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Received: 18/09/24
Accepted: 27/12/25
Online: 06/01/25

ORIGINAL ARTICLE

Analysis of the operational management of the tuberculosis infection control plan in Santiago de Cali

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Keywords:
Evaluation of health programs; infection control; tuberculosis; Colombia (Source: MeSH - NLM).

ABSTRACT

Objective: To analyze the operational management of the infection control plan (ICP) for tuberculosis in hospital care settings in a city with a high burden of the disease. **Methods.** An analysis of operational management was conducted in 37 institutions providing health services in the city of Cali, by applying a tool to collect information on the implementation of administrative, environmental and respiratory protection control measures. Additionally, the program design evaluation was conducted. **Results:** Administrative control measures were not implemented in 65% of the institutions, primarily due to the absence of written infection control plans and a lack of risk assessment. 70% of institutions failed to comply with environmental measures, especially in the verification of air flows, while respiratory control was well implemented in 78. However, the absence of fit testing for N95 respirators was identified. An ICP model is proposed for health care service settings. **Conclusion:** Health service providers should strengthen the implementation of ICP in TB, prioritizing administrative and environmental control measures. It is essential to guarantee sufficient financial resources and to have trained personnel to ensure their proper implementation. Furthermore, continuous monitoring is essential to reduce TB transmission in health care settings.

Análisis de la gestión operativa del plan control de infecciones en tuberculosis en Santiago de Cali

Palabras clave:
Evaluación de Programas y Proyectos de Salud; Control de Infecciones; Tuberculosis; atención hospitalaria (Fuente: DeCS - BIREME).

RESUMEN

Objetivo. Analizar la gestión operativa del plan de control de infecciones (PCI) para tuberculosis en entornos de atención hospitalaria en una ciudad con alta carga de la enfermedad. **Métodos.** Se realizó un análisis de la gestión operativa en 37 instituciones prestadoras de servicios de salud de la ciudad de Cali a través de la aplicación de una herramienta para recabar información sobre la implementación de medidas de control administrativo, ambiental y de protección respiratoria, junto a la evaluación de diseño del programa. **Resultados.** Las medidas de control administrativo no se implementaron en el 65 % de las instituciones, principalmente se evidenciaron falta de planes de control de infecciones por escrito y de evaluación del riesgo. Para las medidas ambientales en el 70 % de las instituciones no hubo cumplimiento, especialmente en la verificación de flujos de aire, mientras que el control respiratorio estuvo bien implementado en el 78 %, sin embargo, se identificó la ausencia de pruebas de ajuste para respiradores N95. Se hicieron recomendaciones para la implementación de PCI para entornos de prestación de servicios de salud. **Conclusión.** Las instituciones prestadoras de servicios de salud deben fortalecer la implementación del PCI en TB, priorizando las medidas de control administrativo y ambiental. Para ello, es fundamental garantizar recursos financieros suficientes y contar con personal capacitado que asegure su correcta aplicación. Además, el monitoreo continuo es esencial para reducir la transmisión de la TB en los entornos de atención en salud.

Cite as: Serna-Trejos JS, Castro Osorio CM, Espinosa Arana M, Luna-Miranda L, Pacheco López R, Rojas Zúñiga C, Puerto Castro GM. Analysis of the operational management of the tuberculosis infection control plan in Santiago de Cali. Rev Peru Cienc Salud. 2025; 7(1):7-17. doi: https://doi.org/10.37711/rpcs.2024.7.1.555

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INTRODUCTION

Tuberculosis (TB) is a disease transmitted by aerosols and is considered a global public health problem. Healthcare workers are at a threefold higher risk of contracting TB compared to the general population [1], a risk that increases in low- and middle-income countries where the burden of disease is high and infection control measures are limited [2].

In Colombia, there were 14,060 new TB cases reported in 2021, resulting in an incidence rate of 25.9 cases per 100,000 inhabitants. Among these, 233 cases were identified in healthcare personnel, despite the implementation of respiratory protection measures in healthcare institutions aimed at reducing the risk of COVID-19 transmission [3]. Notably, Cali ranked as the second city in the country with the highest TB burden in 2021, reporting an incidence rate of 45.1 cases per 100,000 inhabitants, with 3% of these cases occurring among healthcare workers [4].

