

Diagnosing asthma and chronic obstructive pulmonary disease

Importance of pulmonary function testing



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Clinical question

How important is it to perform pulmonary function testing when asthma or chronic obstructive pulmonary disease (COPD) are suspected?

Bottom line

Respiratory complaints are common in primary care, and many patients receive treatment for suspected asthma or COPD without objective testing. Unfortunately, these clinical diagnoses are often incorrect, exposing patients to the possible harms of unnecessary therapies while also missing the true diagnoses. Accordingly, guidelines recommend pulmonary function testing (starting with spirometry and bronchodilator testing) for the diagnosis of asthma and COPD. There are multiple barriers to the effective use of spirometry in primary care settings, and successful interventions for addressing this problem will likely need to be multifaceted. However, ensuring that providers are knowledgeable about the importance of objective diagnosis for these common conditions is a vital first step.

Evidence

Both providers and patients report that respiratory complaints are the most common reason for a primary care visit.¹ These complaints often lead to diagnoses of asthma or COPD, which are among the most commonly diagnosed chronic diseases, with approximately 11% of the Canadian population carrying a diagnostic label of asthma and 6% a label of COPD.²

Although guidelines clearly recommend that a diagnosis of asthma or COPD requires pulmonary function testing^{3,4} (starting with spirometry and a bronchodilator response test), studies show that only 43% of Canadian patients who received a diagnostic label of asthma⁵ and 36% of those with a label of COPD⁶ had a pulmonary function test (PFT) within 1 year before or after their diagnoses.

This care gap is important because clinical diagnoses of these conditions are often inaccurate. A large population-based study found that 33% of Canadians with a diagnostic label of asthma did not have asthma when tested objectively, and 79% of these falsely labelled patients reported using asthma medications.⁷ With COPD, this overdiagnosis similarly occurs in anywhere from 31% to 44% of cases.^{6,8,9}

Even when patients do have COPD, lung function testing carries benefits. Studies suggest that providers tend to underestimate COPD severity without spirometry,¹⁰ and

they prescribe more appropriate (evidence-supported) medications when spirometry has been performed.¹¹ This translates to both lower hospital admission rates and lower mortality rates when COPD diagnoses are made with spirometry rather than clinically.¹¹

The main consequence of overdiagnosis of asthma and COPD is unnecessary treatment, resulting in possible medication side effects and avoidable costs.¹² Furthermore, patients' actual diagnoses may be overlooked, resulting in ongoing symptoms and diagnostic delays.⁷

As a result, multiple expert groups, including the Canadian Thoracic Society,¹² the Canadian Society of Allergy and Clinical Immunology, and the Canadian Society of Internal Medicine, have included statements regarding the importance of objective testing before initiating therapy for suspected asthma or COPD in their Choosing Wisely Canada lists of recommendations by specialty.¹³

Approach

Major guidelines do not recommend routine screening for asthma¹⁴ or COPD¹⁵ in practice. However, when patients present with respiratory symptoms suggestive of airways disease, it is important to consider the possibility of asthma or COPD (referred to as *case finding*), as these conditions are also often missed.¹⁶

Typical asthma symptoms include wheeze, shortness of breath, and chest tightness. Specific clues include worsening of these symptoms at night or early in the morning, the variable and episodic nature of symptoms, and triggers for symptoms (eg, viral infections, exercise, allergens, and irritants such as strong smells or cold air). On the other hand, patients presenting with an isolated dry cough, a productive cough, or chest pain are less likely to have asthma.¹⁷ Unfortunately, many of the suggestive features can also be seen in other conditions. In a Canadian study, the most common mimics leading to an erroneous clinical diagnosis of asthma were allergic or nonallergic rhinitis with postnasal drip, gastroesophageal reflux disease, and anxiety disorders.⁷

Symptoms of COPD are similar to those of asthma and include dyspnea and chronic cough (with or without sputum), with or without wheeze. However, COPD is unlikely in patients younger than 40 years of age and diagnosis requires a history of exposure to risk factors, the most common being smoking (≥ 10 pack years)^{18,19} or exposure to biomass smoke (such as that created by burning coal indoors for cooking or heating).¹⁹ The dyspnea in COPD is

usually triggered by exertion²⁰ and tends to be progressive in nature. Another hint is the presence of recurrent lower respiratory tract infections.²¹ Although chronic cough is a hallmark feature of COPD, as with asthma, other common causes such as postnasal drip, gastroesophageal reflux disease, and use of angiotensin-converting enzyme inhibitors render this symptom nonspecific for COPD.²¹

