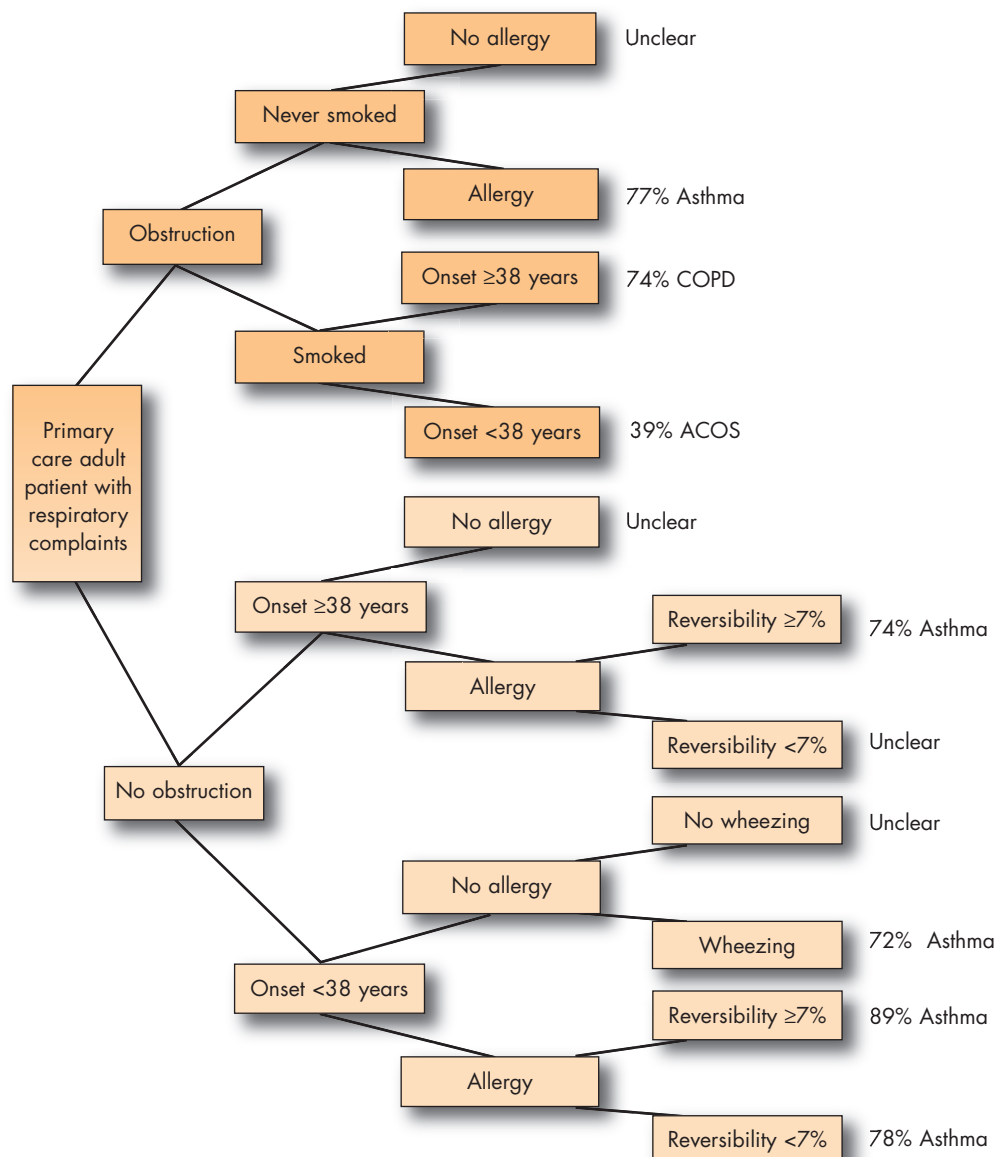# Predicting diagnosis in primary care patients suspected of obstructive respiratory disease

This desktop helper describes a tool designed to support general practitioners (GPs) in diagnosing their patients with suspicion of obstructive respiratory disease. Misdiagnoses and under-diagnoses of asthma and COPD are common.[1-3] Many current diagnostic tools are not based on real-life data and hence lack generalisability to clinical practice.[4] The tool was developed by analysing real-life data from 9,297 primary care patients (45% male, mean age 53±17 years) who were diagnosed by a pulmonologist. These patients visited their GP with respiratory symptoms and were referred to an Asthma/COPD(AC)-service for primary care in the Netherlands[5] for a diagnostic assessment according to a strict protocol. A local pulmonologist used the results from this assessment to diagnose the patients. These diagnoses were the starting point for this desktop tool. No exclusion criteria were used, all patients assessed by the AC-service were included for the development of the tool.

Statistical analyses were used to evaluate which parameters predicted asthma, COPD, Asthma/COPD overlap syndrome (ACOS) or other. Metting et al showed that most patients in the Dutch Asthma/COPD-service could be correctly diagnosed with this tool (asthma 79% correct, COPD 85% correct, ACOS 32% correct).[6] The tool was validated in another primary care population (n=3215) and showed a comparable accuracy (asthma 78%, COPD 83%, ACOS 24%).