Between 2005 and 2016, TB was the third leading cause of death from communicable diseases in Cali, with a growing number of TB cases in healthcare personnel. In response to the increase in TB cases in healthcare workers, the Cali Public Health Secretariat (SSP, by its Spanish acronym) built the intervention plan for infection control in airborne diseases with emphasis on TB (ICP), based on the guidelines proposed by the Pan American Health Organization (PAHO), since at the time there were no national guidelines [5]. These guidelines were implemented since 2016 in Health Service Providers (IPS, by its Spanish acronym) located in jurisdictions with a high incidence rate of TB [6].

ICP is essential in IPS as it reduces the risk of exposure and prevents the transmission of infections [7]. This is part of the global strategy to end tuberculosis and is one of the pillars that allows the control of the transmission chains for any type of pathogen that is transmitted by air [8].

Evaluating the program enables a review of the public policies in place, allowing for adjustments based on results to better achieve objectives and goals [9-11]. Assessing health plans facilitates informed judgments based on data and operational performance [12].

The objective of this study was to analyze the operational management of CP for TB in the hospital care setting of the city of Cali, Colombia.

METHODS

Type and area of study

This is a quantitative, descriptive, cross-sectional study. Evaluative process research was conducted to determine the implementation of the ICP comprising two stages. In the first stage, the design evaluation of the ICP was conducted based on the methodology proposed by CONEVAL which includes the identification, review and analysis of the documentation to identify the objectives of the program and the problem that was addressed in the construction. The review also covered technical, regulatory and contextual aspects (social, economic and cultural) in the formulation of the ICP [11]. The logical framework methodology was used to determine consistency in the causal chain and the alignment of objectives, activities, indicators and assumptions [10].

In the second stage, a methodology with a quantitative approach was developed, the operational management of the plan was explored by applying a survey that made it possible to assess the administrative-managerial, environmental and respiratory prevention control processes implemented in the participating IPS. The study was conducted in Cali, Colombia between July 2020 and August 2022.

Population and sample

The study population consisted of all 55 IPS in Cali that provided diagnosis, treatment, and follow-up services for TB patients and had implemented the Municipal Health Secretariat's ICP guidelines with a TB emphasis as of 2016. The inclusion criteria required that the IPS continued implementing the plan between 2019 and 2021 and had agreed to participate in the research. IPS that had been closed due to non-compliance with the conditions of authorization to provide services at the time of the invitation were excluded.

Variable and data collection instruments

The survey instrument was designed based on the guidelines for the implementation of TB infection control in the Americas [5], the guide for the prevention of the transmission of *Mycobacterium tuberculosis* in health care settings of the Center for Control and Prevention of Diseases [8] and the ICP of Cali [6]. The instrument was reviewed by six national and international infection control experts and piloted for relevance and clarity in an IPS outside the Cali health network. Nineteen questions removed from the initial instrument due to duplicity or lack of relevance. Finally, the survey consisted of four modules with a total of 106 items, 36 focused on the epidemiological context of the institution and administrative control measures, 55 on environmental measures and 15 on respiratory protection measures.

Data collection techniques and procedures

To verify that the measures implemented responded to ICP for TB and not to the pandemic, their application was investigated in 2019. The researchers were

responsible for applying the survey in the IPS in the period from October 2021 to January 2022.

Data analysis

The data were analyzed using the Epiinfo 7.2.5 ® program, for the elaboration of descriptive statistics, the analysis of the information was univariate, the data were organized by distribution of frequencies and percentages, which were assessed on a 100 % compliance scale in a traffic light manner (≤ 59% red, between 60 and 79 % yellow and ≥ 80 % green) in accordance with the scale established in the ICP evaluation instruments in 2016 [6, 13].

Ethical aspects

This study was approved by the Research Ethics and Methodologies Committee of the National Institute of Health, Colombia. (CEMIN-10-2019). This research did not generate risks, because secondary information was used. The confidentiality of the information provided was maintained, as well as the identifiable data of the entity and the personnel responsible for responding to the survey, who signed the informed consent before the collection of the information.

