



The Role of Nursing, Medical Laboratory, Medical Secretary, and Hospital Management in the Management of Tuberculosis

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Abstract:

The management of tuberculosis (TB) involves a collaborative approach where the roles of nursing, medical laboratory personnel, medical secretaries, and hospital management are critically interlinked. Nurses play a frontline role in the identification, treatment, and education of patients suffering from TB. Their responsibilities encompass administering medications, monitoring patient adherence to treatment regimens, and providing vital information on the importance of completing the full course of therapy. They also engage in direct patient care and assessment, ensuring that symptoms are monitored and managed effectively. By fostering a supportive environment, nurses can significantly enhance patient outcomes and encourage community awareness about TB prevention and control. In parallel, medical laboratory professionals are essential for accurate diagnosis and monitoring of TB. They perform tests such as sputum smear microscopy and molecular assays, which are crucial for confirming TB diagnoses and identifying drug-resistant strains. Moreover, medical secretaries facilitate the administrative aspects of TB management, streamlining patient records and communication between departments to ensure timely care and follow-up. Concurrently, hospital management plays a pivotal role by allocating resources, implementing infection control policies, and developing strategic programs to enhance TB care. Effective collaboration among these roles promotes a comprehensive approach to TB management, ultimately contributing to improved health outcomes and reduced transmission rates within communities.

1. Introduction

Tuberculosis (TB) remains one of the most significant infectious disease threats to global public health, having surpassed HIV/AIDS as the world's leading cause of death from a single infectious agent [1]. The World Health Organization (WHO) estimates that approximately 10.7 million people developed active TB disease in 2024, with over 1.23 million deaths attributed to the disease [1]. These staggering figures underscore the enduring challenge that TB poses to health systems worldwide, particularly in low- and middle-income countries where diagnostic and treatment resources are often severely constrained. Despite being both preventable and curable, TB continues to exact an enormous toll on human life, making it imperative that healthcare systems adopt comprehensive, multidisciplinary approaches to its management [2]. The complexity of tuberculosis — from its variable clinical presentation and prolonged treatment regimens to its social determinants and the emergence of drug-resistant strains — necessitates a coordinated, team-based approach to care [3]. No single professional category possesses the full range of competencies required to address the biological, psychological, social, and administrative dimensions of TB management. Nurses, medical laboratory scientists, medical secretaries, and hospital administrators each contribute essential expertise to the care continuum. Understanding the specific contributions of each role, as well as the mechanisms through which they interact, is fundamental to designing effective TB control programmes that can achieve the ambitious targets set by the WHO End TB Strategy [4]. This paper aims to provide a comprehensive analysis of the

roles played by nursing professionals, medical laboratory scientists, medical secretaries, and hospital management in the management of tuberculosis. The paper examines each professional domain in detail, exploring the responsibilities, competencies, evidence-based practices, and challenges associated with each role.

2. Global Burden of Tuberculosis**2.1 Epidemiology and Trends**

The WHO Global Tuberculosis Report 2025 provides the most comprehensive and up-to-date assessment of the global TB epidemic, drawing on data from 184 countries and areas representing more than 99% of the world's population and TB cases [1]. According to this report, approximately 10.7 million people fell ill with TB in 2024, and the disease claimed over 1.23 million lives [1]. Encouragingly, the global rate of people falling ill with TB declined by nearly 2% between 2023 and 2024, while deaths from TB fell by 3% during the same period [1]. However, these modest gains are threatened by funding challenges that endanger the sustainability of TB programmes in many high-burden settings. Global investments in TB fell to just US\$5.9 billion in 2024 — covering only 27% of the US\$22 billion needed annually by 2027 to meet the targets set at the 2023 UN High-Level Meeting on TB [5]. Modelling studies have warned that long-term cuts to international donor funding could result in up to 2 million additional deaths and 10 million people falling ill with TB between 2025 and 2035 [5].

