Original Article

Factors Associated with Adherence to the 2022 Pre-Employment Algorithm for Asymptomatic Patients with Suspected Pulmonary Tuberculosis Among Pulmonologists in the Lung Center of the Philippines

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ABSTRACT

Background: Pulmonary tuberculosis is a global health concern and a leading cause of death from infectious diseases. Screening is crucial in high prevalence TB areas such as the Philippines, particularly among asymptomatic patients. This study explores factors influencing pulmonologists' adherence to the 2022 Pre-Employment Algorithm at the Health and Fitness Assessment Office (HFAO) of the Lung Center of the Philippines.

Methodology: Using a sequential explanatory mixed-methods design, the study conducted a quantitative survey of 16 HFAO pulmonologists, followed by a qualitative focused group discussion (FGD) with 12 participants. Thematic analysis of FGD transcripts provided insights into factors influencing adherence to the algorithm.

Results: The quantitative phase revealed varying awareness and compliance levels among pulmonologists that directly affected adherence to the algorithm. The FGD identified these specific factors influencing adherence: limited awareness resulting in inconsistent application of the guidelines; personal beliefs and patient-related factors influencing individualized decision-making; institutional challenges (i.e., resource constraints) hindering the implementation process; and perceived algorithm inefficacy, coupled with communication barriers among healthcare professionals, further reducing adherence rates.

Conclusions: Knowledge gaps, resource limitations, and personal decision-making significantly affected adherence to the 2022 Pre-Employment Algorithm. Addressing these issues through targeted training, clearer guidelines, and improved resource management can improve adherence and enhance TB screening outcomes

Keywords: pre-employment clearance, tuberculosis, fit to work, FGD, awareness

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ISSN 3028-1199 (Online)
Printed in the Philippines

DOI: 10.70172/pjcd.v22i2.10049

Received: 18 June 2024
Accepted: 28 September 2024

This article has supplementary materials which are accessible from the article's landing page at www.philippinejournalofchestdiseases.com

INTRODUCTION

Pulmonary tuberculosis (PTB) remains a major global health issue and is the second-leading cause of death from infectious diseases globally.[1] In areas with a high TB prevalence such as the Philippines, screening is crucial as missed diagnosis remains notably significant, especially among asymptomatic patients.[2] As the National Apex Center for Lung and Chest Diseases, the Lung Center of the Philippines (LCP) receives a high volume of referrals for the assessment of work applicants before local and overseas employment since most PTB-affected Filipinos are amongst individuals aged ≥15 years, potentially posing an infectious risk to others in their work environments.[3] In 2005, the Department of Labor and Employment released implementation guidelines that mandate employers to implement TB prevention and control policies to alleviate the spread of disease in the workplace.[4] Since the mandate's release, employers have required job applicants to pass the Pre-Employment Medical Examination which included a TB screening protocol based on national guidelines. Pulmonologists at LCP evaluate the TB status of applicants referred for pulmonary clearance prior to local or international employment through its Health and Fitness Assessment Office (HFAO). HFAO, which is part of the LCP Outpatient Department, is tasked to provide comprehensive, quality, and timely diagnostic services to individuals with health risks at a reasonable price. It caters to clients seeking pre-employment TB clearance, outpatient executive check-ups, pre-flight assessments, and outpatient COVID home care services. HFAO recommends using the LCP Pre-Employment PTB Clearance Algorithm (Supplementary Material 1) based on existing National Tuberculosis Program guidelines. The LCP algorithm on diagnosis and management of pre-employment applicants suspected of PTB was first released in 2015 and revised last November 2022.

METHODOLOGY

Research design

The research adopted a sequential explanatory mixed-methods (quanti→QUALI) design, incorporating an initial quantitative survey followed by a qualitative focused group discussion (FGD), with the overarching objective of thoroughly investigating factors influencing adherence to the 2022 Pre-Employment Algorithm. Adherence to the algorithm was categorized as complete when pulmonologists consistently followed all guidelines, partial when they selectively applied the algorithm based on individual cases, and non-adherence when they used a personal or alternative algorithm instead of the recommended guidelines.

Following ethical approval from the review board, the quantitative phase of the study commenced; the researchers distributed a semi-structured questionnaire via Google Forms to 19 pulmonologists practicing in the HFAO of the Lung Center of the Philippines. Preliminary analysis of the survey results

revealed factors influencing adherence that exhibited the highest variation. These gave way to the qualitative phase (FGD) of this research. Purposive sampling involving 19 pulmonologists was employed. Informed consent was sought; 16 consented and completed the questionnaire, but only 12 participated in the FGD. Eligible participants were HFAO pulmonologists who gave consent. Participants were notified seven days before the FGD and received reminders 24 hours prior. A trained moderator facilitated the three-hour discussion in a conducive and private setting at the Lung Center of the Philippines.