RESULTS

ICP Design Evaluation

General description

Table 1 lists the objectives of the plan, along with the proposed monitoring indicators. The products offered for a period of five years (2016-2020) included: training for SSP personnel, managers, health personnel and engineers of the IPS and the evaluation of environmental control measures.

In the context of the implementation of the ICP, the incidence of TB in Cali went from 43,6 in 2015 to 53.1 cases per 100,000 inhabitants in 2019. The diagnosis of new cases of TB in health personnel was 3.07 % (n = 41) for 2019. For the year in which the ICP was designed, there were no specific binding regulations for the implementation of TB infection control in health institutions in Colombia. Since 2014, however, Colombia has recognized TB as an occupational risk disease. The Ministry of Health and Social Protection (MSPS, by its Spanish acronym) specifies, in the Plan Towards the End of TB, compliance with infection control in 100 % of territorial entities by 2025. Among the social determinants identified in the city were acute malnutrition in children under five years of age and chronic nutritional alterations in adults and barriers to access health services.

The proportion of the population with unsatisfied basic needs was 4.08 %, as identified by deficiencies in housing, health services, basic education and minimum income. The operation of the TB program in the IPS in Cali has been reported to have insufficient knowledge of health personnel, little university training in TB, high workload, and high staff turnover.

The problem tree and causality analysis were developed based on the evidence base. The main causes of the increase in TB transmission in health workers and users of IPS, and the lack of knowledge

Table 1. Objectives and indicators of the Intervention Plan for Infection Control in airborne diseases with emphasis on tuberculosis, for the Secretary of Public Health, Cali

General objective. To provide a facilitating instrument for the implementation of the various measures recommended for the prevention and control of the transmission of respiratory infections and *M. tuberculosis* at the municipal level through the adoption of PAHO and WHO guidelines for tuberculosis control in the Americas.

Specific objectives

1. Preparation of the Municipal Infection Control Plan with emphasis on tuberculosis for the period 2016-2019
2. Inclusion of infection control regulations as a municipal TB and TB/HIV co-infection policy.
3. To train and sensitize health personnel and managers of health facilities in areas with high risk of tuberculosis transmission in infection control in airborne diseases with emphasis on tuberculosis
4. To promote the development and implementation of institutional plans for the prevention and control of infections with emphasis on tuberculosis in health facilities with high risk of TB transmission
5. To monitor, supervise and evaluate the municipal plan, as well as the institutional infection control plans with emphasis on tuberculosis in the selected establishments.

Monitoring indicators

1. % of PCT health workers from prioritized facilities trained in TB infection control (Goal 100%)
2. % of prioritized facilities with TB infection control plans developed, approved and being implemented (Goal 25/25)
3. % of hospitals in regions 0, V and II that have implemented TB infection control measures (Goal 25/25)
4. TBP incidence rate in health workers (HCW) x 100,000 (Goal: rate lower than or like the community incidence rate)

of infection control on the part of the working and user population, were identified as: deficiency in the implementation of the ICP in health establishments and in the implementation of administrative, managerial, environmental and respiratory protection control measures, as well as the absence of monitoring and evaluation. The logical framework matrix was built guaranteeing horizontal and vertical logic, and adjustments were proposed to the objectives, activities and indicators (Appendix 1).

Analysis of the operational management of the ICP

We did not receive a response from 18 of the IPS invited to participate, and two IPS were excluded for not providing services to TB patients at the time of the survey. Consequently, the analysis of ICP management included 37 IPS. Based on the level of care and service complexity, the study included 20 public IPS (17 at the primary level and three at the complementary level) and 17 private IPS (three at the primary level and fourteen at the complementary level).

One-third of the institutions implemented at least 80 % of the administrative and environmental control measures. while 78 % of the IPS complied with the respiratory control measures (see Table 2). For the administrative control measures, shortcomings were found in the evaluation of institutional risk, absence of a written infection control plan and lack of procedures to monitor the duration of care for patients with TB. It was also found that 48.7 % of the IPS do not have a TB surveillance program for healthcare workers, 39 % do not comply with the regulatory requirements for patient isolation rooms and only 54 % of the IPS have infection committees. (see Table 3).