While a thorough history is an essential starting point for identifying a patient who merits objective testing, there are no individual questions or combinations thereof that are accurate enough to render a high-likelihood diagnosis of either condition. In fact, even formal case-finding questionnaires for asthma and COPD have not been found to be sufficiently accurate for use in practice. For example, the Asthma Screening Questionnaire, a 6-question tool that was found to be accurate for identifying asthma in adults in an initial small study with 50 participants,²² had a specificity of only 16% upon external validation.²³ Similarly, the widely studied COPD Diagnostic Questionnaire²⁴ had a specificity of only 34% in a population-based sample.²³ The high false-positive rates associated with these questionnaires render them impractical for use in primary care.²⁵

Unfortunately, physical examination also has a limited diagnostic role in each condition. The examination findings will usually be normal in patients with asthma. Although an expiratory wheeze is suggestive, the adage that “all that wheezes is not asthma” must be kept in mind, as wheeze can also be related to laryngeal disease (such as vocal cord dysfunction), heart failure, and bronchiectasis, among other causes. Similarly, physical examination is rarely diagnostic in COPD,²⁶ although wheeze may again be present.

Accordingly, for both conditions, guidelines recommend objective testing, starting with spirometry with bronchodilator response testing in anyone 6 years of age or older.^{3,4,14,21} In asthma, diagnosis requires the presence of obstruction (ie, a reduced forced expiratory volume in the first second [FEV₁] to forced vital capacity ratio) and an improvement in the FEV₁ of at least 12% and 200 mL from the baseline value after administration of the bronchodilator.⁴ Although this finding is sufficient to make the diagnosis, if a bronchodilator response is absent, it does not rule out asthma. Among patients suspected of having asthma, about 40% will have a falsely negative bronchodilator response test result²⁷ and require a methacholine challenge test for diagnosis. For COPD, diagnosis simply requires the presence of obstruction on postbronchodilator spirometry, and no further testing is required in most cases.

Implementation

Some primary care providers are able to offer testing with an in-office spirometer, but most must refer patients to an independent PFT laboratory. Unfortunately, there are several barriers to the successful use of spirometry in each of these scenarios. Studies have identified a lack of physician belief in the importance of spirometry and insufficient skills for spirometry interpretation.²⁸ In-office testing is further

limited by a lack of staff available to perform the test as well as a lack of training and expertise among existing personnel, costs, impact on work flows, and logistical difficulties with accessing and maintaining the spirometer. On the other hand, unique barriers to laboratory PFTs include patient reluctance to undergo the test (owing to delays and the cost or inconvenience of travel), patient non-attendance at testing appointments, and prolonged wait times.²⁸ In some rural and remote settings, wait times may be particularly long or spirometry may be altogether unavailable. Concerns about viral spread and corresponding requirements for improved ventilation and extensive personal protective equipment²⁹ have only increased the cost and scarcity of PFTs in the context of the COVID-19 pandemic.³⁰

Addressing these barriers will likely require multiple approaches. For example, physician knowledge gaps might be addressed by providing better spirometry interpretation training in medical school and family medicine residency programs, and through the provision of primary care-focused continuing professional development programs such as those offered by groups like the Lung Health Foundation, available from: <https://choosingwiselycanada.org/airways/#education>. Staff performing in-office testing should also have greater access to training and maintenance-of-certification programs (eg, through subsidies). An example of such a course is the online RESPTREC course, available from <https://www.resptrec.org/course/spirometry.php>.

