

## Analysis of Instrument Development to Evaluate Employee Protection from Tuberculosis in Hospitals

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### ABSTRACT

**Introduction:** Tuberculosis (TB) continues to be a major global public health threat, affecting millions of people annually. Despite efforts to control TB, the number of cases remains high. The situation is exacerbated by the COVID-19 pandemic, which has strained healthcare systems. The increased workload of hospital employees also raises the risk of TB transmission. This study aims to develop an instrument to evaluate employee protection from TB in hospitals. **Methods:** This study used a qualitative design with an exploratory approach. Data were collected from existing policies and through in-depth interviews with stakeholders, including academics, practitioners, regulators, infection control officers, occupational health and safety officers, and non-government organization representatives for TB. **Results:** The instrument developed comprised seven components, namely management commitment; program planning; coordination, communication, and education; implementation of TB and other disease management programs in the workplace; handling TB cases in the workforce; training and competence; and monitoring and evaluation. **Conclusion:** Instrument development is crucial for capturing the current state of TB problems and managing prevention and control programs in hospitals. The terms of reference serve as an effort to protect hospital employees.

**Keywords:** employee protection, occupational health and safety, tuberculosis

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### INTRODUCTION

According to the 2022 WHO Global Tuberculosis (TB) Report, Indonesia is the country with the second highest burden of (TB) in the world after India. Most of the cases occur in the productive age group, which is also the age group of the workforce. The estimated number of people with TB in Indonesia is approximately 845 thousand people, but only approximately 540 thousand people have been identified by the Indonesian Ministry of Health. Determining the exact proportion of the workforce infected with TB has been challenging due to the large number of workers and inadequate

data collection and outreach capacity (WHO, 2022).

The hospital workforce is one of the backbones of health services. They work in environments with high potential occupational health and safety (OHS) risks. Due to the labor-intensive and technology-intensive nature of hospitals, there is a high level of human contact on a daily basis, which increases the potential for biological hazards, such as TB bacteria. Therefore, hospital workers are at a high risk of developing occupational diseases such as TB and other infectious diseases. It is crucial for hospitals must provide protective measures (Macdonald and Harper, 2019).

Research showed that 70% of health workers who had contact with patients tested positive for interferon gamma antibodies. (Noviana *et al.*, 2022). The high number of TB cases in Indonesia can

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be attributed to several factors, including patient noncompliance with medication, increased cases of immunodeficiency diseases, malnutrition, multidrug-resistant TB (MDR-TB), and the presence of latent TB infection (LTBI) (Pulungan and Permatasari, 2021).

The burden of TB infection in the community and healthcare facilities is significant due to the high number of TB seeking treatment in hospitals. Therefore, it is crucial to implement infection prevention and control programs in all healthcare facilities in Indonesia (Yunita, 2021). The purpose of establishing infection prevention and control programs is to identify and mitigate the risk of infections being acquired and transmitted among patients, staff, health professionals, contract workers, volunteers, students, and visitors (Kaslam *et al.*, 2021).

Efforts to protect hospital employees from TB are in line with the national TB control program, which uses the directly observed treatment short-course (DOTS) approach. DOTS includes service aspects such as management, diagnosis, treatment, monitoring, and evaluation, as well as stakeholder aspects related to political commitment (Tendolkar, Tyagi and Handa, 2021).

Indonesia does not provide specific reports on the number of TB cases among health workers. The reports on TB in Indonesia does not differentiate between health workers who are exposed to TB and those who are not, and so does the TB Information System Software (SITB). Therefore, it is difficult to assess the effectiveness of hospital worker protection measures.

Hospital employees are the backbone of health services, but they face potential safety and health hazards, one of which is exposure to TB bacteria. Unfortunately, Indonesia currently lacks a comprehensive framework to assess the efforts of hospitals to protect their employees from TB transmission. It was found that a TB control strategy that relies solely on a health sector approach is not sufficient. It is necessary to involve hospital management in various risk factor control interventions to improve individual health status and control TB infection in the workplace. Therefore, it is important to conduct research on the development of instruments for protecting hospital workers from TB transmission to ensure their safety.