Simplified decision tree showing the important pathways. Originally published in *ERJ Open Res* 2016; **2**: 00077-2015 | DOI: 10.1183/23120541.00077-2015

HOW TO USE THE TOOL

This desktop helper can be used to predict a working diagnosis in primary care patients along with an estimation of the probability. Initiating and monitoring response to treatment is the next step. The predicted working diagnosis should be evaluated 3 months after diagnosis and treatment onset to confirm or reject the working diagnosis. This tool is suitable for:

• Regular primary care patients, including those with comorbidities
• Patients older than 15 years
• Patients with respiratory complaints suggestive of obstructive airways disease
• Patients with available spirometry data including reversibility testing

DEFINITION OF THE PARAMETERS TO COLLECT

In the tool very few clinical parameters are used. These are part of the structured assessment procedure in the Asthma/COPD-service and are guideline based. In this section we present an overview of the parameters including the thresholds.

Obstruction

The most important variable in this tool is obstruction, which is determined with spirometry. The post bronchodilator FEV_1/FVC as a proportion of predicted should be used.

- Patients with an obstruction have a FEV_1/FVC <70% after bronchodilator
- Patients without an obstruction have a FEV_1/FVC ≥70% after bronchodilator

Reversibility

Reversibility should be tested according to the European Respiratory Society/American Thoracic Society guidelines[8] by comparing FEV_1 in litres before and after administration of 400mcg salbutamol. The proportional change in FEV_1 is the reversibility. In the tool, a threshold of 7% was shown to be most predictive:

- Reversibility <7% increase in FEV_1 in litres
- Reversibility ≥7% increase in FEV_1 in litres

Smoking

To assess smoking, patients are asked if they have ever smoked (for a period longer than 1 year). Patients are divided into
- Ever smokers if they answer "yes"
- Never smokers if they answer "no"

Age of onset

To assess age of onset, patients should be asked "At what age did your lung problems start (e.g. coughing, wheezing, shortness of breath)?" A distinction is made between patients with early and late onset:

- Early onset: onset before 38 years
- Late onset: onset at 38 years or thereafter

Allergy

This is based on self-reported allergy. Patients should answer the question "When or what causes complaints of shortness of breath or wheezing?" We have considered pets, dust, grasses, food, trees and seasonal triggers or other allergens as allergy. Hyper reactivity triggers (e.g. cold air, fog, paint odour) are not considered to be an allergy.

- Allergy is present if the patient mentions any of the allergy triggers
- Allergy is absent if the patient does not mention any of the allergy triggers, or if the patient only mentioned hyper reactivity triggers

Wheezing

If the Asthma Control Questionnaire (ACQ) is used during the assessment, ACQ question 5 can be used to assess wheezing. If not, the physician can ask "How often generally in the past week did you experience wheezy breathing?"

- No wheezing: an ACQ question 5 score of 0 or never wheezed in the past week
- Wheezing: an ACQ5 score ≥1 or wheezed in the past week (regardless of frequency/severity)

USE THE PARAMETERS TO WORK OUT PROBABILITIES OF ASTHMA AND/OR COPD

Use the information from the assessment to follow the paths in the diagnostic tool. For example:

1. Man (age 60, current smoker) presents with breathlessness and restrictions in daily physical activities. His respiratory complaints started a few years ago. Assessment showed that he has a FEV_1/FVC after bronchodilator of 60%.

   - According to the decision tree, he probably has COPD (probability 74%). Treatment for COPD is therefore recommended and effectiveness of treatment should be evaluated after 3 months.

2. Female (age 25, no smoking history) presents with wheezing and breathlessness. She has no allergies. Assessment showed no reversibility (only 5% change in FEV_1 in litres after bronchodilator) and no obstruction (FEV_1/FVC after bronchodilator was 90% of predicted).

   - In this case, an asthma diagnosis is most probable (72%). The recommendation would be to start treatment for asthma and evaluate the effectiveness of the treatment after 3 months to confirm or reject the asthma diagnosis.

Besides the diagnoses of asthma or COPD, the tool can also lead to "unclear" or "ACOS." These two diagnoses require some explanation:

Unclear

Unclear consists of patients with either an "indication of restriction", "diagnosis unclear" or "no disease." In all of these cases, further investigation is necessary potentially including referral to specialist care for further investigation.

ACOS

ACOS is difficult to diagnose. One of the reasons for this is that no clear diagnostic consensus has yet been reached.[7] Patients with features of asthma and COPD can be classified as ACOS patients according to the latest GOLD/GINA guidelines. This is reflected in the diagnostic accuracy of ACOS in our tool. Physicians should follow the latest developments regarding this topic and be aware that patients with both asthma and COPD are more prone to exacerbations, and have more symptoms.

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