

# The validity of diagnostic support of an asthma/COPD service in primary care

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## ABSTRACT

### Background

To support GPs in diagnosing and monitoring their patients with asthma/chronic obstructive pulmonary disease (COPD), 'asthma/COPD services' have been developed. Within these services, pulmonologists perform structured diagnostic and therapeutic assessments based on the combination of written history data and spirometry.

### Aim

This study determines the validity of the diagnosis and advice when assessed using only written information.

### Design of study

The results of the diagnostic procedures of an asthma/COPD service were compared with the results of regular office consultations by pulmonologists.

### Setting

From January until August 2004, two pulmonologists examined 80 randomly selected patients referred to an asthma/COPD service in Eindhoven, the Netherlands.

### Method

Concordance was analysed between diagnosis and advice based on written spirometry and history data, with assessments based on live consultations with the same patients by pulmonologists.

### Results

The validity of the assessed diagnosis was high (Cohen's  $\kappa = 0.82$ ). When the diagnosis was uncertain, the advice for medical treatment scored low in validity (Cohen's  $\kappa = 0.39$ ). The advice for additional diagnostic examinations had a high internal validity: in half of the patients, uncertainty in diagnosis turned into a definite diagnosis of asthma/COPD, or another cause for the complaints of the patient was revealed; in the other half, the diagnosis of asthma/COPD could be rejected.

### Conclusions

A structured asthma/COPD service offering diagnosis and diagnostic advice assessed from written spirometry and history data is a new and valid facility that can support the GP who faces the complicated diagnostic procedures in a progressive number of patients with asthma/COPD.

### Keywords

asthma; chronic obstructive pulmonary disease; diagnosis; primary care; spirometry.

## INTRODUCTION

Diagnosing asthma/chronic obstructive pulmonary disease (COPD) requires the performance and interpretation of spirometry.<sup>1</sup> Implementation of this diagnostic instrument in primary care is considered by many GPs to be complicated,<sup>2,3</sup> causing incorrect use or underuse of this diagnostic procedure and consequent misdiagnosis of many primary care patients.<sup>4-10</sup>

Training of GPs in interpretation of spirometry can solve only part of the diagnostic and none of the practical problems.<sup>11</sup> Therefore, other services have been developed to support GPs in performing and interpreting spirometry, and in organising and managing asthma/COPD care. Scotland has outreach spirometry services;<sup>12</sup> in the Netherlands there are asthma/COPD services; and, starting from direct access to a pulmonary laboratory in 1990,<sup>13</sup> open-access spirometry is used in the UK.<sup>14</sup>

While retaining final responsibility for the care of their patients with asthma/COPD, GPs can delegate diagnostic procedures, follow up, and monitoring procedures to these services. A main issue is whether the general practice (and the patient) can rely on the validity of this procedure. Therefore, the concordance of the ('paper') assessment by pulmonologists based on written patient data and

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spirometry, and the ('live') assessment in cases where the pulmonologists had actually seen the patient in an office consultation, were studied. Specifically, the study assessed the validity of:

- the assessments of the diagnoses;
- the advice for additional examination in order to assess the definite diagnosis in new patients; and
- stable or unstable condition in case of follow-up.

## METHOD

### *Regular routine of the asthma/COPD service*

GPs can refer all patients with complaints suspect for obstructive pulmonary disease to the asthma/COPD service. Lung function assistants perform spirometry and collect written medical history data, complaints, MRC (Medical Research Council)-dyspnoea scale, medication, and compliance. According to a structured assessment protocol, these data are assessed by pulmonologists of the local hospitals. Based on these assessments, GPs receive a report containing the patient's diagnosis, advice for additional examinations in case a diagnosis cannot be assessed yet, and advice for medical and non-medical treatment. History data and the results of spirometry (quality of the curve, obstruction, reversibility, and spirometry figures) are added.

### *Design*

The study was performed at the regional asthma/COPD service in Eindhoven, the Netherlands, which serves 200 GPs who refer about 7000 patients each year for diagnostic spirometry and follow up.

The procedure involved a comparison of 80 assessment reports ('paper assessment'), performed according to the regular routine of the asthma/COPD service, with the assessments of the same 80 patients after live consultation by pulmonologists ('live assessment').

### *Participants*

Each week for 6 months, three to four of the weekly referred patients were randomly selected and asked to visit a pulmonologist immediately after spirometry and history taking was completed by the lung function assistant. Two of five pulmonologists connected to the asthma/COPD service performed the office consultation and the live assessment.

### *Live and paper assessments*

To obtain a live assessment, each participating patient was asked to visit a pulmonologist immediately after a regular spirometry and standardised history taking was completed by the lung function assistant of the asthma/COPD service.

## *How this fits in*

GPs face a growing number of patients with asthma and chronic obstructive pulmonary disease (COPD) who need elaborative diagnostic procedures that many GPs find difficult to interpret. Asthma/COPD services have been developed to support GPs. Within these services, consultant pulmonologists only use written history and spirometry data to assess diagnoses and give advice. The validity of assessment reports based on written information is thus far unknown. This research shows that such reports sent by the asthma/COPD service are a valid support to the GP and may help to improve the diagnosis of asthma and COPD in primary care.

