

# Evaluating the Role of Respiratory Therapists in Pulmonary Function Testing: Impact on Diagnostic Accuracy and Patient Care

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## Abstract

**Background:** Pulmonary function testing (PFT) is essential for diagnosing and managing respiratory diseases. Respiratory therapists (RTs) play a crucial role in conducting and interpreting these tests, but their impact on diagnostic accuracy and patient care has not been thoroughly evaluated.

**Objective:** This study evaluates the impact of respiratory therapists on the accuracy of pulmonary function testing and subsequent patient care, comparing outcomes in settings with and without RT involvement.

**Methods:** A retrospective cohort study was conducted with 400 patients in a large tertiary care hospital. Patients were divided into two groups: those whose PFTs were performed and interpreted with RT involvement (RT Group) and those without RT involvement (Non-RT Group). Diagnostic accuracy, patient management decisions, and 12-month patient outcomes were analyzed.

**Results:** The RT Group demonstrated significantly higher diagnostic accuracy (92.5% vs. 81.0%,  $p < 0.001$ ) and more appropriate treatment adjustments (75.0% vs. 60.0%,  $p = 0.005$ ) compared to the Non-RT Group. Additionally, the RT Group had lower hospitalization rates (15.0% vs. 25.0%,  $p = 0.018$ ) and reduced disease progression (10.0% vs. 18.0%,  $p = 0.022$ ).

**Conclusion:** Respiratory therapists significantly enhance the accuracy of pulmonary function testing, leading to better patient management and outcomes. Integrating RTs into the PFT process is essential for optimizing respiratory care.

**Keywords:** Pulmonary function testing, respiratory therapists, diagnostic accuracy, patient outcomes, spirometry, respiratory care

## Introduction

Pulmonary function testing (PFT) is a cornerstone in the diagnosis and management of respiratory diseases. These tests, which include spirometry, lung volume measurement, and diffusion capacity testing, provide critical information about lung function, helping clinicians diagnose conditions such as asthma, chronic obstructive pulmonary disease (COPD), and restrictive lung diseases (Miller et al., 2005). Accurate PFT results are essential for effective patient management, guiding decisions about treatment, monitoring disease progression, and evaluating the impact of therapeutic interventions (Pellegrino et al., 2005).

However, the accuracy and reliability of pulmonary function tests can be influenced by several factors, including patient cooperation, the technical expertise of the operator, and the quality of the equipment used. Respiratory therapists (RTs) play a pivotal role in the administration and interpretation of PFTs, leveraging their specialized training to ensure that tests are conducted correctly and that the results are accurately interpreted (Shelledy et al., 2009). Their involvement is particularly crucial in ensuring that PFTs are standardized, reproducible, and reflective of the patient's true lung function, which is essential for accurate diagnosis and effective patient management (Crapo et al., 2000).

The role of respiratory therapists extends beyond merely performing the tests; they also provide patient education, encourage optimal effort during the tests, and contribute to the interpretation of the results. By ensuring that patients understand the importance of the tests and are properly coached, RTs can significantly impact the quality of the test results. Furthermore, their expertise in pulmonary physiology allows them to

assist physicians in interpreting complex PFT data, leading to more accurate diagnoses and tailored treatment plans (Shelledy et al., 2009).

Despite the recognized importance of respiratory therapists in the pulmonary function testing process, there is limited research specifically evaluating their impact on diagnostic accuracy and patient outcomes. Most existing studies focus on the technical aspects of PFTs, with less emphasis on the human factors, such as the role of RTs, that contribute to the overall quality of testing and patient care (Miller et al., 2005). This gap in the literature suggests a need for further exploration of how RTs contribute to the accuracy of PFTs and how their involvement influences patient management decisions.

This study aims to evaluate the impact of respiratory therapists on the accuracy of pulmonary function testing and subsequent patient care. By comparing PFT results and patient outcomes in settings with and without the active involvement of RTs, this research seeks to provide a clearer understanding of the critical role RTs play in respiratory diagnostics and the management of respiratory diseases.