Participants

A total enumeration approach was employed for the quantitative component, encompassing 19 pulmonologists practicing in the HFAO. The researchers excluded two co-authors, both pulmonologists, and another who did not consent, resulting in 16 study participants. In the FGD, the researchers included a minimum of 12 participants.

Instrumentation and data collection

For the quantitative phase, a semi-structured questionnaire delivered using Google Forms was used for data collection. The questionnaire, which was launched on December 7, 2023 included questions about pulmonologists' awareness of the 2022 Pre-Employment Algorithm, compliance levels, and factors influencing adherence to the guidelines (Supplementary Material 2). The Focus Group Discussion (FGD) was conducted on December 19, 2023. The questionnaire was developed to capture comprehensive quantitative insights related to the study objectives.

For the qualitative phase, a semi-structured discussion guide was developed based on the survey responses to facilitate the FGD (Supplementary Materials 2, 3). The guide was designed to facilitate an in-depth exploration of participants' understanding of the algorithm, challenges with adherence, perceived barriers and recommendations for improvement. Purposive sampling ensured a diverse representation of perspectives among eligible participants. The FGD employed audio recording and detailed note-taking to ensure accurate data capture; visual recording was not done. An observer documented non-verbal cues and group dynamics through careful note-taking. This approach was chosen to address ethical considerations and foster a more natural and unrestrained discussion environment.

Procedure

The FGD provided a platform for participants to discuss variations in decision-making in pre-employment assessments. For the study, the key steps were: defining objectives, inviting participants, explaining the FGD's purpose, and obtaining consent.

Logistics including venue and equipment were arranged. Participants were welcomed, and the study purpose and ground rules were explained. The FGD followed the facilitator's guide, using probing questions to generate insights (Supplementary Material 3). Audio recording and note-taking captured data accurately. Data were transcribed and analyzed for themes, and key findings were identified. Member checking was done to validate the data. The technique involved discussing findings with participants while the researchers reviewed the methodological and analytic procedures.

The study explored the following areas of discussion: participants' understanding of the algorithm, challenges with adherence, perceived barriers and recommendations for improvement.

Data analysis

The FGD transcripts were transcribed verbatim, followed by thematic analysis of data. The researchers familiarized themselves with the data and assigned preliminary codes to text segments based on recurring themes. These codes were grouped into broader themes and subthemes to identify critical factors related to algorithm adherence. Preliminary findings were shared with participants for validation. Qualitative findings were integrated with quantitative results to provide a comprehensive understanding of factors associated with adherence to the 2022 Pre-Employment Algorithm, using data triangulation to enhance insight.

Further analysis led to Level III codes (themes), with constant comparisons between transcribed narratives.

Validity and reliability

Content validity ensured that the survey and FGD guide aligned with the study objectives. Construct validity confirmed that the methods accurately assessed factors influencing adherence. Internal validity was boosted through the mixed-methods design. External validity was enhanced by including a diverse group of pulmonologists from LCP HFAO to ensure broader applicability. Reliability was ensured by evaluating the test-retest reliability of the survey and inter-rater reliability of the FGD, with standardized data collection procedures for consistency.

Ethical considerations

The study was conducted in accordance with the Declaration of Helsinki, National Ethical Guidelines for Research Involving Human Participants 2022, and the Data Privacy Act of 2012. The study was approved by the LCP Institutional Ethics and Review Board (LCP-IERB code: LCP-PF-028-2023). Informed consent was obtained in compliance with ethical guidelines. Thorough explanations were provided to participants' questions, ensuring their understanding of the procedure. Results were disclosed to participants when the results were scientifically valid, confirmed, and had significant positive implications for patients.

RESULTS

Sixteen pulmonologists from HFAO comprised the study sample, with 12 participating in the FGD. All were board-certified by the Philippine College of Chest Physicians and engaged in private practice at LCP. None of the participants were directly involved in formulating the 2022 Pre-Employment Algorithm. Twelve out of 16 participants had been using the pre-employment algorithm before the 2022 version, highlighting a mix of experience levels in applying previous and updated guidelines. Out of the 16 participants who gave consent, only 12 attended the scheduled FGD due to time constraints.

