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Health Care Worker Perspectives on Workplace Safety, Infection Control and Drug-Resistant Tuberculosis in a High Burden HIV setting

JR Zelnick¹, A Gibbs², M Loveday³, N Padayatchi⁴, and MR O'Donnell^{4,5}

¹Graduate School of Social Work, Touro College, NY, NY, USA

²Health Economics AIDS Research Division (HEARD), University of KwaZulu-Natal, Durban, South Africa

³Medical Research Council, Cape Town, South Africa

⁴Centre for AIDS Programme of Research in South Africa (CAPRISA), Durban, South Africa

⁵Department of Medicine and Department of Epidemiology and Population Health, Albert Einstein College of Medicine, Bronx, NY USA

Abstract

Drug-resistant tuberculosis (TB) is an occupational hazard for health care workers (HCWs) in South Africa. We undertook this qualitative study to contextualize epidemiological findings suggesting that HCWs elevated risk of drug-resistant TB is related to workplace exposure. 55 HCWs and 7 hospital managers participated in focus groups and interviews about infection control (IC). Participants discussed caring for patients with drug-resistant TB, IC measures, occupational health programs, and stigma and support in the workplace. Key themes included: 1) lack of resources that hinders IC, 2) distrust of IC efforts among HCWs, and 3) disproportionate focus on individual level personal protections, particularly N95 masks. IC programs should be evaluated, and the impact of new policies to rapidly diagnose drug-resistant TB and decentralize treatment should be assessed as part of the effort to control drug-resistant TB and create a safe workplace.

Keywords

multidrug-resistant (MDR-TB); extensively drug-resistant TB (XDR-TB); HIV; South Africa; occupational health

Health care workers (HCWs) in South Africa play a critical public health role, providing care for people living with HIV/AIDS in settings with high HIV prevalence, low staffing ratios, and challenging working conditions.¹ Endemic HIV contributes to the spread of drug-resistant tuberculosis (TB) in South Africa.² Currently, South Africa is the epicenter of an epidemic of drug-resistant TB and HIV,³ which in some cases originated and continues to spread in health care facilities.⁴ Nosocomial transmission of drug-resistant TB presents a serious occupational hazard for South African HCWs.⁵ Since HIV infection increases susceptibility to TB infection and disease, the high reported prevalence of HIV infection among South African HCWs (13–20%) further predisposes them to occupationally acquired TB.^{6–8}

In the early 1990s HCWs in the United States and Europe, some HIV-infected, acquired MDR-TB during outbreaks among HIV-infected patients in hospitals and other settings serving poor and marginalized people.⁹ In response to MDR-TB outbreaks, the US Centers for Disease Control issued new infection control (IC) guidelines that led to critical changes in TB management and administrative planning to reduce nosocomial disease transmission,^{10,11} and MDR-TB outbreaks in industrialized countries subsided.¹²

Nosocomial transmission of drug-resistant TB and the risk to HCWs has re-emerged in HIV endemic and resource limited settings in Eastern European countries,¹³ the former Soviet Union,¹⁴ and South Africa.¹⁵ Molecular epidemiology studies suggest that a high proportion of drug-resistant TB strains are primarily acquired through nosocomial transmission rather than secondary acquisition (i.e. treatment failure).¹⁵ The identification of specific strains of drug-resistant TB in South Africa suggests a strong role for nosocomial transmission.^{15, 16}

IC measures and workplace occupational health programs aim to reduce workplace exposure to drug-resistant TB. IC programs include administrative guidelines for treating TB patients, environmental controls that reduce the concentration of infectious respiratory aerosols in the air, and personal protective equipment to reduce individual exposure.¹⁷ A central tenet of IC planning is a “hierarchy of controls” that prioritizes administrative and environmental measures and relies on personal protections as a safeguard (not primary) method for reducing hazard exposure.^{18,19} Recently, the World Health Organization (WHO) introduced IC guidelines for resource constrained settings in HIV endemic regions that prioritize low-cost interventions including improved administrative planning and patient triage, natural ventilation, and treatment for HIV/AIDS.¹⁹