## Literature Review

**The Importance of Pulmonary Function Testing in Respiratory Care:** Pulmonary function testing (PFT) is a fundamental tool in the diagnosis, assessment, and management of respiratory diseases. These tests measure various aspects of lung function, including airflow, lung volumes, and gas exchange, providing critical data that helps clinicians diagnose conditions such as asthma, chronic obstructive pulmonary disease (COPD), and interstitial lung disease (Miller et al., 2005). Accurate PFT results are essential for making informed clinical decisions, including the initiation or adjustment of therapies, monitoring disease progression, and evaluating the effectiveness of interventions (Pellegrino et al., 2005).

The accuracy and reliability of PFTs are influenced by several factors, including the quality of the equipment, the patient's ability to perform the tests correctly, and the expertise of the healthcare professional conducting and interpreting the tests (Crapo et al., 2000). Misinterpretation of PFT results can lead to incorrect diagnoses, inappropriate treatment plans, and potentially adverse patient outcomes. Therefore, ensuring the accuracy of PFTs is paramount in respiratory care.

**The Role of Respiratory Therapists in Pulmonary Function Testing:** Respiratory therapists (RTs) play a critical role in the administration and interpretation of pulmonary function tests. Their specialized training in respiratory physiology and testing procedures equips them with the skills needed to conduct PFTs accurately and efficiently (Shelledy et al., 2009). RTs are responsible for guiding patients through the testing process, ensuring that the tests are performed according to standardized protocols, and that the results are reliable and reproducible (Hansen et al., 2007).

RTs also contribute to the interpretation of PFT results. Given their expertise in respiratory care, RTs are often involved in the initial assessment of test results, identifying potential errors or anomalies before the data are reviewed by a physician. This initial assessment is crucial, as it helps prevent misdiagnosis and ensures that the patient receives appropriate care based on accurate test results (Shelledy et al., 2009).

Furthermore, RTs play a vital role in patient education and coaching during PFTs. Studies have shown that patient cooperation is a significant factor in the accuracy of PFTs, and RTs are instrumental in ensuring that patients understand the importance of the tests and perform them correctly (Miller et al., 2005). By providing clear instructions and support, RTs can help patients achieve optimal performance during the tests, leading to more accurate results.

**Impact of Respiratory Therapists on Diagnostic Accuracy:** The involvement of respiratory therapists in PFTs has been associated with improved diagnostic accuracy. RTs' ability to standardize testing procedures, identify technical errors, and ensure patient cooperation contributes to the overall quality of the test results (Crapo et al., 2000). Research has shown that when RTs are actively involved in the testing process, there is a lower likelihood of errors in test administration and interpretation, leading to more accurate diagnoses (Shelledy et al., 2009).

However, despite the critical role of RTs in PFTs, there is limited research specifically evaluating their impact on diagnostic accuracy. Most studies focus on the technical aspects of PFTs, such as the calibration of equipment and the standardization of test procedures, with less emphasis on the human factors, such as the role of RTs, that contribute to the overall quality of testing (Hansen et al., 2007). This gap in the literature highlights the need for further investigation into how RTs influence the accuracy of PFTs and the subsequent impact on patient care.

**Patient Outcomes and Management:** Accurate pulmonary function testing is essential for effective patient management. PFT results guide clinical decisions regarding the diagnosis and treatment of respiratory conditions, and errors in testing or interpretation can lead to mismanagement of the disease. For instance, incorrect PFT results could lead to the under- or over-treatment of conditions like asthma or COPD, potentially resulting in worsened patient outcomes (Pellegrino et al., 2005).

Respiratory therapists, by ensuring the accuracy of PFTs, directly contribute to better patient outcomes. Their involvement in the testing process helps to ensure that patients receive appropriate diagnoses and treatment plans based on reliable data. Moreover, RTs often play a role in the ongoing management of patients with chronic respiratory diseases, using PFT results to monitor disease progression and adjust treatment as needed (Shelledy et al., 2009).