2.2 Drug-Resistant Tuberculosis

Drug-resistant forms of TB, including multidrug-resistant TB (MDR-TB) and extensively drug-resistant TB (XDR-TB), represent a particularly serious threat to global TB control efforts [3]. Resistant TB is not only more difficult to cure but also requires treatment regimens that are longer, more toxic, and significantly more expensive than those for drug-susceptible TB [3]. The emergence and spread of drug-resistant strains intensify the need for robust laboratory capacity to detect resistance promptly, skilled nursing care to manage complex treatment regimens and their side effects, and effective hospital management to ensure infection control and continuity of care. The WHO has emphasised that addressing drug-resistant TB requires a comprehensive approach that includes rapid molecular diagnostics, appropriate treatment regimens, and strong health systems support [6].

2.3 The End TB Strategy and Global Targets

In 2014, the WHO initiated the End TB Strategy, aiming to reduce TB incidence to fewer than 10 cases per 100,000 population by 2035 and to reduce TB deaths by 95% compared with 2015 levels [4, 7]. Achieving these ambitious targets requires not only biomedical interventions but also strengthening of health systems, including the human resources for health who deliver TB services at every level. The roles of nurses, laboratory scientists, medical secretaries, and hospital managers are central to translating global strategies into local action. The End TB Strategy emphasises patient-centred care, which inherently requires the coordinated efforts of a multidisciplinary team to address the full spectrum of patient needs [4, 8]. The Lancet Commission on TB further highlighted that ending the TB epidemic requires a multisectoral approach, including improved diagnostics, treatment, and prevention, as well as addressing the social determinants of health [4].

3. The Role of Nursing in Tuberculosis Management

3.1 Frontline Care and Patient-Centred Interventions

Nurses occupy a unique position in TB management as the healthcare professionals who have the most frequent and sustained contact with patients throughout their treatment journey. Globally, patients with active TB are seen regularly by nurses who provide care and support to improve treatment outcomes [6, 9]. A scoping review conducted by Yulanda et al. (2025) identified six

major domains of nurse-led interventions for patients with TB: health education, psychological support, respiratory exercises, TB medication guidance, dietary support, and discharge instruction [6]. These interventions were found to be associated with enhanced TB treatment compliance, improved pulmonary function, better quality of life, and improved psychological well-being among patients with TB [6]. The scope of nursing practice in TB care is broad, encompassing assessment, planning, implementation, and evaluation of care, as well as advocacy, education, and case management [10- 13].

3.2 Nurse-Led Treatment Models for Drug-Resistant Tuberculosis

The role of nurses becomes even more critical in the management of drug-resistant TB. At the Johns Hopkins School of Nursing, researchers implemented a clinical training programme in which nurses were trained to diagnose, treat, and manage patients with drug-resistant TB, working with national health departments to put this model into practice [14- 16]. In a cluster randomised trial evaluating nurse case management to improve the treatment experience for patients with drug-resistant TB, researchers discovered that such an approach can reduce treatment failure by 45% [8]. This finding is particularly significant because it demonstrates that nurse-led models can achieve outcomes comparable to or better than physician-led standard of care models, while also increasing access to care in underserved settings [8]. Nurse-led models are particularly valuable in resource-limited settings where physician shortages are acute, and they empower nurses to take on expanded roles in TB care [17- 20].

3.3 Palliative Care and Psychosocial Support

For patients with multidrug-resistant TB who may face prolonged treatment, severe side effects, and significant psychological distress, palliative care becomes an essential component of holistic management. A landmark randomised controlled trial conducted in Uganda evaluated the efficacy of nurse-led palliative care for patients with MDR-TB [9]. The intervention group received nurse-led person-centred holistic assessment, care planning, symptom control, and psychosocial support delivered on inpatient wards or at home [9]. The study demonstrated that additional nurse-led palliative care improved self-reported outcomes across physical, psychological, social, and spiritual domains, and increased medication adherence [9]. This evidence underscores the value of integrating

palliative care principles into routine TB nursing practice. Palliative care in TB should address not only physical symptoms but also psychological, social, and spiritual needs, which are often overlooked in traditional TB programmes [21- 23].