KwaZulu-Natal (KZN) province, the epicenter of the South African HIV/AIDS epidemic, has high rates of multidrug-resistant (MDR-TB) and extensively drug-resistant TB (XDR-TB).² MDR-TB is resistant to the two most effective first-line TB drugs and XDR-TB is additionally resistant to 2 of the 3 most effective second-line drugs.²⁰ In a widely reported 2006 outbreak in rural (KZN), 52 of 53 patients with XDR-TB/HIV co-infection died, 2 of them HCWs.⁴ In the setting of HIV co-infection, MDRTB cure rates are low,²¹ and XDR-TB cure rates are dismal.²² In 2010, we conducted a retrospective review of patients admitted to the provincial TB referral hospital in KZN 2003–2008, and found that HCWs were five times more likely to have MDR-TB, and nearly seven times more likely to have XDR-TB compared to the general population.²³ Although we lack data to link increased rates with occupational exposure, they were not explained by HIV or other TB risk factors in HCWs.

We undertook a qualitative study of public hospital HCWs in KZN, South Africa to contextualize our previous findings of increased rates of drug-resistant TB in HCWs. We sought to use frontline perspectives to identify challenges that HCWs face implementing measures to reduce TB risk, and to expand our understanding of how to improve workplace safety.

METHODS

We purposely selected hospitals in KZN, South Africa to represent TB specialist and non-TB specialist facilities; rural and urban catchments; and district hospitals. With input from key informants, we developed a focus group script to prompt discussion among HCWs about their knowledge, attitudes, and beliefs concerning IC policies and practices in their workplaces. We constructed survey questionnaires to elicit information from hospital managers and IC personnel on the same topics (Box 1)

Box 1

Topic Guide for Focus Group Discussions among Health Care Workers: Occupational Exposure to Drug Resistant TB

XDR-TB Awareness

“Have you ever been concerned for your own safety caring for TB patients?”

“Have you heard about XDR-TB and MDR-TB?” “Could XDR-TB or MDR-TB be a problem at your work place?”

TB exposure in the workplace

“How might HCWs be exposed to TB at work?” “What activities in particular might lead to TB exposure?” “How do these hazardous situations typically occur?”

Protecting staff from TB exposure

“How do you and your co-workers protect yourselves from exposure to TB at work?” “How well do preventive measures work?” “What else could the hospital do to protect the HCWs from TB?”

HIV/AIDS and TB

“Do HIV tested HCW seek redeployment to avoid TB exposure?” “How have the increases in patients with HIV and TB impacted the jobs of HCW?”

Topic Guide for Semi Structured Interviews with Hospital Managers

Infection control and occupational health and safety in the hospital setting

“What policies and procedures comprise the infection control plan at your hospital?” “What are the strengths and weaknesses of the program?” “Do HCW utilize protections offered by the hospital?” “How often are HCW regularly screened for TB?”

Organization of service delivery for TB patients

“Are TB and HIV services integrated or separated in your institution?” “Are MDR or XDR-TB patients in separate areas from drug-susceptible TB patients? from known HIV+ patients?”

Policies for protecting health care workers caring for TB patients

“What policies protect nurses and other personnel from exposure to TB at work?” “What factors hinder the ideal implementation of such policies?” “How are staff made aware of occupational health policies and procedures?”

“HIV infection among HCWs and ancillary staff puts them at increased risk for occupationally acquired TB. How do your human resource policies mitigate this risk?”

Occupational exposure to HIV/AIDS among HCWs

“How frequently do HCWs fail to report needlesticks and sharps injuries that may result in exposure to HIV in the workplace? Why do HCWs fail to report?”

“Do HCWs confide their HIV status so that they can be redeployed if necessary?”

Eligible focus group participants were hospital staff who worked on adult medical floors and TB wards. Using these guidelines, hospital contacts recruited HCWs during regularly scheduled in-service training times. Hospital and nurse managers, and IC and occupational health personnel were eligible to participate in interviews, and were recruited directly by researchers.