Awareness of the algorithm was initially assessed through binary survey responses (yes/no) while compliance level was categorized into "always," "often," "sometimes," "rarely," and "never." Responses were further explored qualitatively. Based on the results of the survey and FGD, participants' awareness of the algorithm was "moderate to high" (high awareness: n = 13, partial awareness: n = 3) while compliance was variable (consistent compliance: n = 14, selective compliance: n = 2).

Table 1. Integration of quantitative and qualitative data

Thematic areas	Codes	Key findings
Awareness and understanding of the algorithm	A1: Knowledge gaps A2: Misconceptions A3: Clarity about the algorithm	- Varying adherence levels to the algorithm - Influencing factors include patient and system-related, and country-specific considerations
Personal factors influencing adherence	B1: Individual beliefs B2: Attitudes B3: Experiences affecting adherence	- Impact of personal experiences and beliefs on adherence - Differences in X-ray interpretation lead to individualized decisions
Patient-related factors	C1: Patient characteristics C2: Communication challenges C3: Perceived patient preferences	- Influence of each codes on decision-making
Facility/institutional factors	D1: Resource constraints D2: Organizational policies D3: Administrative support	- Limited awareness of central order and challenges in disseminating the protocol within the institution - Variability in institutional adherence due to resource availability and organizational policies
Challenges in algorithm implementation	E1: Practical difficulties E2: Time constraints E3: Workflow issues	- Challenges in implementation, including test availability and time constraints - Discrepancies in interpreting chest X-ray findings pose practical difficulties
Perceived effectiveness of the algorithm	F1: Opinions on efficacy F2: Perceived benefits	- Concerns about the algorithm's effectiveness in certain scenarios - Suggestions for improvement, such as clarifications on abnormal X-ray classifications
Feedback and suggestions for Improvement	G1: Modifications to the algorithm G2: Enhancing training G3: Improving implementation	- Proposals for algorithm modifications, such as subdividing abnormal X-ray findings - Calls for standardization and continuous training to address challenges
Communication and collaboration	H1: Interaction with healthcare professionals H2: Interaction with patients	- Collaboration and communication challenges exist, particularly in cases referred from other agencies - Suggestions include conducting workshops and lectures to improve awareness and understanding

Among pulmonologists who consistently complied, occasional deviations may happen due to case complexity, resource availability, and patient preferences. Significant variation arose from knowledge gaps, resource constraints, communication challenges, and institutional issues. Barriers like limited IGRA (interferon gamma release assay) availability, X-ray classification confusion, and personal decision-making further impacted adherence.

Participants also answered open-ended questions like "How familiar are you with the 2022 Pre-Employment Algorithm?" and "How comfortable are you applying the algorithm in practice?" High familiarity was assigned to participants who expressed confidence in their knowledge and indicated consistent algorithm use, while participants who reported partial awareness or uncertainty about specific components were assigned low familiarity, indicating areas where more understanding was needed.. High familiarity was noted in 14 participants, and low familiarity in two. Compliance was grouped into high, moderate, and low. High compliance, defined as always or often followed the algorithm, was reported by 14 participants, while low compliance, defined as sometimes or rarely followed the algorithm, was noted by two.

Reasons cited for low adherence included varying interpretations of abnormal X-rays, lack of awareness or familiarity with the algorithm, and institutional challenges such as outdated or unclear protocols, as highlighted in Table 1 under Challenges in algorithm implementation (E1, E2).

To address these issues, the participants recommended refining the algorithm to provide clearer guidelines on X-ray classifications, enhancing training programs to improve knowledge and application consistency, and ensuring resource availability to support the standardized protocol, as noted in Table 1 under Feedback and suggestions for improvement (G1, G2). Implementing these recommendations could reduce variability and improve adherence rates among pulmonologists.

Conversely, areas of high adherence were noted in routine screening processes where guidelines were well-established and supported by institutional protocols. Participants who frequently adhered to the algorithm cited clear guidance, consistent training, and the availability of necessary resources as key drivers of compliance. These factors drove high adherence (Table 1 under Facility/institutional factors; D1), emphasizing the importance of continuous education and standardized practices. These areas demonstrate how clear and well-supported protocols can enhance adherence and effectiveness in clinical settings.