The literature suggests that the presence of RTs in the pulmonary function testing process not only improves the accuracy of diagnoses but also enhances the overall quality of patient care. By contributing to accurate testing and interpretation, RTs help to ensure that patients receive the most effective treatments, leading to better health outcomes.

**Challenges and Best Practices in Pulmonary Function Testing:** While respiratory therapists contribute significantly to the quality of pulmonary function testing, several challenges can affect the accuracy and reliability of PFTs. These challenges include variations in patient effort, difficulties in standardizing procedures across different healthcare settings, and the potential for technical errors in test administration (Crapo et al., 2000).

To address these challenges, best practices in PFT administration emphasize the importance of standardized protocols, regular equipment calibration, and thorough patient instruction. RTs are central to implementing these best practices, as their expertise allows them to identify and correct issues that could compromise the accuracy of the tests (Miller et al., 2005). By adhering to these best practices, RTs help to minimize errors and ensure that PFT results are both accurate and reliable.

**Gaps in Research and the Need for Further Study:** Although the literature acknowledges the importance of respiratory therapists in pulmonary function testing, there is a lack of focused research on the specific impact of RTs on diagnostic accuracy and patient outcomes. Most existing studies emphasize the technical aspects of PFTs, with less attention given to the human factors that influence the quality of testing.

This gap in the literature underscores the need for further research to evaluate the role of respiratory therapists in PFTs more comprehensively. Future studies should explore how RT involvement affects diagnostic accuracy, patient management decisions, and long-term health outcomes. Such research would provide valuable insights into the contributions of RTs to respiratory care and help to identify areas for improvement in the pulmonary function testing process.

Pulmonary function testing is a critical component of respiratory care, providing essential data for the diagnosis and management of respiratory diseases. Respiratory therapists play a vital role in ensuring the accuracy and reliability of PFTs, contributing to better diagnostic outcomes and improved patient care. However, there is a need for further research to explore the specific impact of RTs on PFT accuracy and patient outcomes. By addressing this gap in the literature, future studies can help to enhance the role of respiratory therapists in pulmonary function testing and improve the overall quality of respiratory care.

## Methodology

This study aimed to evaluate the impact of respiratory therapists (RTs) on the accuracy of pulmonary function testing (PFT) and subsequent patient care. A retrospective cohort design was employed to compare the accuracy of PFT results and related patient outcomes in settings with and without the active involvement of RTs.

**Study Design:** The study utilized a retrospective cohort design to analyze data from patients who underwent pulmonary function testing over a two-year period. The study compared two groups: one group in which PFTs were performed and interpreted with the active involvement of respiratory therapists (RT Group), and another group where PFTs were conducted without direct RT involvement (Non-RT Group). This design allowed for a comparative analysis of diagnostic accuracy and patient outcomes between the two groups.

**Setting:** The study was conducted at a large tertiary care hospital with advanced pulmonary function testing facilities. This hospital was selected based on their comprehensive respiratory care programs and the presence of dedicated respiratory therapy departments. The diversity of settings provided a broad perspective on the role of RTs in different clinical environments.

**Participants:** Participants were selected based on the following inclusion criteria:

- Adult patients ( $\geq 18$  years) who underwent pulmonary function testing for the diagnosis or management of respiratory conditions, such as asthma, COPD, interstitial lung disease, or other pulmonary disorders.
- Patients who had complete PFT data available, including spirometry, lung volumes, and diffusion capacity (DLCO) tests.
- Availability of follow-up data to assess the impact of PFT results on patient management and outcomes.

Patients were excluded if they had incomplete PFT data, were unable to perform the tests due to severe physical or cognitive limitations, or if their tests were performed during emergency settings where standardized procedures could not be followed.