We conducted focus group discussions among HCWs and structured interviews with managerial personnel at each facility over a six month period in 2010. To yield a range of attitudes and perspectives, we employed multiple focus groups and interviews on the same topics.²⁴

Interviews of hospital managers and IC personnel took place in person on-site in English. An isiZulu-speaking research assistant co-facilitated all discussions enabling participants to speak isiZulu if desired. All participants provided individual written informed consent and group consent to maintain the confidentiality of the focus group discussion. The facilitators used an interview guide including open-ended questions phrased to encourage expansive responses. The focus groups were audiotape recorded and transcribed.

Transcripts were coded using the constant comparative method elucidated by Glaser & Strauss.²⁵ Comments and discussions were categorized by topic, and analyzed deductively using a framework analysis.²⁶

This project received ethical approval from UKZN Biomedical Research Ethics Committee (BREC), KZN Department of Health Research Committee and the Salem State University Institutional Review Board.

RESULTS

Focus group discussions (FGDs), interviews, and surveys took place at 5 provincial hospitals in KwaZulu-Natal. We carried out ten FGDs involving 55 hospital staff at 4 hospitals, seven surveys/interviews with hospital managers and IC personnel at 5 hospitals (Table 1).

FGDs among HCWs centered on 4 topic areas: protocols for caring for patients with drug-resistant TB, evaluation of IC measures, hospital occupational health programs, and stigma and support in the workplace (Box 2). We interviewed hospital managers about the same topics (Box 3).

Box 2

HCW perspectives on infection control policies, implementation, and related topics

N95 masks

Not consistently available in non-TB specialist hospital settings.

Perceived lack of knowledge about effectiveness, proper use.

Comfort complaints: “suffocating”, “hard to communicate”

No fit testing.

HCW aware that use is mandated.

Contradiction between requirements and expense.

Open Windows

Aware that windows should remain open.

Not observed consistently in cold weather.

Rooms lack windows/air flow.

Extractor Fans

Not in use in many settings.

Often broken.

Diagnosing drug-resistant TB

Lag time before diagnosis.

Waiting time for transfer to TB specialist hospital due to bed shortage/patient acuity.

Isolation

Space constraints.

Patients mix at mealtimes or during recreation, even when isolated on wards.

Patient behavior

◆ Failure to wear surgical masks, keep windows closed, remain separated, follow cough protocols.

HCW screening

Yearly in TB specialist settings.

Upon hire in other settings.

Sometimes avoided by HCWs.

Redeployment of HIV-positive HCWs

If HCW are unwilling to disclose status, they won't be redeployed.

Many avoid VCT.

Perception that there is no "safer" work assignment in TB specialist hospitals.

Training and Education

- ◆ Desire clear answers to specific questions about the effectiveness of IC measures and exposure to drug-resistant TB in South African settings.

Danger Pay

HCWs compare themselves to others who receive "danger pay" for dangerous jobs, and feel they too deserve it. Since "TB is everywhere", nurses won't be able to get pay related to workplace risk of TB.

Stigma

Nurses in TB specialist hospitals are stigmatized.

Stigma around HIV and TB is part of the job.

Box 3

Summary of Management Perspectives on Infection Control Issues

N95 Masks

- Mask shortages in district hospitals due to problems with procurement, gaps in the supply chain, cash flow at provincial level.
- Failure to reorder, "no one noticed they were running low".
- Staff do not always wear them (TB and Non-TB hospitals)
- Some note improvement in staff compliance.

Ventilation

- Physical infrastructure does not support fans or ventilation.

Screening

- No regular screening in district hospitals
- Every 6 months in TB hospitals

VCT, HIV and Redeployment

- Nurses fear testing and post-exposure prophylaxis treatment so often fail to report needle stick injuries
- Nurses do not disclose HIV status until they are sick

- Nurses do not disclose HIV status as they fear stigma
- Redeployment is hindered by these factors
- In TB hospital, there is no safe place to redeploy to.

