

Enhancing the Management of Non-Tuberculous Mycobacteria Lung Infections: The Integral Role of Respiratory Therapists in a Multidisciplinary Approach

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Abstract

Background: Non-tuberculous mycobacteria (NTM) lung infections are complex and challenging to manage, requiring a multidisciplinary approach. Respiratory therapists (RTs) play a critical role in managing these infections through airway clearance, supporting antibiotic therapy adherence, and providing patient education.

Objective: This study explores the collaborative role of respiratory therapists in the management of NTM lung infections, focusing on their contributions to airway clearance, medication adherence, and patient education within a multidisciplinary team.

Methods: A qualitative descriptive study was conducted in a large tertiary care hospital, involving semi-structured interviews and focus group discussions with 25 healthcare professionals, including 15 respiratory therapists. Thematic analysis was used to identify key themes related to the role of RTs in NTM management.

Results: The findings revealed that RTs are integral to the management of NTM lung infections, providing expertise in personalized airway clearance techniques, educating patients on complex antibiotic regimens, and fostering patient self-management. Effective multidisciplinary collaboration was highlighted as crucial for optimizing patient outcomes.

Conclusion: Respiratory therapists play a vital role in managing NTM lung infections within a multidisciplinary framework. Enhancing training, standardizing protocols, and strengthening team collaboration are essential for improving patient care.

Keywords: Non-tuberculous mycobacteria, respiratory therapists, airway clearance, antibiotic adherence, multidisciplinary care, patient education

Introduction

Background: Non-tuberculous mycobacteria (NTM) lung infections are a growing concern in the field of respiratory medicine due to their increasing prevalence and complex treatment requirements. NTM infections, caused by various species of mycobacteria other than *Mycobacterium tuberculosis*, can lead to chronic and debilitating pulmonary diseases, particularly in individuals with underlying lung conditions such as bronchiectasis, chronic obstructive pulmonary disease (COPD), and cystic fibrosis (Prevots & Marras, 2015). The management of NTM lung infections is challenging, often requiring prolonged antibiotic therapy and extensive airway clearance measures to manage symptoms and prevent disease progression.

Challenges in Management: The treatment of NTM lung infections is notoriously difficult due to the pathogen's resistance to standard antibiotics and the need for long-term, multidrug regimens that can last 12 months or more (Daley et al., 2020). These treatments are often associated with significant side effects, leading to issues with patient adherence. Additionally, the complex nature of these infections requires a

comprehensive approach that goes beyond pharmacological intervention. Effective airway clearance is crucial for managing symptoms, preventing secondary infections, and improving overall lung function (Griffith et al., 2007).

Importance of a Multidisciplinary Approach: Given the complexity of managing NTM lung infections, a multidisciplinary approach is essential. Respiratory therapists (RTs) play a critical role in this collaborative care model, particularly in managing airway clearance, optimizing antibiotic therapy through patient education, and ensuring adherence to treatment protocols (Haworth et al., 2017). RTs are often the frontline providers who engage directly with patients to deliver therapies such as chest physiotherapy, nebulized medications, and other airway clearance techniques, all of which are vital for maintaining lung function and improving quality of life in patients with NTM lung infections.

Study Objective: This paper aims to explore the collaborative role of respiratory therapists in managing NTM lung infections, focusing on their contributions to airway clearance, antibiotic therapy adherence, and patient education. By examining the integral role of RTs within a multidisciplinary team, this study seeks to highlight the importance of their contributions to the effective management of this challenging condition.

Literature Review

Overview of Non-Tuberculous Mycobacteria (NTM) Lung Infections: Non-tuberculous mycobacteria (NTM) lung infections have become increasingly prevalent, particularly in individuals with underlying lung diseases such as bronchiectasis, chronic obstructive pulmonary disease (COPD), and cystic fibrosis (Prevots & Marras, 2015). NTM encompasses a diverse group of mycobacteria species, with *Mycobacterium avium* complex (MAC) and *Mycobacterium abscessus* being among the most common pathogens causing pulmonary disease (Griffith et al., 2007). These infections are challenging to manage due to their chronic nature, the need for prolonged treatment, and the high rate of recurrence and drug resistance.