A total of 400 patients were included in the study, with 200 patients in the RT Group and 200 patients in the Non-RT Group. The groups were matched for age, gender, and underlying respiratory conditions to reduce potential confounding factors.

**Data Collection:** Data were collected retrospectively from the electronic health records (EHRs) of the hospital. The following key variables were extracted:

- **Pulmonary Function Test Results:** Including forced vital capacity (FVC), forced expiratory volume in one second (FEV1), FEV1/FVC ratio, total lung capacity (TLC), and diffusion capacity (DLCO).
- **Diagnostic Outcomes:** Accuracy of the initial diagnosis based on PFT results, as confirmed by follow-up clinical assessments, imaging, or further testing.
- **Patient Management Decisions:** Changes in treatment plans based on PFT results, such as the initiation of new therapies, adjustments in medication, or referral to specialized care.
- **Patient Outcomes:** Follow-up data on disease progression, hospitalization rates, and any complications related to the respiratory condition over a 12-month period.

The involvement of respiratory therapists in each case was documented, including their role in conducting the tests, providing patient education, and contributing to the interpretation of results.

**Data Analysis:** Data analysis was conducted using SPSS (Version 26.0). Descriptive statistics were used to summarize the baseline characteristics of the two groups. Continuous variables, such as PFT results, were compared using independent t-tests, while categorical variables, such as diagnostic accuracy and patient outcomes, were compared using chi-square tests.

To assess the impact of RT involvement on diagnostic accuracy, the primary outcome was the percentage of correct diagnoses made based on PFT results in each group. A correct diagnosis was defined as one that was confirmed by follow-up clinical assessments or additional diagnostic testing.

Multivariate logistic regression analysis was performed to control for potential confounding variables, such as age, gender, and the severity of the underlying respiratory condition. The secondary outcomes included changes in patient management and overall patient outcomes, such as hospitalization rates and disease progression.

### **Ethical Considerations**

The study was approved by the ethics committee. Given the retrospective nature of the study, informed consent was waived, but patient confidentiality was strictly maintained by anonymizing all data before analysis. All data were securely stored, and access was limited to the research team.

### **Rigor and Trustworthiness**

Several strategies were employed to ensure the rigor and trustworthiness of the study:

- **Data Triangulation:** Data were collected from multiple sources within the EHRs, including PFT results, clinical notes, and follow-up records, to ensure a comprehensive analysis.
- **Inter-Rater Reliability:** A subset of data was independently reviewed by two researchers to ensure consistency in data extraction and coding, with discrepancies resolved through discussion.
- **Sensitivity Analysis:** Sensitivity analyses were conducted to assess the robustness of the findings, particularly the impact of excluding patients with incomplete data or those in emergency settings.

## Findings

The study analyzed data from 400 patients who underwent pulmonary function testing (PFT) across three tertiary care hospitals. The patients were divided into two groups: the RT Group, where respiratory therapists were actively involved in performing and interpreting PFTs, and the Non-RT Group, where PFTs were conducted without direct RT involvement. The findings are presented below, focusing on diagnostic accuracy, patient management, and overall patient outcomes.

**1. Diagnostic Accuracy:** The primary outcome of the study was the diagnostic accuracy of pulmonary function tests, defined as the percentage of correct diagnoses confirmed by follow-up clinical assessments or additional diagnostic testing. The results showed that the RT Group had significantly higher diagnostic accuracy compared to the Non-RT Group.

**Table 1: Diagnostic Accuracy Between RT Group and Non-RT Group**

Group	Correct Diagnoses (%)	Incorrect Diagnoses (%)	p-value
RT Group	92.5	7.5	<0.001
Non-RT Group	81.0	19.0	

As shown in Table 1, the RT Group had a correct diagnosis rate of 92.5%, significantly higher than the 81.0% observed in the Non-RT Group ( $p < 0.001$ ). This suggests that the involvement of respiratory therapists in the PFT process is associated with improved diagnostic accuracy.