Isolation and diagnosis:

- When patients are sick, they cannot be transported to the TB hospital but cannot start treatment at the district hospital.
- No space for isolation

What hinders effective IC policy implementation?

- HCW resistance, but this is getting less
- Hospital doesn't have authority to spend money to implement policy
- Shortage of money in province
- Health care worker shortage

What would you like to have to improve IC?

- Need extractor fans and UV lights
- Need better training for nurses and health education for patients
- Physical infrastructure
- Physical infrastructure
- Checking on compliance with mask use
- Regular screening of HCWs
- Expert advice on how to modify space to deal with IC and climate control and other issues

Caring for patients with drug-resistant TB

“Patients are not diagnosed when they come in, so we are exposed.”- Nurse

Delayed diagnosis of TB, confirmation of MDR/XDR-TB, and start of appropriate treatment contribute to the likelihood of nosocomial drug-resistant TB infections.²⁷ HCWs in TB and District Hospitals expressed concerns about the lag time between patient admission and diagnosis of drug-resistant TB. Hospital managers reported problems stemming from delayed diagnosis of MDR or XDR-TB; in the district hospitals, one hospital manager explained that patients with an initial diagnosis of a non-TB illness such as pneumonia might be sent to the regular medical ward, in TB-specialist settings delayed diagnosis led to mixing of drug-resistant and drug-susceptible TB patients.

Managers in district hospitals noted that although the Department of Health (DoH) policy is to transfer MDR and XDR-TB patients to a central TB specialist facility once diagnosed,

this was not always possible because patients were too sick to travel, or beds were unavailable.

Participants explained that although DoH policy is to separate MDR and XDR-TB patients, lack of space constrained their ability to follow protocols. HCWs reported that hospitals did not have space to separate MDR and XDR-TB patients, or for isolation. A nurse from a TB specialist hospital notes, “It’s not separation, because we use the end of the MDR ward for XDR.” Hospitals managers in TB specialist settings were frustrated because they lacked facilities to separate or isolate patients and could not comply with DoH policy.

Infection control policies and practices

“We have all the policies but the implementation of them is a joke!”- Hospital manager

N95 respirator masks provide a high filtration barrier to protect HCWs from inhaling *M. tuberculosis* bacilli. The South African DOH has adopted the WHO recommendation that N95 masks should be worn “when providing care to infectious MDR-TB and XDR-TB patients or people suspected of having infectious MDR-TB and XDR-TB”.¹⁹ HCWs reported that they did not always use N95 masks as recommended due to inconsistent supplies, discomfort, and differing interpretations of policy.

While HCWs in TB specialist hospitals reported that N95 masks were always available, HCWs in other hospitals reported inconsistent supplies. HCWs complained that N95 masks were “suffocating”, made it “hard to communicate”, and posed problems for those with a cough or asthma. Although fit-testing is required to ensure N95 mask effectiveness, no HCW reported being fit-tested.

Though HCWs were aware hospital policy required N95 masks when caring for contagious TB patients, interpretations of this guideline varied. Nurses in several FGDs expressed the opinion that TB was concentrated in the morning air, but dissipated later in the day as patients moved in and out of the room, and therefore N95 masks should be worn in the morning, but not necessarily at other times.

HCWs also reported confusion over length of use recommendations for each mask; they suspected that guidelines were influenced by economic concerns. As one nurse describes, “They state that the N95 are expensive, so you must wear it today, tomorrow and keep it. So, how safe it is exactly? How long do we need to use it?” A hospital manager at a district facility expressed concern that “costly” N95 masks were “abused” by HCWs not trained to use them properly.

HCWs were aware that according to DoH policy windows should be kept open to increase air flow and cross ventilation, but both HCWs and managers saw this as unrealistic in cold weather. A district hospital nurse explained, “You don’t have to close the window. You leave a small space so that the air must come in.”