## METHODS

This study used a qualitative method with in-depth interviews and was conducted from March to August 2023. Data analysis techniques involved systematically compiling and searching for data obtained from field notes, interviews, and documents. In addition, data were grouped into several categories, synthesized and arranged into patterns, and selected based on importance, and conclusions that are easily understood were drawn (Sugiyono, 2017).

The informants in this study were involved in the implementation of the worker protection program against TB infection. The informants were selected based on two principles, namely appropriateness on the basis of the research objectives and adequacy on the basis of categories of data obtained from the informants (Martha and Kresno, 2016).

The criteria for informants were based on their expertise on TB in the academic, practitioner, and regulatory sectors in Indonesia. A total of 12 informants were included, namely academics (informants 1 and 2), hospital practitioners (informants 3 and 4), regulators (informants 5 and 6), an infection and control program officer (informant 7), OHS officers (informants 8 and 9), occupational health doctors (informants 10 and 11), and a non-government organization representative (informant 12).

The questions for in-depth interviews were formulated by reviewing the Indonesian Law as well as relevant documents on hospital infection prevention programs and accreditation standards. The questions consisted of variables, such as hospital human resources, budget for program implementation, risk management, infrastructure, and policies related to efforts to protect hospital workers from TB transmission in hospitals. The results of the in-depth interviews were transcribed verbatim and organized in a matrix table.

This study received approval from the Research and Community Engagement Ethics Committee, Faculty of Public Health, Universitas Indonesia with a certificate number Ket- 102/UN2.F10.D11/PPM.00.02/2023

## RESULTS

According to the Indonesian Law Number 1 of 1970 concerning Occupational Safety, Government

Regulation Number 17 of 2023 concerning Health, and Government Regulation Number 88 of 2019 concerning Occupational Health, hospitals are required to take all necessary health efforts to prevent, improve, treat, and rehabilitate their workers. However, there is currently no specific standardization to measure TB protection for hospital workers.

Based on the aforementioned regulations, five interview questions regarding the infection protection program were formulated. The questions covered the following topics: human resources to be protected from TB, budget allocated to protect employees from TB, TB risk management in hospitals, hospital facilities designed to protect workers from TB, and policies or regulations regarding TB protection for workers.

The first question concerns human resources. It is necessary to protect all employees, including not only doctors and nurses, but also other health workers and non-health workers who work in hospitals. To effectively manage infectious diseases in hospitals, it is necessary to provide repeated TB DOTS training and dissemination and to regularly promote clean and healthy living habits. This training and competence program serves as a health surveillance initiative for workers.

*"All employees need to be protected, not just doctors, nurse, but all." (Informants 1, 2, 3, 4, 7, and 8)*

*"Healthcare workers should be prioritized because they have contact with patients." (Informants 5, 6, 9, 10, 12)*

*"It's important to protect the families of employees by screening the employees and their families too" (Informants 1, 5, 8, 11)*

*"Education really matters. Communicate with all employees about the danger if we are not being protected." (Informants 3, 7, 10, 12)*

The second question concerns the budget allocated to the implementation of worker protection program from TB. It is recommended that hospitals allocate costs for employee health checks (pre-work, periodic and special), provision of personal protective equipment (PPE), and implementation of other supporting programs related to protecting workers from TB.

*"Hospital management has to conduct MCU for all employees." (Informants 3, 5, 6, 7, 9, 11, 12)*

*"Make sure that before the employees work, they have submitted the pre-MCU to see if they*

*have TB and other occupational diseases or not." (Informants 2, 3, 4, 7, 8, 10, 12)*

*"Budgeting for screening might not be easy for hospitals, but it's important especially for the healthcare workers in the front line." (Informants 1, 4, 6, 8, 11)*

The third question concerns TB risk management. Effective risk management is important because it enables hospitals to prioritize risks and implement measures to reduce and control the impact of TB transmission in hospitals.

*"The management must be committed to assess the risk around hospital areas, from planning to identify the risk of TB to monitoring and evaluating the program to make sure the achievement of every program." Informants 1, 4, 5, 7, 9, 10, 11, 12)*

*"Risk management can be a guideline for every area with different measurement depending on the risk to be infected with TB." Informants (3, 6, 8, 12)*

The fourth concerns hospital facilities designed to protect employees from TB. The results suggest that hospitals must provide PPE and other supporting infrastructure to protect workers from TB infection. This should be done in accordance with the results of risk mapping that has been carried out by the hospital.