**2. Impact on Patient Management:** The study also assessed the impact of respiratory therapist involvement on patient management decisions, including changes in treatment plans based on PFT results. The RT Group showed a higher rate of appropriate treatment changes based on accurate PFT interpretation.

**Table 2: Changes in Patient Management Based on PFT Results**

Outcome	RT Group (n=200)	Non-RT Group (n=200)	p-value
Treatment Plan Adjusted (%)	75.0	60.0	0.005
Referral to Specialist (%)	30.5	20.0	0.010
No Change in Management (%)	24.0	39.0	0.004

Table 2 indicates that 75.0% of patients in the RT Group had their treatment plans adjusted based on PFT results, compared to 60.0% in the Non-RT Group ( $p = 0.005$ ). Additionally, the RT Group had a higher rate of referrals to specialists (30.5% vs. 20.0%,  $p = 0.010$ ), reflecting the greater accuracy and confidence in PFT interpretation by RTs. Conversely, the Non-RT Group had a higher percentage of patients with no change in management, suggesting potential underutilization of PFT results.



**3. Patient Outcomes:** The study evaluated patient outcomes over a 12-month follow-up period, including hospitalization rates due to respiratory complications and overall disease progression. The findings suggest that the involvement of RTs in PFTs contributed to better patient outcomes.

**Table 3: Patient Outcomes Over 12-Month Follow-Up**

Outcome	RT Group (n=200)	Non-RT Group (n=200)	p-value
Hospitalization Rate (%)	15.0	25.0	0.018
Disease Progression (Worsened) (%)	10.0	18.0	0.022
Stable Disease (%)	80.0	70.0	0.036

Table 3 shows that the RT Group had a lower hospitalization rate (15.0%) compared to the Non-RT Group (25.0%) ( $p = 0.018$ ). Additionally, fewer patients in the RT Group experienced disease progression (10.0% vs. 18.0%,  $p = 0.022$ ), and a higher percentage of patients in the RT Group had stable disease over the follow-up period (80.0% vs. 70.0%,  $p = 0.036$ ).

## Discussion

This study aimed to evaluate the impact of respiratory therapists (RTs) on the accuracy of pulmonary function testing (PFT) and subsequent patient care, focusing on diagnostic accuracy, patient management, and overall patient outcomes. The findings provide compelling evidence that the involvement of RTs in PFTs significantly enhances the quality of respiratory diagnostics and improves patient outcomes.

**Diagnostic Accuracy:** One of the most significant findings of this study is the higher diagnostic accuracy observed in the RT Group compared to the Non-RT Group. The correct diagnosis rate in the RT Group was 92.5%, significantly higher than the 81.0% in the Non-RT Group. This finding underscores the critical role that RTs play in ensuring the accuracy of pulmonary function tests. Their specialized training and expertise in respiratory physiology allow them to conduct PFTs with greater precision and to identify potential errors or anomalies during the testing process (Shelledy et al., 2009). This higher accuracy likely results from the RTs' ability to standardize testing procedures, provide real-time patient coaching, and ensure that the test results accurately reflect the patient's lung function (Miller et al., 2005).

The improved diagnostic accuracy associated with RT involvement has important clinical implications. Accurate PFT results are essential for making correct diagnoses and developing effective treatment plans. Misdiagnosis or incorrect interpretation of PFT results can lead to inappropriate treatments, which may worsen patient outcomes. The higher diagnostic accuracy in the RT Group suggests that integrating RTs into the PFT process can help reduce the risk of misdiagnosis and ensure that patients receive appropriate care based on accurate data.

**Impact on Patient Management:** The study also found that the involvement of RTs in PFTs led to more appropriate patient management decisions. In the RT Group, 75.0% of patients had their treatment plans adjusted based on PFT results, compared to 60.0% in the Non-RT Group. This suggests that RTs not only contribute to more accurate testing but also play a crucial role in interpreting the results and guiding clinical decisions.

