of patients than other health institutions . . . The supply of disposable materials should be three times greater than any other hospital because of the large number [of patients]." Another emergency physician suggested that additional fund-raising could reduce at least one financial burden on the institution: "Health campaigns can raise funds to buy protective masks."

## Research

Participants stated that research studies are essential for analyzing and evaluating basic health indicators, identifying enablers and barriers in service delivery, and examining influences of stigma and social determinants of health on health outcomes. One nurse in the department of emergency medicine commented on the power of research findings to modify current clinical practices: "Research produces recommendations that can inform us about what is needed for proper use and management of TB pathology." In addition, a nurse in the department of internal medicine said that the exchange of research findings is crucial for all countries, especially health systems that encounter similar challenges in service delivery and health outcomes: "Research can yield innovative approaches that can be directly applied from one country to another. This can facilitate change in infection control practices."

## DISCUSSION

This is the first known study to examine HCWs' practical recommendations for improved TB control in health institutions and the general community in the Dominican Republic. Increased capacity-building for clinicians was deemed fundamental for strengthening *M. tuberculosis* infection control practices and treatment adherence. Pilot capacity-building programs in TB infection control, epidemiology, and operations

research applied in Latvia, Mexico, Nigeria, Russia, South Africa, and Vietnam have resulted in successful educational training (27) and improvements in *M. tuberculosis* infection control (28). Hence, once physicians and nurses are trained in their designated pedagogical models, they can reinforce their new expertise in adherence to *M. tuberculosis* infection control measures. They can also gain insight on holistic and multidimensional TB care and develop health promotion activities that educate TB patients and families about available resources that support long-term TB management.

The study participants indicated that administrative policies can add more oversight to *M. tuberculosis* infection control practices, ranging from continued surveillance programs to annual periodic health evaluations for HCWs. These policy additions have four benefits. First, prevalence of latent and active TB among HCWs can be carefully recorded and documented, ensuring prompt diagnosis and management. Second, departmental records can quantify medications and supplies and confirm that stock meets institutional demands for best practices. Third, by increasing the number of HCWs per work shift and distributing responsibilities, overall job stress and burnout can be reduced (29). Fourth, monetary or legal sanctions for failed adherence to recommended infection control practices could underscore critical changes in the organizational culture within the health institution that prioritize HCWs' physical and mental health. These deterrents may also motivate HCWs to consistently use infection control practices.

Participants mentioned that institutional policies should focus on environmental controls for proper TB management in health institutions. Institutions with sufficient ventilation to control airflow in patient rooms can reduce biological threats of nosocomial *M. tuberculosis* transmission (4–6). However, with few existing isolation wards in the Dominican Republic, and national renovation of more than 50 hospitals since 2013, HCWs have the academic training and expertise to influence changes in institutional policies that promote *M. tuberculosis* infection control practices within their health institutions. With the national TB budget of US\$ 15 million in 2017 (which is consistent with reported

TB budgets of US\$ 15–21 million since 2013) (9), MoH leaders can consider hospital utilization rates and reevaluate the national budget designated for Dominican health institutions.

Likewise, by highlighting the need for increased capacity in research, participants emphasized that epidemiologic and other baseline studies are essential to better understand TB transmission dynamics in the Dominican Republic. For example, regular hospital and community assessments can identify barriers that hinder treatment adherence among TB patients (30). By identifying barriers specific to the Dominican Republic's population, HCWs can foster sustainable, ethical health care service delivery and minimize TB-associated stigma. In turn, this may encourage the MoH to develop stronger clinical and community measures and policies. A closer review of the national budget for each health institution and an emphasis on strengthening local and national health leadership could highlight limitations in the health system. Therefore, evidence-based public health policy should incorporate three domains in order to strengthen *M. tuberculosis* infection control practices in the Dominican Republic: 1) process (e.g., approaches linked with policy approval); 2) content (e.g., components considered effective); and 3) outcomes (e.g., documented effects of policy) (31).

This exhaustive examination adds value to clinical practice by stressing potential modifications of infection control standards across health institutions in the Dominican Republic. Our study findings were presented to health officials at the Dominican NTP and selected hospitals for review prior to publication. However, there were some limitations in the study design and analysis. First, two authors analyzed the data for final themes, incorporating the techniques of participant checking for feedback on the final consensus of recommendations and peer debriefing with qualitative research experts for advice on study design and analysis. We acknowledge that that our data analysis could be interpreted in additional ways (32). Second, the focus groups did not incorporate rank ordering of the six themes, based on the weighted contribution of importance to TB infection control measures. Adding rank ordering of the themes might have

accentuated one theme over another, thus simplifying formal briefings to the country's MoH.

The observed “knowledge–action gap,” described as inconsistencies in HCWs' application of clinical knowledge to practice (8), results in ineffective TB prevention and control in health institutions in the Dominican Republic. Direct consultation with front-line HCWs about their perceived limitations of *M. tuberculosis* infection control practices at the institutional and national levels can add value to their recommendations for enhanced TB control efforts. Likewise, these recommendations can serve as a framework for continued national dialogue with the Dominican MoH on policy reform. This is especially valuable since the Dominican Republic is a middle-income country with an established MoH national budget and political commitment to TB control. Hence, this study can serve as a model for other low and intermediate TB burden countries that share national priorities for strengthening HCWs' leadership in clinical practice, supporting TB elimination efforts, and improving population health.