For environmental control measures, the greatest non-compliance was due to the lack of verification of air flow in the offices where TB patients are treated with 43.2 %. The main strength was the existence of a cleaning and disinfection program for areas and surfaces in most IPS institutions (see Table 3). Natural ventilation was prevalent in medical offices caring for TB patients and waiting rooms in 67.6 % and 75.5 % respectively, and in isolation rooms, 56.7 % had mechanical ventilation. Although 64.5 % of the IPS had an isolation room for airborne infections, only 21,6 % complied with the necessary six air changes per hour (R.A.H) and 78,4 % did not have negative pressure and/or filters HEPA. It was found that in 10.8 % of the IPS, the air extracted from the isolation room was recirculated inside the building in areas with circulation of patients and visitors.

16.2 % of the IPS institutions lacked a designated person responsible for the installation, maintenance and evaluation of environmental controls or the verification of air flows, and in 51.6 % of the IPS, there was no coordination between the Infection Control Committee and the technical area responsible for the operation and maintenance of the ventilation systems.

For respiratory control measures, N95 respirators were used by health personnel in outpatient consultations, respiratory procedures, care for patients in isolation and emergencies. N95 respirators were used for 48

Table 2. Results for determining compliance with infection control measures in IPS in Cali, as of 2019

Compliance with infection control measures	fi	%
Compliance with administrative control measures		
Greater than 80 %	13	35
Between 60-79 %	18	49
Less than 59 %	6	16
Compliance with environmental control measures		
Greater than 80 %	11	30
Between 60-79 %	17	46
Less than 59 %	9	24
Compliance with respiratory protection measures		
Greater than 80 %	29	78
Between 60-79 %	5	14
Less than 59 %	3	8

Table 3. Variables of the Infection Control Plan in the IPS, Cali, 2019

Variables	Yes		No	
	fi	%	fi	%
Administrative-managerial control variables				
Was there a written Infection Control Plan in the institution?	32	86.5	5	13.5
Was there a clear display of cough hygiene measures in all areas frequented by patients? *	32	86.5	4	10.8
Was an institutional risk classification conducted? (Risk of TB disease transmission)	5	13.5	32	86.5
Has training been provided to Infection control personnel for TB in the last 4 years?	36	97.3	1	2.7
Were all patients admitted to the institution routinely asked about the presence of cough?	34	91.9	3	8.1
Were patients with respiratory symptoms prioritized in triage?	33	89.2	4	10.8
Did the institution have a strategy to capture respiratory symptoms (RS)?	33	89.2	4	10.8
Was there a procedure to monitor patient care time within the institution?	21	56.8	16	43.2
Did the institution have patient education information available on TB transmission aimed at visitors?	33	89.2	4	10.8
Was a record kept of all the personnel at the institution who were diagnosed with TB?	23	62.2	14	37.8
Was PPD performed on health personnel? * *	16	43.2	16	43.2
Environmental control variables				
Based on the review of regulations, was compliance with the environmental conditions in the IPS monitored?	32	86.5	5	13.5
Based on the findings, did they make an improvement plan for the areas of patient care (outpatient consultation, hospitalization and laboratory?	30	81.1	7	18.9
Was there a cleaning and disinfection program for areas and surfaces?	36	97.3	1	2.7
Was there a cleaning program for cleaning and disinfecting biomedical equipment?	34	91.9	3	8.1
Was there a preventive maintenance plan for the natural ventilation system (implemented at a minimum once a year)?	33	89.2	4	10.8
Was there a preventive maintenance plan for the mechanical ventilation system (implemented at a minimum once a year)?	34	91.9	3	8.1
Was directional airflow in isolation rooms checked regularly? * * *	16	43.2	20	13.5
Was directional airflow regularly checked in offices?	21	56.8	16	43.2
Were methods used to verify air flow?	24	64.7	13	35.1
Did the IPS have isolation rooms for airborne infections?	24	64.7	13	35.1
Respiratory protection variables				
Did the N-95 respirators used by IPS workers have had NIOSH or OSHAS certifications?	36	97.2	1	2.8
Once the respiratory protection equipment was delivered, Did the IPS monitor its use?	36	97.2	1	2.8
Did the IPS have a guide or protocol for the use of N-95 respirators and surgical masks?	33	89.1	4	10.9
Did the IPS conduct training with experts in respiratory protection for its workers?	31	89.1	6	10.9
Did the IPS have a written respiratory protection program?	30	79.0	7	21.0
Did the IPS conduct a fit test on the N-95 respirators used by workers?	26	70.2	11	29.8