During this consultation, the pulmonologist himself did the history taking, examined the patient, and used a copy of the spirometry test to assess the diagnosis and the need for additional examinations and therapeutic advice. A regular structured assessment form was filled in; this was the live assessment. These live assessments were kept aside to be compared with the paper assessments.

The paper assessments were performed by the consulting pulmonologists, and were based on the original spirometry and medical history data of the patients. To prevent recall bias, these original data were kept apart for at least 3 months, and mixed with the routine weekly set of assessments before they were offered to the pulmonologists for regular (paper) assessment.

### *Evaluation of the advice for additional examination*

If spirometry and medical history cause doubts about the diagnosis, the assessing pulmonologist can advise that additional diagnostic examinations be performed or initiated by the patient's GP. To validate this advice for additional examinations, the pulmonologist performed the additional examinations to ensure that he judged these as indicated and would normally have advised them to the GP. For this protocol, permission was granted from both the GP and the patient.

To assess the real impact of these additional examinations on the patient's diagnosis and treatment — and the value of the advice to perform these — the regular discharge reports of the pulmonologist that were sent to the GP were examined.

The following diagnostic tests were successively applied until the diagnosis was clear: physical examination, extensive history taking, laboratory test (brain natriuretic peptide/Phadiatop), extensive lung function test, X-ray of the chest and sinus, PC20-test (bronchial responsiveness to histamine), body box airway resistance test, and diffusion capacity test.

**Analyses**

To compare the paper and live assessments, descriptive statistics were used with SPSS (version 11.0). Concordance between paper and live assessment in assessed diagnosis and patient condition (as a preliminary for therapeutic advices) were determined by Cohen's  $\kappa$ . Concerning the additional diagnostic advice, their internal validity was examined by evaluating the results of the additional examinations advised.

**RESULTS**

**Patients**

Eighty patients were selected, and all participated; four failed to perform an adequate flow volume curve, leaving a total of 76 patients in the study. Forty-seven (male = 21) were new patients and did not use medication. Twenty-nine patients (male = 11) came for follow up of their pulmonary condition. Of these, 22 used inhaled steroids. New and follow-up patients were equally divided under and above the age of 45 years: mean age was 49 years (range 19–89 years).

**Concordance of the diagnoses**

When considering the main categories of diagnosis (that is, normal lung function [no asthma or COPD], asthma, asthma with persisting obstruction, COPD, restriction), a good concordance was found between diagnoses of all patients in the paper and live assessments (Table 1,  $\kappa = 0.82$ ). One-third of all patients had no asthma or COPD, and almost all were recognised as such both on paper and live.

There was a good concordance ( $\kappa = 0.76$ ) in the assessment of reversibility, a preliminary condition for correct diagnosis.

Also, a good concordance ( $\kappa = 0.78$ ) was found in the diagnostic subcategories 'normal' and 'about

normal', which led to the distinct conclusions 'no asthma' and 'additional diagnostic examinations advised'.

**Advice for additional examinations in cases of doubt about the definite diagnosis or its severity**

For 57% of the patients ( $n = 45$ ), additional diagnostic tests were advised, because in the assessment doubts remained about the diagnosis, mostly caused by discrepancies between spirometry and presenting complaints. The concordance in advising additional tests between paper and live assessment was good (Cohen's  $\kappa = 0.65$ ). Of the advised tests, 62% ( $n = 28$ ) were performed. Previously assumed asthma or COPD could be confirmed in 35% of these patients, of which two-thirds had an additional diagnosis. In two patients, the diagnosis changed from asthma to COPD or vice versa. Alternative diagnoses were revealed in almost half of the examined patients (Table 2). Alternative and additional diagnoses were mainly detectable by the GP: they concerned sinusitis, allergic rhinitis, oesophagitis, and cardiac problems.

Between paper and live assessment there was full concordance about referral of four out of 29 follow-up patients because of COPD severity.

**Stable or unstable patient condition in case of follow up**

The advice to follow-up patients for adding/stopping/continuing medication was mainly based on the patient's condition, which was considered stable in cases where there were (almost) no complaints, no exacerbations in the last year, and no conditional problems (MRC-dyspnoea scale <2). Therefore, the pulmonologist assessed the stability or instability of the pulmonary condition of the follow-

**Table 1. Concordance of diagnosis in patients being assessed using written data of spirometry and history or being assessed in a live consultation.**

	Assessment by pulmonologist when using written patient data					Total
	Restriction <sup>a</sup>	(About) normal	Asthma	Asthma + persisting obstruction	Obstruction/ COPD	
Assessment of diagnosis in live contact between pulmonologist and patients						
Restriction	2	–	–	–	–	2
Normal	–	26	–	–	1	27
Asthma	–	–	21	2	1	24
Asthma + persisting obstruction	–	1	1	6	1	9
COPD	–	1	–	2	11	14
Total	2	28	22	10	14	76

Cohen's  $\kappa = 0.82$ . <sup>a</sup>Restriction: no other problem. (Minor) restriction as additional diagnosis occurred seven times, but is not counted. COPD = chronic obstructive pulmonary disease.