Challenges in Managing NTM Lung Infections: Managing NTM lung infections is particularly challenging due to the complexity of the disease and the resistance of NTM to standard antibiotic regimens. Treatment often requires a combination of multiple antibiotics administered over a long duration, often exceeding 12 months (Daley et al., 2020). The prolonged use of antibiotics can lead to significant side effects, including hepatotoxicity, ototoxicity, and gastrointestinal disturbances, which can hinder patient adherence (Johnson & Odell, 2014). Additionally, the risk of drug interactions and the need for close monitoring further complicate the management of NTM infections.

Another major challenge in managing NTM lung infections is the need for effective airway clearance to manage symptoms, reduce bacterial load, and prevent further lung damage. Airway clearance techniques, such as chest physiotherapy, nebulized saline, and mucolytics, are essential components of the treatment regimen, especially in patients with underlying structural lung disease (Haworth et al., 2017). However, the effectiveness of these interventions depends heavily on patient adherence and the proper implementation of techniques, which require thorough patient education and ongoing support.

The Role of Respiratory Therapists in Managing NTM Lung Infections: Respiratory therapists (RTs) play a critical role in the multidisciplinary management of NTM lung infections. Their expertise in airway clearance techniques is invaluable in helping patients maintain lung function and manage symptoms effectively. RTs are often responsible for teaching patients how to perform airway clearance techniques at home, ensuring that they understand the importance of adherence to these practices (Flume et al., 2009). Additionally, RTs may be involved in the administration of nebulized therapies, monitoring of treatment efficacy, and adjustments based on patient response.

In addition to their role in airway clearance, RTs contribute significantly to patient education and adherence to antibiotic therapy. Given the complexity and side effects associated with NTM treatment regimens, RTs provide essential support in educating patients about their medication schedules, potential side effects, and the importance of completing the full course of therapy to prevent resistance and relapse (Griffith et al., 2007). This role is particularly important in outpatient settings, where RTs often serve as a primary point of contact for patients managing chronic conditions.

Multidisciplinary Approach to NTM Management: The management of NTM lung infections requires a multidisciplinary approach that includes pulmonologists, infectious disease specialists, respiratory therapists, nurses, and pharmacists. This collaborative effort ensures that all aspects of the disease are addressed, from diagnosis and treatment to ongoing management and patient education. The involvement of RTs in this team is crucial, as they bridge the gap between medical management and patient-centered care, providing hands-on support that is essential for successful long-term management of NTM lung infections (Haworth et al., 2017).

Despite the recognized importance of RTs in managing NTM lung infections, there is a lack of detailed research exploring their specific contributions within the multidisciplinary team. While some studies have highlighted the general role of RTs in chronic lung disease management, more focused research is needed to understand how their involvement specifically impacts the outcomes of patients with NTM lung infections. The management of NTM lung infections presents significant challenges that necessitate a comprehensive, multidisciplinary approach. Respiratory therapists play a vital role in this process, particularly in managing airway clearance and supporting patient adherence to complex treatment regimens. However, more research is needed to fully understand and optimize the contributions of RTs within the multidisciplinary team managing NTM lung infections.

Methodology

This study aimed to explore the collaborative role of respiratory therapists in managing non-tuberculous mycobacteria (NTM) lung infections within a multidisciplinary team, focusing on their contributions to airway clearance, antibiotic therapy adherence, and patient education. The research employed a qualitative descriptive approach to capture in-depth insights from healthcare professionals involved in the management of NTM lung infections.

Study Design: The research utilized a qualitative descriptive design, which is well-suited for understanding the experiences and roles of healthcare professionals in specific clinical settings. This approach allowed for a comprehensive exploration of the practices, challenges, and contributions of respiratory therapists in the context of managing NTM lung infections.

Setting: The study was conducted in a large tertiary care hospital known for their specialized respiratory care units. This hospital was selected because they have established multidisciplinary teams for managing complex pulmonary conditions, including NTM lung infections.

Participants

Participants were selected using purposive sampling to ensure a rich diversity of experiences and insights. The inclusion criteria were as follows:

- **Respiratory Therapists:** Certified respiratory therapists with at least two years of experience in managing patients with NTM lung infections.
- **Other Healthcare Professionals:** Pulmonologists, infectious disease specialists, and nurses who work closely with respiratory therapists in the management of NTM lung infections.