* 1 IPS (2.7%) did not know if there was a clear display of cough hygiene messages in all areas frequented by patients in 2019.
* * 5 IPS (13.5%) did not know if PPD was performed on staff health in 2019.
* * * An IPS did not have an isolation room.

hours in 91.9 % of the IPS and, in 73 % of IPS, storage was in paper bags. Verification of the correct use of N95 respirators by health personnel was conducted in 62.2 % of the IPS, through observation and field notes. The main shortcoming identified was the failure to perform fit tests on N95 respirators in 30 % of the IPS (see Table 3).

DISCUSSION

This is the first study to evaluate the design and operational management of the ICP implemented in Cali in 2016, prior to the issuance of national guidelines by the MSPSP in February 2020, which outlined the measures to be adopted by the IPS [14].

A ICP monitoring model is proposed based on the logical framework methodology [15,16] that can be a useful tool for each IPS to continuously monitor the implementation of the ICP, considering the characteristics of the user census, the demographic, socioeconomic and cultural characteristics of the environment. Such a tool enables the IPS to make the necessary adjustments in the operation of the ICP, with a view to achieving a decrease in the transmission of TB in their health personnel, generating an impact on public health [10,16].

In our study, we observed the low implementation of administrative and environmental control measures in the evaluated IPS in Cali. Studies conducted by Muñoz et al. [7] in Bogotá, Colombia, identified deficiencies in the implementation of ICP especially to environmental control measures, with greater progress in the establishment of the administrative and personal protection (30 - 60%) [17]. The literature reports that the lack of an infection control plan within health institutions negatively affects the transmission of *M. tuberculosis* in the hospital environment, while its implementation impacts the reduction of the number of cases of intramural transmission [18].

The findings of this study support recommendations aligned with current regulations, highlighting significant deficiencies in administrative and environmental control adherence in over half of the evaluated healthcare institutions [5,6,14].

For administrative control measures: managers of IPS must guarantee the creation and maintenance of an infection control committee with a designated person who is responsible for TB infection control. The Infection Control Committee must prepare in writing the institutional ICP that includes all administrative, environmental and respiratory control measures, including the evaluation of risk management [6], and the monitoring and evaluation of the ICP on an annual basis. The Committee must also guarantee the existence of one isolation room for patients with infectious diseases for every 20 hospital beds in the institution [19].

Senior management in IPS ensures the existence of collaborative work between the area in charge of purchasing, occupational health and the infection control committee for the provision of personal protective elements for health workers and patients with TB. The infection control committee must guarantee that within each institution there is a surveillance system for TB among health workers: the study of TB infection among its workers with the application of the PPD test at the time of admission to the institution and repeat periodically according to the annual risk assessment [20].

Each IPS must have a TB program coordinator responsible for the design and publication, where required, of information on TB transmission and cough hygiene. Managers must ensure the evaluation of the architectural design of the facilities where TB patients will be cared for and make the necessary improvements to comply with regulations. They must also create a flow map of TB patients within the institution that is known by patients and by all the staff who work in the institution with special emphasis on people presenting with respiratory symptoms upon admission. Administrative-managerial control measures are without a doubt the most relevant pillar when it comes to TB control, since they focus on those conducted by senior management which are of an administrative nature, to reduce the risk of exposure to anyone who may have the disease.