**Table 2. Diagnostic results after performing additional diagnostic examinations as advised by the asthma/COPD service in case of primarily uncertain diagnosis (frequencies of finding, confirming, converting and rejecting the diagnosis asthma and/or COPD).**

	Final diagnosis after performing additional diagnostic examinations					Total
	Newly diagnosed as asthma or COPD	Diagnosis asthma or COPD confirmed	Asthma respiratory COPD converted in COPD respiratory asthma	No asthma or COPD but another diagnosis	COPD, but also another diagnosis	
Primarily uncertain diagnosis						
New patients	5	–	–	9	–	14
Follow up	–	3	2	3	6	14
Total	5	3	2	12	6	28

COPD = chronic obstructive pulmonary disease.

up patient. Only 66% agreement ( $\kappa = 0.39$ ) was found between paper and live assessment, which meant that this differentiation did not meet good validity standards.

## DISCUSSION

### Summary of main findings

This study shows that in diagnostic assessments of patients with asthma/COPD there is good concordance between paper consultations as performed by the asthma/COPD service and the live consultations by pulmonologists.

Also, advice for additional diagnostic examinations in the case of unclear diagnosis can be given from paper data. The value of this advice is shown by the results of performing these tests: most alternative or additional diagnoses could be found by extended history taking, physical examination, and eventually referral for laboratory tests or X-rays. GPs can manage these additional examinations when discussing the asthma/COPD service report with the patient. Referral to a pulmonologist was seldom necessary.

Treatment advice was not checked for its validity since it was based on the patient's clinical stability, which was found to be difficult to assess. Criteria for instability should be better defined.<sup>15</sup> Possible criteria are the number of exacerbations in the past year, dyspnoea (MRC-dyspnoea scale), increase in complaints and/or bronchodilator use, persisting reversibility in patients with asthma on maximum inhaled steroid medication, and decline in FEV1 (forced expiratory volume in 1 second) over the last 3 years of more than 200 ml. Nevertheless, even with better definitions, a support service will only be able to carefully advise, and cannot replace the GP's medical decision based on the live consultation and knowledge of the patient's medical and psychosocial characteristics.

### Comparison with existing literature

The performance of spirometry in primary care has been validated,<sup>16</sup> and interpretation of spirometry by

GPs has been compared with a golden standard (in an educational setting)<sup>11</sup> and with the remote reporting of interpretation by respiratory specialists. However, no studies were found that validated this remote interpretation. The validity of interpretation of other complicated diagnostic procedures like X-ray is studied more often and similar  $\kappa$  are found.<sup>17</sup>

### Strengths and limitations of the study

For correct assessment — and for testing its validity — it is necessary to know whether a patient is referred for diagnosis or for follow up. In this study, there was a problem with patients who already used inhaled corticosteroids without being diagnosed as having asthma (having shown reversible bronchus obstruction) or severe COPD (irreversible obstruction; more than two exacerbations in 1 year). While the paper assessment tended to consider these participants as patients with asthma, the live assessment more often rejected the diagnosis. Although the validity of the diagnostic assessment was adequate, it could still be improved by solving this problem. Therefore, a new protocol has been developed for assessment and intervention in cases of unclear diagnosis and the use of inhaled corticosteroids, which should improve the diagnostic process and stimulate more accurate pharmacotherapy.<sup>18</sup>

To assess the concordance in diagnostic performances of the respiratory specialists it would have been sufficient — and easier — to only include new patients that do not use medication. However, the regular care problems, such as the issue with inhaled corticosteroids, would not have been encountered. It adds to the clinical importance of this study that all patients referred were included.

### Implications for clinical practice

GPs, as well as pulmonologists, have to manage the growing demands of care for patients with asthma/COPD.<sup>19</sup> A main and complicated task is to assess the right diagnosis. It can be discussed

whether all individual GPs should be able to perform and interpret spirometry, preferably combined with history data.<sup>20</sup> The fact is that there are many thresholds in everyday practice. Access to a diagnostic support service that delivers (or rejects) a diagnosis asthma or COPD, as a blood test does for diabetes or an X-ray for pneumonia, enforces asthma/COPD disease management in primary care even when GPs themselves are not well-enough equipped and/or skilled or confident enough to do the complicated diagnostic procedure.

The present study showed that GPs can validly rely on the diagnostic support of respiratory specialists who only use written spirometry and medical history data. When organised in the asthma/COPD service as described, this diagnostic support can facilitate and improve the care for patients with asthma/COPD in primary care on a broad scale.

Further research must be done to determine if this approach improves diagnosis in primary care and whether it benefits primary care disease management.

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#### Ethics committee

Not applicable

#### Competing interests

The authors have stated that there are none

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