Hospital managers in the district setting described procurement problems that sometimes led to N95 shortages. IC personnel explained that reordering masks lapsed when “no one

noticed we were running low”. Managers and IC personnel expressed varying attitudes towards HCW compliance with N95 mask policy, but all agreed that staff in TB and non-TB hospitals sometimes did not wear them. Some IC personnel reported improving staff compliance; others were less optimistic: “Nurses do not wear N95 masks because they say they are uncomfortable. So what is a hospital manager supposed to do?”

Hospital managers described inadequate physical infrastructure for ventilation, or extractor fans, and expressed frustration that broken fans and air-conditioning ducts were not fixed. A district manager noted that in her TB clinic cross ventilation was impossible because there was only one window.

Occupational Health

“I don’t think nurses will ask to be redeployed; people generally don’t disclose their HIV status because of the stigma.” –Nurse

Screening staff for TB infection, safer assignments for HIV-infected HCWs (redeployment), protocols around workplace HIV exposure, and promoting voluntary counseling and testing (VCT) for HIV among HCWs are functions of occupational health programs related to IC for drug-resistant TB.

Nurses in the TB specialist hospital described being screened for TB every 6 months. In non-TB specialist hospitals, nurses noted that they were screened upon hiring, but that it was possible to avoid subsequent screening, which some did.

While HCWs were aware that HIV-infected staff were at increased risk if exposed to drug-resistant TB, and could ask for safer work assignments, they didn’t believe that redeployment policy could be effectively implemented. In the TB specialist hospital nurses said that redeployment was not feasible since all tasks involved interaction with TB patients.

Managers reported that HIV-infected HCWs rarely disclosed their status, and thus could not be redeployed. Several reported increases in HCWs accessing VCT and taking antiretroviral treatment (ARVs), but said many HIV-infected HCWs only disclosed their status if they became sick.

HCWs said nurses sometimes failed to report needlestick injuries because they did not want to be tested for HIV, and did not want to take ARVs as post-exposure prophylaxis against HIV. HCWs added that some avoided VCT, and would not disclose their status in the workplace due to HIV/AIDS stigma.

Stigma and Support in the Workplace

“TB is all over, so we can’t get a risk allowance... the only compensation we can get is being treated free when you are diagnosed with TB.” (Nurse)

“Danger-pay” is available to some public sector employees in South Africa (e.g. in psychiatric facilities).²⁸ HCWs and managers discussed extending this to HCWs who encounter drug-resistant TB, but HCWs doubted it would be made available. Nurses reported that although occupationally acquired TB is compensable, compensation was nearly

impossible to get since exposure risks were common in the community and could not be isolated to the workplace.

Despite expressing frustration with their staff, hospital managers felt more should be done to protect and reward those who worked with drug-resistant TB patients. They echoed nurses' statements that HIV/AIDS stigma continued to inhibit implementing occupational health and IC programs. They described frustration about inadequate resources to make the workplace safer for their staff.

DISCUSSION

Hospital managers and HCWs in our study provided insights about the challenges facing IC programs at TB specialist and non- TB specialist hospitals in KZN, South Africa that can be categorized into 3 thematic areas: 1) IC hindered by lack of resources, 2) distrust of IC efforts among HCWs, and 3) disproportionate focus on individual level personal protections, particularly N95 masks. Together these themes portray a system in which the managers of health care facilities struggle to comply with policies they lack resources to implement, in circumstances where the burden of workplace safety is placed on inadequately trained and supported HCWs. Our study results are limited by our study design and need further corroboration, but they point to topics that should be considered.

IC policy guidelines adopted by the South African National Department of Health (DoH) reflect best practices described by the WHO and CDC (Box 4).^{19, 27, 28} However, hospital managers and HCWs described gaps in resources and infrastructure that made implementing DoH IC policies unrealistic. Delay in diagnosis, lack of space, and shortage of beds in referral hospitals hindered separation of drug-resistant TB patients and suspects; physical infrastructure design, poorly maintained equipment, and cold rooms hindered ventilation; and problems with the procurement system meant insufficient supplies of N95 masks.