Environmental control measures aim to prevent the spread, dispersion, and reduce the concentration of infectious droplet nuclei containing M. tuberculosis in the air. These controls focus on the use of local ventilation to achieve the elimination of contaminated air [14]. In some developing countries, an increase in transmission in waiting areas has been observed, since patients and visitors tend to congregate or remain for a long time in hallways and common areas in health centers [5].

Senior management must ensure that air exchanges in natural ventilation are changed, using the PAHO document "Natural ventilation for infection control in health care environments" as a guide [21]. Institutions where hospitalization is conducted must have an isolation room with negative pressure and an air filtration system with HEPA filters of at least 6 to 12 R.A.H. It is advisable to use some method of air cleaning in the offices. Ideally, they should have an engineer responsible for the correct operation of air flows in the different areas of the institution, the maintenance of environmental control devices and all the required documentation [5].

It is necessary for ICP to include a respiratory protection section, which guides the use and control of the operation of N95 respirators and surgical masks, considering that these are aimed at reducing the number of people exposed to infection. Fox and collaborators indicated that the implementation of respiratory control measures reduces TB infection by 14.8 % and tuberculosis disease by 0.5 to 28.9 % [18].

Some limitations of this study include that the surveys were conducted during the period of health restrictions due to the pandemic, which may have influenced the lack of participation of the IPS in the study, the respiratory control measures such as use of N95 masks

and infection control training were implemented in IPS due to the Covid-19 pandemic and not as part of the ICP for TB. In many cases, the epidemiology coordinator or infection control committee coordinator was solely responsible for responding. However, many engineering aspects related to environmental control may have been inadequately addressed due to lack of experience or the absence of in-house engineering staff. The IPS needs to consider including engineering experts to ensure airflow and negative pressure were required.

One of the strengths of this study is its collaboration with the local health authority, as the program's evaluation will enable adjustments to the ICP based on the results and in accordance with the guidelines issued by Colombia's national TB program. We hope that improvements in its implementation will contribute to reducing TB transmission in health care settings, a situation that can be determined through an impact evaluation that attributes change in the decrease in cases to the intervention conducted.

Conclusions

In conclusion, there was evidence of low compliance in the implementation of the ICP for TB in the IPS in Cali, which was influenced by the lack of resources for investment in personnel and infrastructure, and the lack of specific regulation given in the period evaluated. To ensure correct operational management, financial and human resources must allow for effective implementation and continuous monitoring, leading to reduced TB transmission in healthcare settings such as IPS. Compliance with the control measures included in the ICP could be improved by being included within the institutional authorization standards monitored by the health control authorities.

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Authorship contribution

JSS-T: formal analysis, research, methodology, and review.

CMC-O: conceptualization, writing, original draft, formal analysis, research, methodology, supervision, writing: review and editing.

GMPC: conceptualization, writing, original draft, formal analysis, research, methodology, supervision, writing: review and editing.

MEA: formal analysis, research, methodology, and review.

RPL: formal analysis, research, methodology, and review.

CNRZ: formal analysis, research, methodology, and review.

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Funding sources

The research was funded by the Ministry of Science, Technology, and Innovation of Colombia. Project code 210484467820.

Conflict of interest statement

The authors declare no conflicts of interest.

APPENDICES

Appendix 1. Logical framework matrix program plan of interventions for infection control in airborne diseases with emphasis on tuberculosis