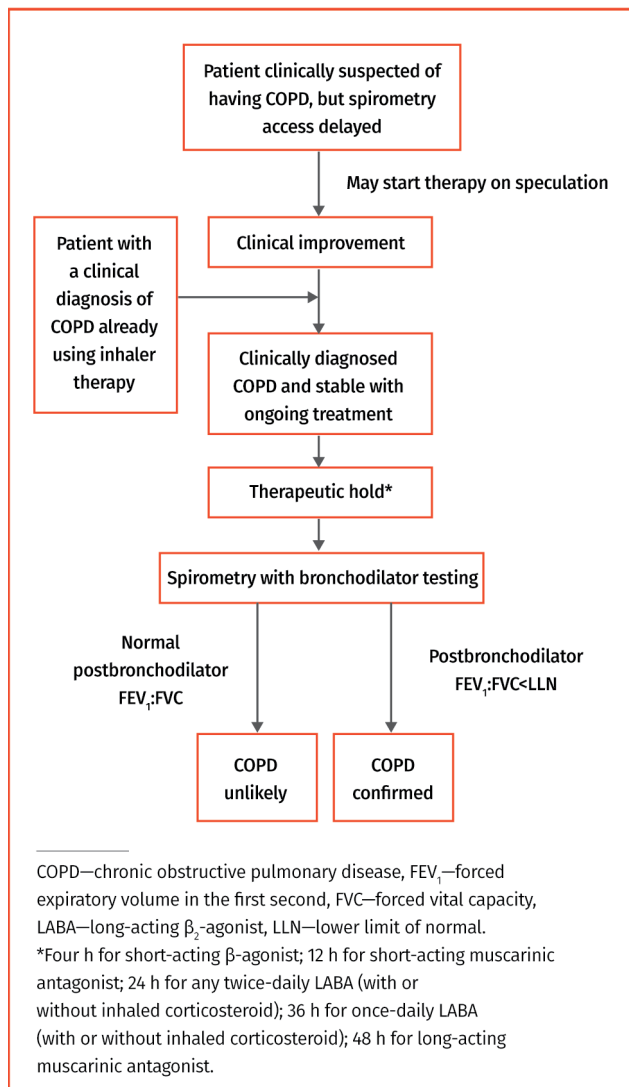
System-level solutions may include better remuneration for in-office spirometry performance and interpretation and greater PFT laboratory capacity to reduce wait times and address access in rural settings. Patient-level barriers may be addressed by empowering patients with knowledge about the risks associated with overdiagnosis and the corresponding importance of objective diagnosis. This is the focus of a new national campaign led by Choosing Wisely Canada, the College of Family Physicians of Canada, and the Canadian Thoracic Society, featuring a video and handouts for patients along with materials for health care providers, available from: <https://choosingwiselycanada.org/airways/>.

Practically, providers who cannot quickly access spirometry but who have a high degree of suspicion of COPD and particularly of asthma (given the acuity with which asthma patients often present) in a patient may need to start therapy on speculation. When held for a sufficient period to allow for drug clearance before testing, first-line therapies (bronchodilators) are unlikely to render spirometry results falsely negative in COPD. However, first-line asthma therapy includes inhaled corticosteroids, which have downstream biological effects that require a longer washout period to mitigate their impact on test sensitivity.²⁷

Providers who encounter patients already taking prescribed therapy but without an objective diagnosis of asthma or COPD, or who start patients on therapy while awaiting objective testing, should ask patients to hold their bronchodilator use before spirometry testing. For patients with suspected COPD,

this is often all that will be required to rule in or rule out the diagnosis (see **Figure 1**). For patients with suspected asthma, if the test results are nondiagnostic, a confirmatory methacholine challenge test should be ordered. If the methacholine challenge test results are negative, the inhaled corticosteroid (with or without a long-acting β_2 -agonist) dose can then safely be decreased by 50%, followed by a repeat methacholine challenge test as soon as 3 weeks thereafter. If results of that test are negative, it is safe to stop these medications altogether and repeat the test while the patient is not taking any therapy to rule in or rule out asthma more definitively.⁷ Also, a clinical worsening at any point should halt the medication taper and would be highly suggestive of asthma. This approach is outlined in **Figure 2**.

Figure 1. Approach for confirming or rejecting a suspected or clinical diagnosis of COPD when spirometry access is delayed: Although treatment is seldom urgent in COPD, if there are long delays in accessing spirometry testing, it may be reasonable to start therapy on speculation while ordering spirometry at the same time and planning for a brief therapeutic hold, which allows for bronchodilator clearance before spirometry. Note that this algorithm does not account for an overlap of asthma and COPD diagnoses, restrictive lung diseases, and other conditions that may be suggested on spirometry testing.



However, given that methacholine challenge testing is often even more difficult to access than spirometry, this strategy might be difficult to implement efficiently in some settings. Another diagnostic approach suggested in guidelines⁴—a substantial ($\geq 12\%$) improvement in FEV₁ with therapeutic trial—may be more realistic in such settings. Another option may be to have patients gradually decrease therapies as long as they remain asymptomatic; methacholine challenge testing would then be requested only once they have stopped taking all therapies.