A total of 25 participants were included in the study, comprising 15 respiratory therapists, 5 pulmonologists, 3 infectious disease specialists, and 2 nurses. This diverse group provided a comprehensive perspective on the collaborative efforts in managing NTM lung infections.

Data Collection: Data were collected through semi-structured interviews and focus group discussions, providing both individual and group perspectives on the role of respiratory therapists. The semi-structured interviews were conducted with each participant individually, lasting approximately 45 to 60 minutes. The interviews were guided by an interview protocol that included open-ended questions focusing on:

- The role of respiratory therapists in airway clearance management.
- The involvement of respiratory therapists in ensuring adherence to antibiotic therapy.
- The challenges faced in patient education and strategies used to overcome them.
- The effectiveness of the multidisciplinary approach in managing NTM lung infections.

In addition to individual interviews, two focus group discussions were conducted with respiratory therapists to explore shared experiences and collaborative practices in more depth. Each focus group included 7 to 8 respiratory therapists and lasted about 90 minutes.

All interviews and focus group discussions were audio-recorded with participants' consent and transcribed verbatim for analysis.

Data Analysis: The data were analyzed using thematic analysis, a method well-suited for identifying, analyzing, and reporting patterns within qualitative data. The analysis followed these steps:

1. **Familiarization:** The researchers first immersed themselves in the data by reading and re-reading the transcripts, making initial notes on recurring ideas and concepts.
2. **Generating Initial Codes:** The data were systematically coded to identify meaningful segments related to the role and experiences of respiratory therapists in managing NTM lung infections.
3. **Searching for Themes:** Codes were then grouped into broader themes that represented key aspects of the data, such as "Airway Clearance Techniques," "Patient Education Challenges," and "Multidisciplinary Collaboration."
4. **Reviewing Themes:** The themes were reviewed and refined to ensure they accurately captured the underlying data and were relevant to the research questions.
5. **Defining and Naming Themes:** Each theme was clearly defined, and subthemes were identified where necessary to provide a more nuanced understanding of the data.

NVivo software was used to assist in organizing and managing the data during the analysis process.

Ethical Considerations: The study was approved by the ethics committee. Written informed consent was obtained from all participants, ensuring they were fully informed about the study's purpose, procedures, and their right to withdraw at any time. Confidentiality was maintained by anonymizing all data, and only the research team had access to the audio recordings and transcripts.

Rigor and Trustworthiness

To ensure the rigor and trustworthiness of the study, the following strategies were employed:

- **Credibility:** Member checking was conducted by sharing the preliminary findings with a subset of participants to verify the accuracy of the interpretations.
- **Transferability:** Detailed descriptions of the study context and participant characteristics were provided to allow for the transferability of findings to similar settings.
- **Dependability:** An audit trail was maintained throughout the research process, documenting all methodological decisions and changes.
- **Confirmability:** Reflexivity was practiced by the researchers, who kept reflective journals to acknowledge and mitigate any potential biases.

Findings

The analysis of the interviews and focus group discussions with respiratory therapists and other healthcare professionals revealed several key themes related to the management of non-tuberculous mycobacteria (NTM) lung infections. These themes highlight the crucial role of respiratory therapists in a multidisciplinary approach, focusing on airway clearance, antibiotic therapy adherence, and patient education. The findings are organized into four main themes with corresponding subthemes, supported by direct quotes from participants.

Theme 1: Role in Airway Clearance

Subtheme 1.1: Expertise in Airway Clearance Techniques

- **Participant 4 (Respiratory Therapist):** "Our primary role is ensuring effective airway clearance. Techniques like chest physiotherapy and the use of devices such as oscillating positive expiratory pressure (OPEP) are key in helping patients clear mucus and maintain lung function."
- **Participant 9 (Pulmonologist):** "Respiratory therapists are essential in managing airway clearance for our NTM patients. They teach patients techniques they can use at home, which makes a huge difference in disease management."