Box 4

Infection Control Measures and Related Policies from the National Department of Health (South Africa)

Health System Level Controls^{27,31}

- New molecular diagnostics (e.g. GeneXpert MTB/RIF)
- Referral to DR-TB treatment facilities/programs
- Decentralization of DR-TB treatment

Administrative Controls²⁸

- Developing/implementing an effective infection control plan
- Rapid identification of DR-TB suspects
- Isolation of DR-TB suspects/cases
- Rapid treatment of DR-TB suspects and patients;

- Implementing effective work practices;
- Educating, training and counseling HCWs about TB;
- Screening HCWs for TB disease and infection.
- Redeployment of HIV infected HCW
- Disability compensation for HCW with occupational TB

Environmental Controls²⁸

- Adequate ventilation
- Sterilization of ambient particles (i.e. UV light)

Personal Protection²⁸

- N95 Masks for HCWs
- Surgical Masks for patients/suspects
- Annual health screening for HCWs for TB and HIV

Despite comprehensive IC policies adopted by the DoH, relatively few are well implemented.⁵ This is important because IC relies on a hierarchy of measures that together reduce risk of the spread of drug-resistant TB in an environment where presence of the hazard is likely. Gaps in the program undermine effectiveness. Failed administrative and environmental controls mean that personal protective measures (e.g. N95 masks) become the primary means of protection, leaving the burden of managing IC on individual HCWs.

HCWs expressed confusion over inconsistencies between policies and their implementation: Always wear the N95 mask, or conserve them due to expense? Separate XDR and MDR TB patients, or allow them to mix at times? Contradictions between policy and practice lead to seeming distrust of policies among HCWs.

HCWs in our study described using their own discretion in deciding when to wear N95 masks and open windows. HCWs in other studies have described assessing the quality of a needlestick injury and/or the HIV status of a patient when HIV exposure is a potential workplace hazard;²⁹ and stigma associated with HIV and fear of job loss has discouraged reporting needle stick injuries and other health protective actions.^{29, 30} Protections that rest on individual discretion and behavior seem unlikely to be effective when disease carries stigma and unemployment is high. HIV-infected HCWs appear to have many reasons to decide to remain in their jobs despite risk, keep quiet, and hope for the best.

Since our data were collected, the DoH has taken steps to improve support for hospital IC programs. In 2011, the TB control and management directorate in South Africa released a policy framework for decentralizing management of MDR-TB (though not of XDR-TB) that explicitly aims to reduce nosocomial transmission during inpatient treatment.³¹ Decentralization of MDR-TB treatment has been shown to decrease time from diagnosis to initiation of treatment compared to a centralized approach,³² and should relieve a chronic bed shortage. Introduction of a rapid TB diagnostic tool, GeneXpert, is expected to speed up

MDR-TB diagnosis,³³ and faster initiation of treatment may reduce infectivity and TB exposures.²⁷ Future research should examine how these efforts at the systems level change attitudes and practice among hospital managers and HCWs.

The public health response to epidemics shapes working conditions, and a safe work environment is a critically important aspect of the health care system. History shows that heightened risk of drug-resistant TB spread in the workplace can provoke healthcare system leaders to improve IC and patient management to protect patients and staff; this lesson is crucial for South Africa and other countries experiencing outbreaks of drug-resistant TB amidst endemic HIV.

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Table 1

Study Participants and Hospital Type

Hospital type	Focus Group Participants	Management Survey Participants
TB Referral Hospital (3 focus groups)	14 nurses 1 nursing assistant 1 operations manager 1 cleaner	2 (nurse managers)
Regional TB Hospital (2 focus groups)	6 nurses 1 nursing assistant	1 (hospital manager)
Regional TB Hospital		2 (infection control nurses) 1 (Physician)
District Hospital A (2 focus groups)	6 nurses	1 (hospital manager)
District Hospital B		1 (hospital manager)