The participants' recommendations for algorithm improvement are presented in Table 2. Participants recommended modifying the algorithm, enhancing training, and improving overall implementation. Proposals included subdividing abnormal X-ray findings, standardizing procedures, and offering continuous training to address challenges. Discussion occurred on the interaction between

Table 2. Recommendations for algorithm improvement

Recommendations
Provide clarity on local versus international application
Address individualized decision-making based on beliefs and attitudes
Enhance communication and patient understanding
Improve resource allocation and institutional support
Streamline algorithm implementation challenges
Clarify abnormal X-ray classifications and efficacy concerns
Standardize and continuously train pulmonologists
Facilitate workshops and lectures for better collaboration

Table 3. Recommendations for algorithm improvement with key issues addressed

Recommendations	Key Issues Addressed
Modify the algorithm	- Clarity - Individualized decision-making
Enhance training	- Continuous training
Improve implementation strategies	- Communication - Resource allocation

pulmonologists, other healthcare professionals, and patients in the algorithm context. Collaboration and communication issues, especially with cases referred from other agencies, were discussed. Suggestions included workshops and lectures to improve awareness and understanding. These recommendations addressed issues like clarity, individualized decision-making, communication, resource allocation, and continuous training (Table 3).

DISCUSSION

Pulmonary tuberculosis stands as a formidable global health concern, particularly in regions of high prevalence like the Philippines. The LCP plays a key role in evaluating job applicants to prevent workplace transmission, with missed diagnoses, particularly in asymptomatic patients, posing significant risks. This study explores the factors influencing pulmonologists' adherence to the 2022 Pre-Employment Algorithm.

The research used a sequential explanatory mixed-methods design which involved quantitative surveys of 16 HFAO pulmonologists, followed by an FGD with 10 participants. The survey showed varying levels of awareness and compliance with the algorithm, while the subsequent FGD unearthed thematic areas influencing adherence such as awareness, personal/patient-related and facility/institutional factors, implementation challenges, and perceived effectiveness, feedback, suggestions for improvement, and communication issues (Table 1, Supplementary Material 4). Knowledge gaps, misconceptions, and clarity issues about the algorithm were identified and showed that while participants were generally aware of the algorithm, they demonstrated varying adherence levels. Factors influencing adherence encompassed patient and system-related, and country-specific considerations. Clarity was needed regarding the algorithm's application in local versus international employment. We identified individual beliefs, attitudes, and experiences affecting adherence. Personal experiences and beliefs, including perceptions of patient risk, impacted adherence. Differences in interpreting X-ray findings contributed to individualized decisions.

Decision-making was influenced by patient characteristics, communication challenges, and perceived patient preferences. Patient understanding, compliance, and preferences influenced the process, while challenges in obtaining sputum samples contributed to treatment delays. Adherence was impacted by resource constraints, organizational policies, and administrative support. Limited awareness of the central order and challenges in disseminating the protocol within the institution were noted. Institutional adherence varied due to differences in resources and policies.

Challenges in algorithm implementation included practical difficulties, time constraints, and workflow issues such as test availability, time constraints, and discrepancies in interpreting chest X-ray findings. The participants expressed their opinions on the algorithm's efficacy and perceived benefits. Its effectiveness in specific scenarios was raised and the participants suggested improvements including clarification of abnormal X-ray classifications.

The integrated data analysis provided key insights and recommendations, addressing concerns such as clarity in application, individualized decision-making, communication improvement, streamlined implementation, abnormal X-ray classification, and ongoing training and standardization. The study's findings have implications for policy-making, training, and continuous improvements in healthcare, highlighting the need to address limitations and advocate further research to enhance generalizability. The study's design contributed significantly to understanding factors influencing pulmonologists' adherence to the 2022 Pre-Employment Algorithm, offering insights for better disease prevention and control in employment settings.

A SWOT analysis highlighted critical factors that influence adherence to the 2022 Pre-Employment Algorithm (Supplementary Material 5). Strengths included provision of standardized guidance for TB screening, support for consistent decision-making, prevention of TB in workplaces, and implementation in a tertiary healthcare institution, all of which enhance the algorithm's credibility. Weaknesses included inconsistent adherence, knowledge gaps regarding the algorithm, perceived effectiveness issues, and limited training and standardization efforts. Opportunities involved refining the algorithm based on feedback, enhancement of training programs, standardization of practices across institutions, and improvement of stakeholder communication and collaboration. Threats included resource constraints, limited test availability, miscommunication among healthcare professionals, varying international TB screening requirements, and resistance to change in established practices.

The study has limitations inherent to the qualitative design. While the exchange of ideas during the FGD can elicit new insights, it may also unintentionally silence participants who are hesitant to voice dissenting opinions or feel pressured to

conform. To address this, a trained moderator managed the FGD, ensuring that no individual dominates the discussion that less vocal participants can share their views.