Subtheme 1.2: Personalized Airway Clearance Plans

- **Participant 7 (Respiratory Therapist):** "We create individualized airway clearance plans based on the patient's condition and capabilities. It's not a one-size-fits-all approach—what works for one patient might not work for another."
- **Participant 11 (Infectious Disease Specialist):** "The respiratory therapists are excellent at tailoring airway clearance regimens to meet the specific needs of each patient, which is critical for the effectiveness of the overall treatment plan."

Theme 2: Supporting Antibiotic Therapy Adherence**Subtheme 2.1: Educating Patients on Antibiotic Regimens**

- **Participant 2 (Respiratory Therapist):** "We spend a lot of time educating patients about their antibiotic regimen—why they need to take multiple medications, the importance of timing, and how to manage side effects. It's crucial for adherence."
- **Participant 8 (Nurse):** "The respiratory therapists work closely with patients to reinforce the importance of sticking to their antibiotic schedule, which is often complex and difficult to manage."

Subtheme 2.2: Monitoring and Addressing Side Effects

- **Participant 6 (Respiratory Therapist):** "Many patients struggle with the side effects of long-term antibiotic use. We monitor these closely and work with the team to adjust treatment plans if necessary."
- **Participant 10 (Pulmonologist):** "The respiratory therapists are vigilant in monitoring patients for side effects. Their input is invaluable in managing these complex treatment regimens effectively."

Theme 3: Patient Education and Empowerment**Subtheme 3.1: Comprehensive Patient Education**

- **Participant 3 (Respiratory Therapist):** "Education is a big part of what we do. We teach patients not just about airway clearance and medication but also about lifestyle changes and how to manage their condition day-to-day."
- **Participant 14 (Respiratory Therapist):** "Patients need to understand their disease to be proactive in their care. We make sure they have the knowledge and tools to manage their condition at home."

Subtheme 3.2: Encouraging Self-Management

- **Participant 12 (Respiratory Therapist):** "We empower patients to take control of their health by teaching them self-management techniques. This not only improves outcomes but also helps them feel more in control of their condition."
- **Participant 5 (Pulmonologist):** "Respiratory therapists are key in building patient confidence in managing their disease. They provide ongoing support that helps patients stick to their treatment plans."

Theme 4: Multidisciplinary Collaboration**Subtheme 4.1: Effective Communication within the Healthcare Team**

- **Participant 1 (Respiratory Therapist):** "Communication with the rest of the healthcare team is vital. We discuss each patient's progress in team meetings and adjust our approaches based on their needs."
- **Participant 13 (Infectious Disease Specialist):** "The collaborative efforts between respiratory therapists, pulmonologists, and other specialists ensure that we provide comprehensive care to our patients."

Subtheme 4.2: Coordinating Care Plans

- **Participant 15 (Respiratory Therapist):** "Coordinating care plans with the entire team is essential. We all bring different expertise to the table, and when we collaborate effectively, it really benefits the patient."
- **Participant 16 (Nurse):** "Respiratory therapists often take the lead in coordinating the airway clearance and antibiotic management aspects of care, ensuring everything aligns with the patient's overall treatment plan."

Discussion

This study explored the collaborative role of respiratory therapists in managing non-tuberculous mycobacteria (NTM) lung infections, with a focus on their contributions to airway clearance, antibiotic therapy adherence, and patient education. The findings underscore the critical importance of respiratory therapists within a multidisciplinary team, highlighting their expertise in managing complex and chronic conditions such as NTM lung infections. The discussion below reflects on the key themes identified in the study, compares them with existing literature, and considers the implications for clinical practice and future research.

Role in Airway Clearance: The study findings emphasized the pivotal role respiratory therapists play in managing airway clearance for patients with NTM lung infections. Participants described how personalized airway clearance techniques, such as chest physiotherapy and the use of oscillating positive expiratory pressure (OPEP) devices, are essential in maintaining lung function and preventing the progression of the disease. These findings align with existing literature that stresses the importance of airway clearance in managing chronic lung infections, particularly in patients with bronchiectasis or other underlying lung conditions (Flume et al., 2009).

The personalized approach to airway clearance highlighted in this study reflects the need for tailored treatment plans that consider each patient's unique condition and capabilities. This customization is crucial, as ineffective airway clearance can lead to mucus accumulation, worsening of infection, and further lung damage. The study confirms that respiratory therapists are integral to ensuring these techniques are applied effectively and consistently, supporting previous research on the critical role of respiratory therapists in chronic respiratory disease management (Haworth et al., 2017).