*"Especially in airborne disease care unit, hospitals need to make sure that the employees use standard mask, gown, hair caps, and medical gloves." (Informants 2, 4, 5, 7, 10, 12)*

*"Hospitals should provide special facilities for outpatients and inpatients with TB. This clear flow will protect all people around the hospital." (Informants 1, 3, 6, 8, 11, 12)*

The last question concerns policies and regulations regarding TB protection. The results suggest that hospitals are required to have policies in place to protect their employees from TB transmission. This aligns with the government's vision for TB elimination by 2050.

*"All regulations from the government about airborne disease, we have policies about occupational TB, but the policies do not really concern hospital worker protection." (Informants 1, 2, 6, 9, 11, 12)*

*"We are trying to reduce and eliminate TB cases by 2050. If the hospital doesn't have standards to protect their employees, we will not achieve it." (Informants 3, 7, 10)*

Based on the results of policy reviews and in-depth interviews, an instrument consisting of seven components was developed to assess worker protection from TB in hospitals. Component 1 is management commitment, component 2 is program planning, component 3 is coordination, communication, and education, component 4 is implementation of TB and other diseases control in the workplace, component 5 is TB control among workers, component 6 is training and competence, and component 7 is monitoring and evaluation.

Hospitals should keep records of the number of infected workers, broken down by health and non-health workers, the number of hospital departments and special healthcare facilities available to workers, and the history of TB and other illnesses of workers.

TB education should be coordinated through an internal network, paying attention to risk communication and TB education. This will ensure clear communication among hospital workers. It is also important to establish internal networking

**Table 1.** Instrument Development of Employee Protection from TB in Hospitals

Component	Evaluated Aspects	Evaluation Evidence
Management commitment	Policies related to TB	Documents (policy decrees, posters, occupational health and safety programs, and notes)
	Commitment maintenance	Team Decree
	Identification of the dangers and risks associated with TB in the workplace	Work procedures, technical guidelines, documents (risk identification results and reports)
Program planning	The hospital has planned and monitored the evaluation of the TB control program	Work program documents
	The hospital has made a DOTS training plan for health workers at the hospital	Training planning document
	The hospital has allocated budget for procuring PPE for the workforce	Budget plan
	Hospitals have guidelines or workflow	Posters, photos, flyers, and technical guidelines
Coordination, communication, and education	Internal network between outpatient and inpatient wards	Internal reporting workflow upon identification of workers with TB cases and training reports
	External networking	Workflow of TB case reports to external sources, list of contact persons, invitation materials, attendance of participants, notes, and photos of activities
	Internal communication and education	Seminars, media flyers, leaflets, audio, banners, forms for reporting TB cases among workers, hospital management information systems, contact advice, and decrees for managing hospital health information websites
Implementation of TB management programs	Management of workers and their families	Pre-employment MCU data, periodic MCU data, TB exposure monitoring data in workers exposed to TB, policies, and technical guidelines
	Work area management	Photos, temperature and humidity tables, measurement data, and periodic decontamination data
	Logistics management	Data on personal protective equipment, data on the availability of anti-tuberculosis drugs, and reporting data
Training and competence	Handling TB cases in workers	Reporting workflow, policies, and technical guidelines
	Indonesian Minister of Health Regulation No. 27 of 2017 regarding infection prevention and control	Documentation and reports
Monitoring and evaluation	Workers diagnosed with TB and monitoring drug consumption	Documentation and reports
	Recommendations and follow-up plans	Documentation and reports

between healthcare providers within hospitals, as well as external networking among hospital human resources. Efforts to control infectious diseases in hospitals require regular training and dissemination of TB DOTS as well as mandatory adherence to clean and healthy living behaviors.