## Conclusions

The Dominican HCWs believe that *M. tuberculosis* infection control measures can be strengthened at the institutional and national levels by emphasizing their practical recommendations for education and training, administrative policy, infrastructure policy, economic allocations, research, and public health policy. Future efforts may combine these recommendations with evidence-based strategies in *M. tuberculosis* infection control, thus paving the way for interventions in specific target areas that empower HCWs as institutional and national health leaders in TB prevention.

**Acknowledgments.** The authors wish to thank the participants for giving their time to describe their unique viewpoints and experiences regarding TB infection control in their clinical practice. We acknowledge the research support from the Dominican Republic's NTP, O&M Medical School, and selected health institutions. We recognize the academic mentorship of Dr. Mary Ellen Young and peer

debriefing provided by the University of Florida Qualitative Research Colloquium during the data design and analysis. We also acknowledge the logistical support from Dr. Guillermo Hernández, Mr. Saulo Rodríguez, and Mrs. Cristina Ventura.

**Funding.** This work was supported by the Gatorade Trust through funds distributed by the University of Florida Department of Medicine. Travel expenses were provided by the University of Florida Department of Environmental and Global Health. In-country academic space was provided by O&M Medical School (O&Med). The funders and sponsors had no role in study design, data collection and analysis, the decision to publish, or preparation of the manuscript.

**Conflicts of interest.** None declared.

**Disclaimer.** Authors hold sole responsibility for the views expressed in the manuscript, which may not necessarily reflect the opinion or policy of the *RPSP/PAJPH* or PAHO.

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Manuscript received on 16 January 2018. Revised version accepted for publication on 13 June 2018.

## RESUMEN

### Recomendaciones de los trabajadores de salud para fortalecer el control del contagio de la tuberculosis en la República Dominicana

**Objetivo.** Definir las recomendaciones prácticas de los trabajadores de salud para consolidar la adhesión a las prácticas de control de la infección por *Mycobacterium tuberculosis* en instituciones de salud y otros lugares de la República Dominicana.

**Métodos.** En este estudio cualitativo, se organizaron 10 grupos de debate, con un total de 40 trabajadores clínicos (24 médicos, 16 enfermeras), en dos instituciones de nivel terciario de la República Dominicana en el 2016. El análisis para ampliar las recomendaciones de los trabajadores de salud a fin de estimular a los trabajadores clínicos a adherirse a las prácticas de control de la infección por *M. tuberculosis* se basó en teoría fundamentada. Para garantizar la fiabilidad y validez de los resultados, los autores analizaron los datos e incorporaron el asesoramiento sobre el diseño y el análisis del estudio a cargo de expertos cualitativos y la verificación de la información con los participantes sobre los temas finales.

**Resultados.** Se encontraron seis temas emergentes: 1) educación y capacitación; 2) política administrativa; 3) política de infraestructura; 4) asignaciones económicas; 5) investigación; y 6) política de salud pública.

**Conclusiones.** En iniciativas futuras para el control de la infección por *M. tuberculosis* en entornos de escasos recursos, se pueden combinar las recomendaciones de los trabajadores de salud con estrategias basadas en evidencia. De esta forma se podría allanar el camino para llevar a cabo intervenciones que ayuden a los trabajadores de salud a aplicar las medidas de control de la infección por *M. tuberculosis* en la práctica clínica.

#### Palabras clave

Grupos focales; teoría fundamentada; personal de salud; control de infecciones; transmisión de enfermedad infecciosa; *Mycobacterium tuberculosis*; exposición ocupacional; República Dominicana.



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**RESUMO**

**Recomendações dos profissionais da saúde para reforçar o controle de infecção pelo bacilo da tuberculose na República Dominicana**

**Objetivo.** Descrever as recomendações dos profissionais da saúde para reforçar a adesão às práticas de controle de infecção por *Mycobacterium tuberculosis* nas instituições de saúde e outros locais na República Dominicana.

**Métodos.** Estudo qualitativo realizado com 10 grupos de discussão, ao todo 40 profissionais da área clínica (24 médicos, 16 enfermeiros), em duas instituições de nível terciário na República Dominicana em 2016. A análise foi baseada em teoria fundamentada para expandir as recomendações dos profissionais da saúde a fim de habilitar o pessoal da área clínica a aderir às práticas de controle da infecção por *M. tuberculosis*. Para assegurar a confiabilidade e a validade dos dados, os autores analisaram as informações e incluíram um processo de revisão com especialistas em pesquisa qualitativa (peer debriefing) e observações ou validação dos participantes sobre os temas finais.

**Resultados.** Seis temas emergentes foram descritos: 1) educação e capacitação, 2) política administrativa, 3) política de infraestrutura, 4) alocações financeiras, 5) pesquisa e 6) política de saúde pública.

**Conclusões.** Iniciativas futuras podem combinar as recomendações dos profissionais da saúde com estratégias baseadas em evidências para o controle de infecção por *M. tuberculosis* em locais com poucos recursos. Isso poderia abrir o caminho para intervenções que habilitam os profissionais da saúde a empregar medidas de controle de infecção por *M. tuberculosis* na prática clínica.

**Palavras-chave**

Grupos focais; teoria fundamentada; pessoal de saúde; controle de infecções; transmissão de doença infecciosa; *Mycobacterium tuberculosis*; exposição ocupacional; República Dominicana.

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