4. Technology-Integrated Nursing

4.1 Interventions for Medication Adherence

Ensuring adherence to prolonged TB treatment regimens is one of the most significant challenges in TB management, and nurses play a central role in addressing this challenge. Technology-integrated nursing interventions have emerged as powerful tools for supporting medication adherence. A scoping review published in BMC Nursing examined how nurses act as central facilitators in Video Directly Observed Treatment (VDOT) implementation [10]. In this model, nurses provide initial training, instruct patients and treatment supporters on video use, and follow up on missed doses or reported side effects [10]. The nurse's role is the main facilitator and monitor of the VDOT process, explaining and training the patient and the medication supervisor on the use of the selected video application or platform [10]. Beyond video-based approaches, technology-based nursing interventions through automated text messages (SMS reminders) have been shown to improve TB treatment completion rates [10]. Two-way SMS systems allow patients to confirm their adherence through message replies or phone calls, thereby increasing patient involvement in their treatment and helping the medical team monitor progress [10, 24- 25].

4.2 Comprehensive Nursing Care and Treatment Outcomes

The effectiveness of comprehensive nursing care on TB treatment outcomes has been systematically evaluated in meta-analytic studies. A meta-analysis published in the Chinese Journal of Antituberculosis examined 16 randomised controlled trials and found that comprehensive nursing care significantly increased the treatment compliance rate of tuberculosis patients (OR=4.87, 95% CI: 3.36-7.06) compared with conventional care [11]. Furthermore, the meta-analysis demonstrated that comprehensive nursing significantly enhanced patients' self-management abilities across multiple domains, including self-concept, self-responsibility, self-care skills, and health knowledge [11]. Mental health indicators also improved, with significantly lower anxiety and depression scores observed in patients receiving

comprehensive nursing care [11]. These findings highlight the importance of holistic nursing care that addresses both physical and psychological aspects of TB.

4.3 Discharge Planning and Continuity of Care

The transition from hospital care to community-based treatment is a critical juncture in the TB care continuum, and nurses play a leading role in ensuring successful discharge planning. A scoping review on the effectiveness of discharge planning interventions for patients with pulmonary tuberculosis found that discharge planning is increasingly recognised as a peri-discharge intervention that may reduce readmission by supporting treatment continuity and complication monitoring [12]. Discharge planning for pulmonary tuberculosis is implemented through nurse-led education, counselling, medication guidance, readiness assessment, family engagement, and continuity of care arrangements [12]. A more recent study constructed a discharge preparation service protocol for newly diagnosed drug-susceptible pulmonary tuberculosis patients based on the Timing Theory, comprising five primary indicators, 24 secondary indicators, and 70 tertiary indicators spanning the period from admission to six months post-discharge [12]. This protocol provides a practical pathway for clinicians delivering discharge planning services and underscores the importance of structured nursing involvement in care transitions.

5. The Role of Medical Laboratory in Tuberculosis Management

5.1 Diagnostic Testing and Techniques

The medical laboratory plays an indispensable role in the diagnosis and management of tuberculosis. Accurate and timely laboratory diagnosis is the cornerstone of effective TB control, enabling early initiation of treatment, detection of drug resistance, and monitoring of treatment response [13]. The traditional diagnostic method, sputum smear microscopy, remains widely used in many resource-limited settings due to its low cost and simplicity, but it lacks sensitivity, particularly in HIV-coinfected patients and children [13]. Culture-based methods, while more sensitive, require sophisticated infrastructure and can take weeks to yield results [13]. The introduction of molecular diagnostics, particularly the Xpert MTB/RIF assay, has revolutionised TB diagnosis by providing rapid, sensitive detection of *Mycobacterium tuberculosis* and simultaneous detection of

rifampicin resistance [14]. The Xpert MTB/RIF assay has been endorsed by the WHO and is now recommended as the initial diagnostic test for all persons with signs and symptoms of TB [14]. More recently, next-generation sequencing and other molecular technologies have further expanded the diagnostic armamentarium, allowing for comprehensive resistance profiling [16].

5.2 Quality Assurance and Biosafety

Quality assurance and biosafety are critical components of laboratory management in TB diagnostics. Laboratories must adhere to strict quality control procedures to ensure accurate and reliable results, including regular equipment calibration, reagent validation, and participation in external quality assessment schemes [13]. Biosafety is of paramount importance given the infectious nature of *M. tuberculosis*, which is classified as a Risk Group 3 organism [15]. Laboratories must implement appropriate containment measures, including biological safety cabinets, personal protective equipment, and engineering controls, to protect laboratory personnel and the environment [15]. The WHO Laboratory Biosafety Manual provides comprehensive guidance on risk assessment, containment levels, and safe work practices for handling infectious agents [15]. The Global Laboratory Initiative (GLI) has developed model TB diagnostic algorithms that integrate various testing modalities and provide guidance on their appropriate use in different settings [16].