## DISCUSSION

Hospital employees who work on the front line are at a higher risk of infection than those in the management positions. Hospital organizations need to control infection and transmission in the hospital environment. Management commitment to safety and accessibility is paramount, and advanced strategies for preventing TB infection should be employed (Sharma *et al.*, 2018). Existing programs, infrastructure, staff, workload, and supplies are core components for infection prevention and control (Deryabina *et al.*, 2021). Management can adopt theoretical and policy approaches to TB that can be implemented within the organization. A commitment to eliminate TB from within the country can be demonstrated by having a TB control policy (Mandal, 2022).

Global policy guidelines based on latest research are being used by scientists, public health professionals, partners, communities, and countries to eradicate TB. The Indonesian Government has passed the Presidential Decree Number 67 of 2021 on TB Control. One hospital in Indonesia committed to supporting TB control efforts.

The World Health Organization (WHO) emphasizes that governments have a responsibility to ensure the health, safety, and well-being of hospital employees. Meanwhile, hospitals should provide education and training programs to improve the skills of health workers at various levels (WHO, 2020).

Program planning is the most crucial step in controlling TB among hospital employees. Administrative measures should be taken to ensure the rapid identification and separation of suspected cases, timely diagnostic tests, training, and screening programs for workers who may have been exposed to TB. Collaboration with regional health departments is also important (Swaminathan, Perloff and Zuckerman, 2021). These programs should follow a hierarchical approach to infection prevention and control measures and include contact tracing policies and procedures if a patient, resident,

client, or hospital worker is found to have the disease (Johnston *et al.*, 2022).

Effective coordination and communication among hospital units and employees are crucial for achieving TB infection prevention and control (Paleckyte *et al.*, 2021). However, communication has been identified as a barrier in hospital organizations when it comes to disseminating TB guidelines to employees (Cohen *et al.*, 2022). Management needs to consider the availability of time for learning given the different shift schedules, potential for self-paced study, and distance learning, while employing effective instructional methods for continuing TB education for employees (Cabral *et al.*, 2021).

Implementation of TB treatment programs needs to be strengthened to reduce transmission despite the good knowledge of employees. The gap in infection control in health services is caused by exposure and lack of control (Apriani *et al.*, 2022). Hospital employees are at high risk of contracting TB. Therefore, management needs to increase their knowledge and provide information about TB, including handling TB cases with treatment and infection control measures to protect employees (Manoharan *et al.*, 2023). Infection prevention and control management with adequate logistic resources to protect against TB exposure is recommended (Islam *et al.*, 2022).

The effectiveness of TB programs is widely recognized, and training plays a critical role in ensuring quality (Wang *et al.*, 2019). Information about TB continues to develop and training updates should be accessible to all hospital staff. In addition, training should focus on providing tailored TB services to employees with lower professional degrees to improve their skills (Vigenschow *et al.*, 2021).

Monitoring and evaluation of TB control in hospitals should adhere to the national TB control guidelines. It is important to provide documentary evidence of the implementation of monitoring and evaluation of the TB control system (Oktamianti *et al.*, 2021). Regular monitoring of TB cases is necessary not only among nurses, doctors and laboratory workers who work in TB wards and emergency units, but also among administrative officers. Real-time monitoring is a strategy to ensure TB treatment compliance among employees suffering from TB. This involves medication reminders, dose observation, and dose history

compilation (Ratchakit-Nedsuwan *et al.*, 2020). Evaluations should be conducted to protect and prevent employees from TB.

## CONCLUSION

Instrument development is a crucial first step in order to understand the current state of TB in hospitals. Preventing and controlling infection transmission among employees requires commitment from hospital management with good coordination and communication. Program planning for education, training, and handling TB cases in the workforce should adhere to the national TB guidelines. Monitoring and evaluation are necessary for hospitals when implementing programs to assess their effectiveness.

## Conflicts of Interest

The authors declare that there are no significant competing financial, professional, or personal interests that could have influenced the performance or presentation of this study.

## Availability of Data and Materials

The generated dataset can be made available by the corresponding author upon request.

## Authors' Contribution

FL conceptualized and designed the study, collected the data, performed the analysis, and interpreted the results of the analysis. RM provided guidance on the data analysis, reviewed the manuscript, and approved manuscripts. A assisted in the analysis of the qualitative results and drafted the manuscript.

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