The higher rate of treatment plan adjustments in the RT Group reflects the RTs' ability to provide valuable insights into the patient's condition, ensuring that the management plan is tailored to the specific needs of the patient. This finding aligns with previous research that highlights the importance of RTs in contributing to the interpretation of PFT results and collaborating with physicians to optimize patient care (Shelledy et al., 2009). Moreover, the RT Group had a higher rate of referrals to specialists (30.5% vs. 20.0%), indicating that RTs are more likely to identify cases that require further evaluation by a specialist. This proactive approach can lead to earlier interventions, potentially preventing disease progression and improving patient outcomes.

**Patient Outcomes:** The study's analysis of patient outcomes over a 12-month follow-up period revealed that patients in the RT Group experienced better outcomes than those in the Non-RT Group. Specifically, the RT Group had a lower hospitalization rate (15.0% vs. 25.0%) and a lower rate of disease progression (10.0% vs. 18.0%). Additionally, a higher percentage of patients in the RT Group had stable disease over the follow-up period (80.0% vs. 70.0%).

These findings suggest that the involvement of RTs in PFTs contributes to more effective disease management, leading to fewer hospitalizations and better long-term outcomes for patients. The lower hospitalization rates in the RT Group are particularly significant, as they indicate that accurate PFTs and appropriate management decisions can reduce the need for acute care interventions, thereby improving the overall quality of life for patients with respiratory conditions.

The reduced rate of disease progression in the RT Group further highlights the importance of RTs in ensuring that patients receive timely and effective treatment based on accurate PFT results. By contributing to more precise diagnoses and appropriate management plans, RTs help to stabilize the patient's condition and prevent the worsening of respiratory diseases.

### **Implications for Clinical Practice**

The findings of this study have several important implications for clinical practice. First, they underscore the critical role of respiratory therapists in pulmonary function testing. The involvement of RTs in PFTs leads to more accurate diagnoses, better-informed management decisions, and improved patient outcomes. Therefore, healthcare institutions should prioritize the integration of RTs into the PFT process to enhance the quality of care in respiratory diagnostics.

Second, the study highlights the importance of training and continuing education for respiratory therapists. Ensuring that RTs are well-equipped with the latest knowledge and skills in pulmonary function testing and respiratory care is essential for maintaining high standards of diagnostic accuracy and patient care. Healthcare institutions should invest in ongoing professional development opportunities for RTs to keep them updated on best practices and emerging technologies in respiratory care.

Finally, the study suggests that interdisciplinary collaboration between RTs, physicians, and other healthcare professionals is crucial for optimizing patient outcomes. RTs' expertise in conducting and interpreting PFTs should be leveraged as part of a collaborative approach to patient care, ensuring that all aspects of the patient's respiratory health are addressed comprehensively.

### **Limitations**

While this study provides valuable insights into the role of respiratory therapists in pulmonary function testing, it is not without limitations. The retrospective design may introduce selection bias, and the results may not be generalizable to all clinical settings, particularly those with different levels of RT involvement. Additionally, the reliance on electronic health record (EHR) data may limit the completeness and accuracy of the information available for analysis.

Future research should consider prospective studies with larger, more diverse patient populations to validate these findings and explore the long-term impact of RT involvement in PFTs. Additionally, studies that include patient perspectives on the care provided by RTs during PFTs could offer a more comprehensive understanding of the patient experience and the value of RTs in respiratory diagnostics.

### **Conclusion**

This study demonstrates that the involvement of respiratory therapists in pulmonary function testing significantly enhances diagnostic accuracy, improves patient management decisions, and leads to better patient outcomes. The findings underscore the importance of integrating RTs into the PFT process and highlight the need for continued investment in the training and professional development of RTs. By prioritizing the role of RTs in respiratory diagnostics, healthcare institutions can ensure that patients receive the highest quality of care, leading to more accurate diagnoses, more effective treatments, and improved long-term health outcomes for individuals with respiratory conditions.

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