Narrative summary of objectives	Indicators**	Means of verification	Assumptions
AIM			
To contribute to the reduction of extra costs to the Health System for the care of TB cases in IPS healthcare workers providing services to tuberculosis patients in Cali.	Total annual expenditure on health care for tuberculosis in health personnel	Ministry of Health and Social Protection	The IPS allocate economic and human resources for the effective implementation of the ICP.
Purpose			
To reduce the transmission of tuberculosis to IPS users and healthcare workers that care for patients with TB in Cali.	Incidence of TB in IPS health workers who care for patients with TB decreased over a five-year period. Incidence of TB in IPS users who care for patients with TB, decreased in a period of five years Percentage of patients with TB in the IPS treated promptly Percentage of TB patients diagnosed in a timely manner Percentage of compliance with SR search goals Existence of exclusive spaces for the care of patients with TB that comply with air flow according to regulations Existence of the program for the use, maintenance and/or improvement of the ventilation system in the IPS where the areas with the highest risk of transmission are prioritized, the flow and air exchanges per hour (RAH) are determined, favoring cross ventilation, negative pressure and air cleaning by HEPA filtration.	Epidemiological surveillance system of each IPS	The IPS allocate economic and human resources for the effective implementation of the ICP.
Components			
Train managers, health workers and IPS users who care for TB cases in Cali on infection control for TB	% of IPS health workers caring for TB patients trained in TB infection control	Infection control committee or whoever takes its place in the institution	The IPS generates economic resources and time spaces for its health workers to attend training in infection control
	% of IPS managers who care for TB patients sensitized in infection control in TB infection control	TB Program of the SSP	IPS managers attend awareness-raising board meetings convened by the SSP
	Number of IPS users who care for TB patients who receive information from the IPS on TB infection control	Responsible for the Patient Safety Program at the IPS	The IPS generates economic and human resources for the dissemination of information on infection control to patients
Implement the Infection Control Plan of the Secretary of Public Health of Cali in the city's health facilities, with emphasis on tuberculosis	Regulatory document issued by the District Health Secretary of Cali (Mayor's Office) on the mandatory implementation of the ICP	SSP/ Cali Mayor	Political will for ICP regulation with decision makers.
	Minutes of meeting of the leaders of the PTB of Cali with decision makers	Cali PTB leaders with decision makers.	Obtaining appointments with decision makers of the district government of Cali.
	Existence of an Infection Committee in each IPS that cares for patients with TB in Cali Written document of the TB infection control plan in each IPS approved by senior management and implemented	Minutes of formation of the Committee and the minutes of periodic meetings.	Disposition from the senior management of the IPS for the formation of the Infection Committee.

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Narrative summary of objectives	Indicators**	Means of verification	Assumptions
Implement administrative and managerial control measures in the IPS in Cali.	Annual TB incidence rate in IPS health workers.	IPS TB event surveillance system	There is a quality information system in the IPS
Implement environmental control measures in the IPS in Cali	Annual TB incidence rate in IPS health workers	IPS TB event surveillance system	There is a quality information system in the IPS
Implement environmental control measures in the IPS in Cali	Annual TB incidence rate in IPS health workers	IPS TB event surveillance system	There is a quality information system in the IPS
Supervise and evaluate the District Plan and the IPS plans for infection control with emphasis on TB	Monitoring and evaluation report of the district plan and the IPS plans.	TB program of the SSP	Human and financial resources available in the IPS and the SSP
Activities			
Raising awareness among managers and health workers about the importance of prevention and control of TB transmission within health facilities	% of IPS health workers caring for TB patients trained in TB infection control	Infection control committee or whoever takes its place in the institution	The IPS generates economic resources and time for its health workers to attend training in infection control
Training managers, health workers and IPS users on infection control for TB	% of IPS managers who care for TB patients sensitized in TB infection control	TB Program of the SSP	IPS managers attend awareness-raising board meetings convened by the SSP
Training of Health Personnel in the proper use of personal and respiratory protection elements Provide training in respiratory hygiene (cough etiquette) among patients with suspected or confirmed TB in healthcare facilities	Number of IPS users who care for TB patients who receive information from the IPS on TB infection control	Responsible for the Patient Safety Program at the IPS	The IPS generates economic and human resources for the dissemination of information on infection control
Preparation and inclusion of Policies and procedures on Tuberculosis Infection Control in the municipality Regulate at the district level on the implementation of the infection control plan in the IPS	Regulatory document issued by the SSP (Mayor's Office) on the mandatory implementation of the ICP	SSP/ Cali Mayor's Office	Political will for the regulation of ICP among government decision makers in the District of Cali
Advocate for the political will of senior management in Cali IPS for the implementation of the infection control plan	Minutes of meeting of the leaders of the PTB of Cali with decision makers	Cali TB leaders with decision makers	Obtaining appointments with decision makers.
Form a team responsible for the implementation of infection control measures in each IPS of Cali	Existence of the Infection Committee in each IPS that cares for patients with TB in Cali	Minutes of formation of the Committee and minutes of periodic meetings	Disposition of the senior management of the IPS for the formation of the Infections Committee.
Formulate the TB infection control plan in the IPS that care for TB patients in Cali	Written document of the TB infection control plan in each IPS	Infection Control Committee in each IPS	Administrative will of the senior management of the IPS for the formation of the Committee
Measurement and evaluation of delay times in diagnosis and treatment of patients with suspected resistant TB Generate guidelines in each IPS in Cali on opportunities for the recruitment, prioritization, diagnosis and treatment of TB of IPS users and health workers	Existence of the guidelines in each IPS on the opportunity in the recruitment, prioritization, diagnosis and treatment of TB of users and health workers of the IPS	Responsible for the TB program in each of the IPS	Adoption by each of the IPS that care for TB patients in Cali of the technical and operational guidelines of the PNPCTB of the MSPS Resolution 227 of 2020