5.3 Laboratory Information Systems

Effective laboratory information systems are essential for managing the large volumes of data generated in TB diagnostics, tracking specimens, reporting results, and facilitating communication with clinical teams [13]. Laboratory information systems (LIS) enable real-time result reporting, which is critical for timely clinical decision-making and initiation of treatment [13]. In many high-burden settings, the implementation of electronic LIS has improved turnaround times and reduced errors in result transmission [16]. Integration of laboratory data with patient records and national TB surveillance systems is essential for monitoring programme performance and identifying trends in drug resistance [16]. The Clinical and Laboratory Standards Institute provides guidelines for susceptibility testing that laboratories must follow to ensure accurate resistance detection [22].

6. The Role of Medical Secretary in Tuberculosis Management

6.1 Administrative Coordination and Scheduling

The medical secretary serves as a crucial administrative link in the multidisciplinary TB care team. While often overlooked in clinical literature, the role of the medical secretary is essential for the smooth operation of TB services. Medical secretaries are responsible for scheduling appointments, managing patient flow, and ensuring that patients are seen in a timely manner [17]. In TB care, where continuity of treatment is critical, the medical secretary's role in appointment scheduling and reminder systems directly impacts treatment adherence [17]. They coordinate with nursing staff to ensure that patients who miss appointments are contacted and rescheduled, thereby reducing the risk of treatment interruption [17].

6.2 Patient Records and Documentation

Accurate and comprehensive patient records are essential for TB management, and medical secretaries play a key role in maintaining these records. They are responsible for creating, updating, and safeguarding patient files, ensuring that all clinical encounters, test results, and treatment details are properly documented [18]. In TB care, where treatment regimens are prolonged and require careful monitoring, meticulous record-keeping is vital for tracking patient progress, identifying adverse drug reactions, and ensuring that appropriate follow-up occurs [18]. Medical secretaries also play a role in coding and billing, which affects reimbursement and resource allocation for TB services [18].

6.3 Communication and Referral Management

Effective communication among members of the TB care team is essential for coordinated care, and the medical secretary often serves as the central communication hub. They manage incoming and outgoing communications, including referrals to specialists, consultations, and communication with public health authorities [17]. In TB care, timely referral for drug susceptibility testing, specialist consultation, or social support services can significantly impact patient outcomes [17]. Medical secretaries ensure that referrals are processed efficiently and that results are communicated back to the treating team promptly [18]. They also play a role in patient education by providing information about appointments, test preparation, and treatment expectations [17].

7. The Role of Hospital Management in Tuberculosis Management

7.1 Infection Control and Prevention

Hospital management bears the ultimate responsibility for ensuring that infection control and prevention measures are in place to protect patients, staff, and visitors from TB transmission. This includes developing and implementing TB infection control plans, conducting risk assessments, and ensuring compliance with national and international guidelines [19]. Administrative controls, such as triage and isolation of suspected TB patients, environmental controls, such as ventilation and ultraviolet germicidal irradiation, and personal protective equipment are all part of a comprehensive infection control programme [19]. Hospital management must ensure that these measures are adequately resourced and that staff are trained in their proper use [15]. The Joint Commission International standards provide a framework for hospital infection control that can be applied to TB-specific programmes [19].

7.2 Resource Allocation and Staffing

Hospital management is responsible for allocating resources to TB services, including staffing, equipment, supplies, and infrastructure. Adequate staffing levels are essential for delivering quality TB care, and hospital management must ensure that there are sufficient numbers of trained nurses, laboratory personnel, and support staff [1]. Investment in laboratory infrastructure and equipment is critical for accurate and timely diagnosis [13]. Hospital management must also ensure that there is a reliable supply chain for TB medications and laboratory reagents, as stockouts can lead to treatment interruption and the development of drug resistance [1]. The allocation of resources should be guided by data on TB burden, service utilization, and outcomes [5]. The WHO guidelines for treatment of drug-susceptible tuberculosis provide recommendations on treatment regimens and patient care that hospital management must support [20].

