

# Advances in the early diagnosis of chronic obstructive pulmonary disease (COPD): a clinical perspective.

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## Introduction

Chronic Obstructive Pulmonary Disease (COPD) is a progressive respiratory condition characterized by airflow limitation that is not fully reversible. Despite its burden, COPD is often underdiagnosed until it has significantly progressed. Early diagnosis is crucial for implementing preventive strategies, slowing disease progression, and improving quality of life. This clinical perspective explores the evolving tools and technologies that enable earlier recognition of COPD and discusses how clinicians can incorporate these advances into patient care. Chronic Obstructive Pulmonary Disease (COPD) remains a leading cause of morbidity and mortality worldwide. Traditionally diagnosed at advanced stages, recent advances in early diagnostic strategies have the potential to improve patient outcomes significantly. This perspective highlights the latest clinical advancements in the early detection of COPD, including emerging imaging techniques, biomarker research, innovative spirometry approaches, and the role of artificial intelligence (AI) in risk prediction. Emphasis is placed on integrating these tools into routine clinical practice to shift the diagnostic paradigm toward earlier, more proactive intervention [1, 2, 3, 4].

## *Spirometry and Beyond: Redefining Functional Assessment*

Spirometry remains the cornerstone of COPD diagnosis; however, its use in early-stage disease is often limited due to low clinical suspicion. Recent efforts have focused on expanding the role of **pre-bronchodilator spirometry, forced oscillation techniques (FOT), and impulse oscillometry**, which detect small airway dysfunction before overt airflow obstruction occurs. These methods are less effort-dependent and may be more feasible in primary care settings, increasing accessibility for at-risk populations [5,6, 7].

## *Clinical Implications and Challenges*

Despite these advances, several barriers remain. A significant proportion of primary care providers still underuse spirometry, and there is limited access to advanced diagnostic technologies in low-resource settings. Training, awareness, and system-level changes are necessary to support implementation. Moreover, the cost-effectiveness and clinical utility of some newer methods need further validation in large, real-world studies [8, 9, 10].

## Conclusion

Early diagnosis of COPD is no longer a distant goal but an emerging clinical reality supported by technological innovation. By moving beyond reliance on symptoms and spirometry alone, and embracing a multimodal diagnostic approach, clinicians can identify at-risk patients earlier and initiate interventions that may alter the disease trajectory. As research continues to mature, integration of these tools into clinical guidelines and routine practice will be essential to reducing the global burden of COPD.

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