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Narrative summary of objectives	Indicators**	Means of verification	Assumptions
Carry out risk assessment by areas and processes in the IPS at least annually or according to the adjustments to the processes.	Number of risk assessments conducted annually in each IPS by area and by process	Safety and Health at Work of each IPS	Existence in the IPS of personnel trained to carry out risk assessment
Generate an epidemiological surveillance program for TB in IPS health workers	Existence of an epidemiological surveillance program for TB among IPS health workers	Epidemiological Surveillance Committee in each IPS	The IPS has designated functions among its officials to carry out epidemiological surveillance.
Identification and improvement of separation or isolation rooms in Reference Hospitals for patients with TB, resistant TB. Improvement of waiting rooms and offices in Health Centers with high risk of transmission of TB, MDR TB and patients with TB/HIV co-infection Evaluation and improvement of the biosafety conditions of laboratories that process cultures and sensitivity tests (CBS certification and assurance of air exchanges in processing areas) Create a program for the use, maintenance and/or improvement of the ventilation system in the IPS where the areas with the highest risk of transmission are prioritized, the flow and air exchanges per hour (RAH) are determined, favoring cross ventilation, negative pressure and air cleaning by HEPA filtration. Based on point 8 of resolution 227 of 2020 of the PNPCT of the MSPS and current national regulations	Existence of the program for the use, maintenance and/or improvement of the ventilation system in the IPS where the areas with the highest risk of transmission are prioritized, the flow and air exchanges per hour (RAH) are determined, favoring cross ventilation, negative pressure and air cleaning by HEPA filtration.	Department of Engineering and Maintenance of the IPS in association with the Infection Control Committee	Existence of an engineering department with personnel trained in ventilation systems
Promote the appropriate and rational use of N95 respirators used in reference establishments. Ensure the availability of respiratory protection elements for health workers in IPS	Number of N95 masks certified for tuberculosis per health worker per month	IPS Administrative Department in association with the coordinator of the TB program at the IPS	Availability of financial resources for the purchase of N95 masks certified for TB by the IPS The IPS has designated functions among its officials to carry out the respiratory protection measures program.
Generate a monitoring program on the proper use of certified respirators and compliance with biosafety standards for both IPS health personnel	Documents with signatures of health workers that demonstrate monitoring of adherence to respiratory protection standards and compliance with biosafety standards	Head of the TB Program at the IPS	
Monitoring, supervision and evaluation of the Municipal Plan and Institutional Plans for infection prevention and control with emphasis on TB for the period 2016-2020 Apply the supervision guide for TB infection control suggested by PAHO to the IPS that implement the TB infection control plan of the Cali Secretary of Health. Monitor the indicators specified in the PAHO TB Infection Control Plan	Report on results of the application of the supervision guide Report on compliance with indicators supervision of the indicators of the TB Infection Control Plan	Coordinator of the TB Program of the SSP	Existence of trained personnel in the SSP
Implement corrective plans on the evaluated indicators	Number of corrective plans implemented by the IPS per year	IPS Infection and Quality Assurance Committee	The IPS has the resources and the will of senior management to carry out corrective actions

** Annual measurement frequency. Result indicators are observed for the aims and purpose sections.