7.3 Quality Assurance and Reporting

Hospital management is responsible for implementing quality assurance mechanisms to monitor and improve the quality of TB care. This includes establishing clinical audit systems, monitoring treatment outcomes, and ensuring compliance with national TB programme guidelines [1]. Hospital management must also ensure that TB

cases are reported to public health authorities as required by law, and that data are accurately recorded in national surveillance systems [1]. The WHO Global Tuberculosis Report relies on data reported by national programmes, and the accuracy of these data depends on the quality of reporting at the facility level [1]. Hospital management plays a key role in fostering a culture of quality improvement and accountability [19].

7.4 Interprofessional Collaboration in Tuberculosis Management

Effective management of tuberculosis requires seamless collaboration among nurses, medical laboratory scientists, medical secretaries, and hospital management. Each professional group brings unique expertise to the team, and optimal outcomes are achieved when these roles are well-coordinated and mutually supportive [2]. Interprofessional collaboration in TB care involves shared decision-making, clear communication, and mutual respect among team members [21]. For example, nurses rely on laboratory results to guide treatment decisions, while laboratory personnel depend on nurses to collect appropriate specimens and provide clinical information [13]. Medical secretaries facilitate communication and scheduling, ensuring that patients move smoothly through the care pathway [17]. Hospital management provides the infrastructure and resources that enable the team to function effectively [19]. Research has shown that team-based care models in TB are associated with improved treatment outcomes, reduced loss to follow-up, and higher patient satisfaction [6][8].

7.5 Challenges and Barriers

Despite the clear benefits of multidisciplinary TB management, several challenges and barriers impede optimal care. These include shortages of trained healthcare workers, inadequate laboratory infrastructure, limited funding, and weak health information systems [1][5]. In many high-burden settings, nurses are overburdened with high patient loads, leaving little time for comprehensive care [6]. Laboratory services may be centralized and inaccessible, leading to diagnostic delays [13]. Medical secretaries may lack specific training in TB care coordination [17]. Hospital management may face competing priorities and limited resources [19]. Additionally, stigma and discrimination associated with TB can deter patients from seeking care and adhering to treatment [2]. Addressing these challenges requires systemic solutions, including investment in health workforce,

strengthening of laboratory networks, and integration of TB services into primary health care [24]. The WHO Global Tuberculosis Report 2024 further highlights the need for sustained political commitment and funding to overcome these barriers [25].

8. Recommendations

Based on the evidence reviewed, several recommendations can be made to strengthen the roles of nursing, medical laboratory, medical secretary, and hospital management in TB management. First, investment in training and education for all professional groups is essential to ensure that they have the competencies required for TB care [21]. Second, task-shifting and task-sharing models should be expanded, particularly in resource-limited settings, to optimize the use of available human resources [8]. Third, laboratory capacity should be strengthened through investment in infrastructure, equipment, and quality assurance systems [16]. Fourth, the role of medical secretaries in TB care should be formally recognized and supported through training and clear job descriptions [17]. Fifth, hospital management should prioritize TB infection control and allocate adequate resources to TB services [19]. Sixth, interprofessional collaboration should be fostered through team-based training, shared protocols, and regular communication [6]. Finally, health systems should be strengthened to address the social determinants of TB, including poverty, malnutrition, and inadequate housing [24].

9. Conclusion

Tuberculosis remains a major global health challenge, but it is a challenge that can be met through coordinated, multidisciplinary efforts. Nurses, medical laboratory scientists, medical secretaries, and hospital management each play essential roles in the management of TB. Nurses provide frontline care, patient education, and psychosocial support; laboratory scientists deliver accurate and timely diagnostic services; medical secretaries ensure administrative coordination and continuity of care; and hospital management provides the infrastructure, resources, and oversight necessary for effective TB control. When these roles are well-integrated and supported, TB programmes can achieve better outcomes, including higher treatment success rates, reduced transmission, and improved patient quality of life. Achieving the goals of the End TB Strategy will require sustained investment in these professional roles and in the systems that support them. By

working together, the multidisciplinary TB care team can make significant progress toward eliminating tuberculosis as a public health threat.

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