Supporting Antibiotic Therapy Adherence: Adherence to long-term antibiotic therapy is a significant challenge in the management of NTM lung infections, primarily due to the complex regimens and potential side effects. The study participants highlighted the role of respiratory therapists in educating patients about their antibiotic regimens and monitoring for side effects, which is essential for improving adherence and optimizing treatment outcomes. These findings are consistent with the literature that identifies patient education and monitoring as key strategies in managing chronic infections (Griffith et al., 2007).

The study also revealed the importance of respiratory therapists in detecting and managing side effects, which can be a major barrier to adherence. By working closely with the rest of the healthcare team, respiratory therapists can help adjust treatment plans as needed, ensuring that patients can tolerate and adhere to their therapy. This collaborative approach is crucial in managing the long-term and often difficult treatment regimens required for NTM infections, as supported by the findings of Johnson and Odell (2014).

Patient Education and Empowerment: Comprehensive patient education emerged as a central theme in this study, with respiratory therapists playing a key role in empowering patients to manage their condition effectively. The findings highlight how respiratory therapists provide essential education on airway clearance techniques, medication management, and lifestyle changes, all of which are crucial for patient self-management. This emphasis on patient education is well-documented in the literature, which underscores the importance of informed and empowered patients in managing chronic diseases (Holland & Button, 2016).

The study also found that respiratory therapists help patients develop confidence in their ability to manage their condition, which is vital for long-term success in chronic disease management. By fostering a sense of control and self-efficacy, respiratory therapists contribute to improved adherence and better health outcomes, consistent with the principles of patient-centered care (Bourbeau & Bartlett, 2013).

Multidisciplinary Collaboration: Effective multidisciplinary collaboration was identified as essential for the successful management of NTM lung infections. The study highlighted the importance of communication and coordination among healthcare professionals, with respiratory therapists playing a crucial role in bridging the gap between different aspects of patient care. This finding is supported by the literature, which emphasizes the value of a team-based approach in managing complex chronic diseases (Haworth et al., 2017).

The study participants noted that regular team meetings and open communication channels are vital for ensuring that all aspects of a patient's care are aligned and that any issues are promptly addressed. This collaborative approach not only improves patient outcomes but also enhances the overall efficiency of the care process. The importance of such collaboration is widely recognized in the management of chronic respiratory diseases, where coordinated care plans are essential for optimizing treatment (Griffith et al., 2007).

Implications for Clinical Practice: The findings of this study have several important implications for clinical practice:

1. **Enhanced Training and Education:** There is a need for ongoing training and education for respiratory therapists to ensure they are equipped with the latest knowledge and techniques for managing NTM lung infections. This includes training in advanced airway clearance techniques, patient education strategies, and the management of complex antibiotic regimens.
2. **Standardization of Airway Clearance Protocols:** Developing standardized protocols for airway clearance in patients with NTM lung infections could help ensure consistency in care and optimize treatment outcomes. These protocols should be flexible enough to allow for personalization based on individual patient needs.
3. **Strengthening Multidisciplinary Collaboration:** Encouraging regular communication and collaboration among healthcare team members is essential for the successful management of NTM lung infections. This includes holding regular team meetings, ensuring clear communication channels, and fostering a team culture that values each member's contributions.

Limitations and Future Research

While this study provides valuable insights into the role of respiratory therapists in managing NTM lung infections, it is not without limitations. The qualitative nature of the study and the relatively small sample size may limit the generalizability of the findings. Future research should consider larger, multi-center studies to confirm these findings and explore the role of respiratory therapists in different healthcare settings.

Further research is also needed to explore the long-term impact of respiratory therapist interventions on patient outcomes in NTM lung infections, as well as to evaluate the effectiveness of specific airway clearance techniques and educational strategies.

Conclusion

This study highlights the critical role of respiratory therapists in managing NTM lung infections, particularly within a multidisciplinary team. Their expertise in airway clearance, support for antibiotic therapy adherence, and patient education are essential components of effective disease management. By enhancing training, standardizing protocols, and strengthening multidisciplinary collaboration, healthcare teams can improve outcomes for patients with NTM lung infections.

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