CONCLUSION

Knowledge gaps, resource limitations, and personal decision-making significantly affected adherence to the 2022 Pre-Employment Algorithm. Addressing these issues through targeted training, clearer guidelines, and improved resource management can improve adherence and enhance TB screening outcomes. The study provided an understanding of factors that influence adherence to the algorithm and offered valuable insights for policy-making, training initiatives, and continuous improvement efforts in similar healthcare settings.

Acknowledgments (CRediT)

Dr. Racquel Ibanez: Conceptualization, Supervision, Methodology; **Dr. Gerald Tejada:** Project Administration, Investigation; **Dr. Ma. Lalaine Gumiran-Cheng:** Formal Analysis, Resources

Statement of Authorship

All authors certified fulfillment of ICMJE authorship criteria.

Authors' Disclosure

The authors declared no conflict of interest.

Funding Source

None declared.

References

1. World Health Organization. WHO policy on collaborative TB/HIV activities: guidelines for national programs and other stakeholders. Geneva: World Health Organization; 2012. Accessed October 26, 2024. Available from: https://www.who.int
2. Department of Health, Government of the Philippines. Comprehensive and Unified Policy for TB Control in the Philippines (C.U.P. 2004). 2004
3. Lansang MAD, Alejandria MM, Law I, et al; Philippine NTPS 2016 Group. High TB burden and low notification rates in the Philippines: The 2016 national TB prevalence survey. *PLoS One*. 2021;16(6). https://doi.org/10.1371/journal.pone.0252240
4. Department Order No. 73-05. Guidelines for the Implementation of Policy and Program in Tuberculosis. Accessed October 26, 2024. Available from: https://www.dole.gov.ph/php_assets/uploads/2005/03/DO-73-05.pdf
5. Monera OM, Delos Reyes V. Knowledge and Practices among Pulmonologists of the Lung Center of the Philippines in Giving Pre-Employment Clearance in Asymptomatic Patients with Findings Suggestive of Tuberculosis in the Common Diagnostic Examinations. 2020
6. World Health Organization. WHO consolidated guidelines on tuberculosis: Module 2: screening – systematic screening for tuberculosis disease [Internet]. Geneva: World Health Organization; 2021. Accessed October 26, 2024. Available from: https://www.ncbi.nlm.nih.gov/books/NBK569336/
7. World Health Organization. Global Tuberculosis Report. 2022. Accessed March 21, 2020
8. Republic of the Philippines. Executive Order No. 187: Instituting a Comprehensive and Unified Policy for the Tuberculosis Control in the Philippines. Manila, Philippines: Republic of the Philippines; 2003:1-2
9. Department of Health, Manila, Philippines. Manual of Procedures for the National TB Control Program. 5th ed. 2013
10. Munro SA, Lewin SA, Smith HJ, Engel ME, Fretheim A, Volmink J. Patient adherence to tuberculosis treatment: a systematic review of qualitative research. *PLoS Med*. 2007;4(7). https://doi.org/10.1371/journal.pmed.0040238
11. Gebreweld FH, Kifle MM, Gebremicheal FE, et al. Factors influencing adherence to tuberculosis treatment in Asmara, Eritrea: a qualitative study. *J Health Popul Nutr*. 2018;37(1):1. https://doi.org/10.1186/s41043-017-0132-y
12. Department of Health. Review report. 2019 Philippines TB Joint Program Review; October 3-14, 2019:56,74
13. Arreola A, Obusan J, Gonong JR, Balanag V. Clinical profile and outcome of job applicants with chest X-ray findings suspicious of PTB seen in the Lung Center of the Philippines. 2017
14. Creswell JW. Qualitative Inquiry and Research Designs: Choosing Among Five Approaches. 2nd ed. California: Sage Publication, Inc.; 2007
15. Daniel WW, Cross CL. Biostatistics: A Foundation for Analysis in the Health Sciences. 10th ed. Wiley & Sons, Inc.; 2013
16. Al-Med A, Abbas B, Al-Ubaidi B. The radiological diagnosis of pulmonary tuberculosis (TB) in primary care. *J Fam Med Dis Prev*. 2018;4. https://doi.org/10.23937/2469-5793/1510073
17. Onwuegbuzie AJ, et al. A qualitative framework for collecting and analyzing data in focus group research. *Int J Qual Methods*. 2009;8(3). https://doi.org/10.1177/160940690900800301