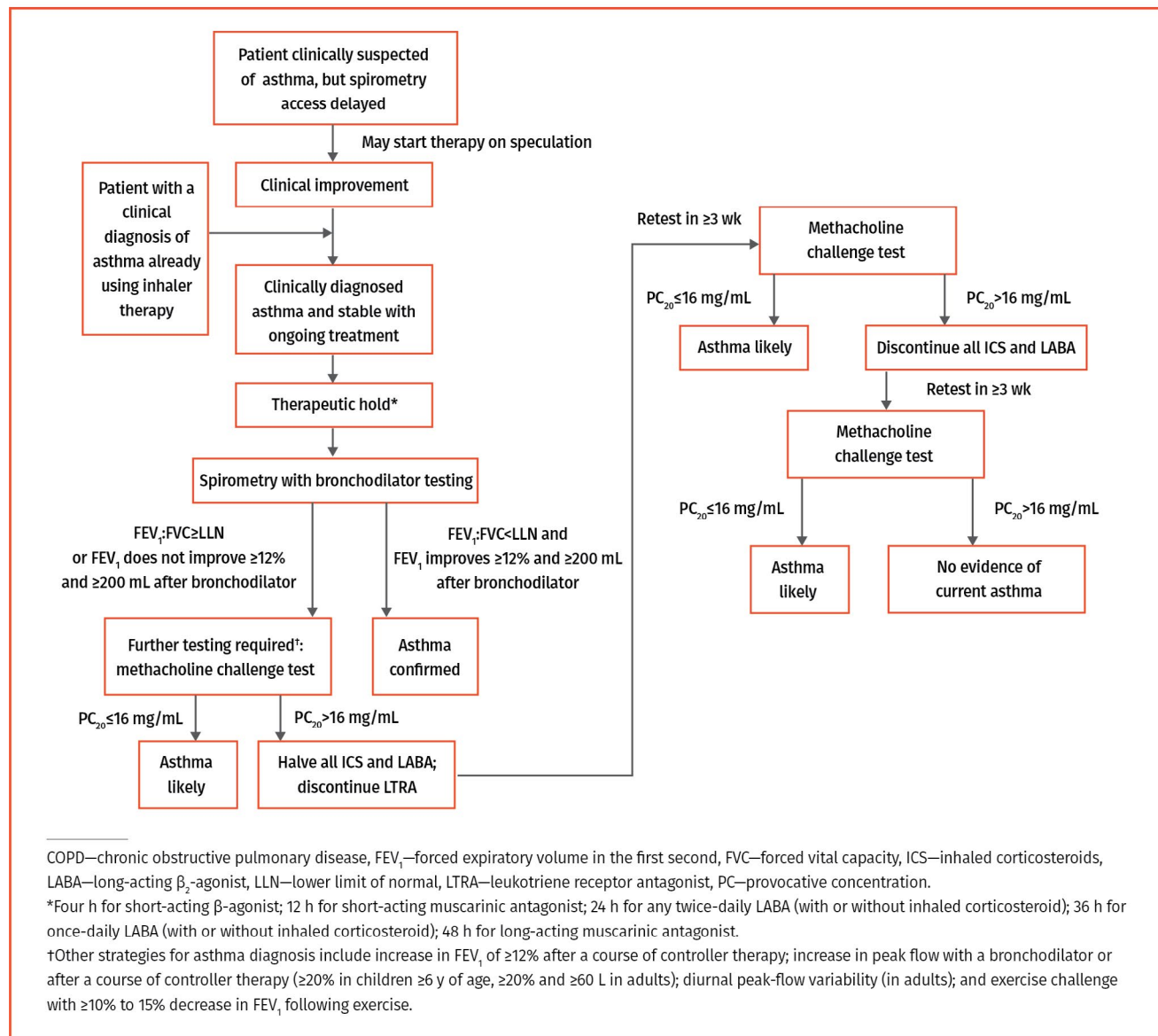
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Competing interests
None declared

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Figure 2. Approach for confirming or rejecting a suspected or clinical diagnosis of asthma when spirometry access is delayed (children ≥ 6 years and adults): If asthma is suspected and there are long delays in accessing spirometry testing, it may be reasonable to start therapy on speculation while ordering spirometry at the same time and planning for a brief therapeutic hold, which allows for bronchodilator clearance before spirometry. If spirometry findings are negative, methacholine challenge testing is then required; if the results are negative, therapy can be progressively decreased with repeated methacholine challenge testing until a positive result or a negative result while holding therapy. If the patient demonstrates an acute worsening of asthma symptoms with therapeutic wean, therapy should be restored and a diagnosis of asthma is likely. This algorithm does not account for an overlap of asthma and COPD diagnoses, restrictive lung diseases, and other conditions that may be suggested on spirometry testing.



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Choosing Wisely Canada

Choosing Wisely Canada is a campaign designed to help clinicians and patients engage in conversations about unnecessary tests, treatments, and procedures and to help physicians and patients make smart and effective choices to ensure high-quality care is provided. To date there have been 13 family medicine recommendations, but many of the recommendations from other specialties are relevant to family medicine. Articles produced by Choosing Wisely Canada in *Canadian Family Physician* are on topics related to family practice where tools and strategies have been used to implement one of the recommendations and to engage in shared decision making with patients. If you are a primary care provider or trainee who has used Choosing Wisely recommendations or tools in your practice and you would like to share your experience, please contact us at info@choosingwiselycanada.org.