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ORIGINAL RESEARCH

Diagnostic certainty, co-morbidity and medication in a primary care population with presumed airway obstruction: the DIDASCO2 study

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Abstract

Study Objectives: To document the rate of diagnostic certainty, co-morbidity and use of medication in patients with presumed obstructive airway disease (OAD) in a primary care setting.

Methods: Twenty-six general practitioners (GPs) were asked to select the last 50 contacts with patients older than 40 years of age who were taking bronchodilators and/or inhaled corticosteroids or who had known OAD. After reviewing their medical data on file, the GPs gave their diagnostic opinion and rated their certainty about the diagnosis using a Likert-type scale.

Results: Analysis of 1126 files revealed that in at least 523 patients (46.4%), a diagnostic work-up was judged necessary. The GPs judged that 6% of the patients had no OAD. Less than 33% of the study population underwent spirometry during the two years preceding the survey. The number of co-morbid conditions was on average 2.2 for patients with asthma and 3.2 for patients with COPD. Patients with presumed COPD took significantly more drugs (mean, 5.1; 95% CI, 4.8–5.3) than did patients with other diagnostic labels (mean, 4.6 95%; CI, 4.4–4.8).

Conclusions: We confirmed the underuse of spirometry as a diagnostic tool in presumed airway obstruction in primary care. Nearly half of the patients older than 40 years who were taking bronchodilators and/or inhaled corticosteroids needed a diagnostic work-up. This population had a high prevalence of co-morbidity and polypharmacy.

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Keywords COPD, asthma, diagnosis, co-morbidity, medication, spirometry, family practice

Introduction

The prevalence of obstructive airways disease (OAD) is increasing worldwide,[1-3] and the vast majority of patients with asthma or chronic obstructive pulmonary disease (COPD) receive their healthcare in a primary care setting.[4,5] General practitioners (GPs) deliver comprehensive care for patients who often present with multiple diseases or conditions, and this complexity of presentation may compromise the GP's adherence to different disease-specific guidelines.[6,7] The first step in the optimal management of a patient with a chronic disease is to assess and diagnose the condition correctly. However, in contrast with specialised hospital-based or 'secondary' care, GPs are not always completely certain about a diagnosis before proceeding to treatment;[8] for example, patients may refuse to be referred to a specialist or may refuse consent for a technical examination[9] – a problem which appears to be more frequent in lower socio-economic groups. In the Belgian health care system people have free access to specialised care, including chest physicians. GPs mostly work without practice assistance.

Our survey was the first part of a larger study on the differential diagnosis between asthma and COPD in patients

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aged 40 or older in primary care. This paper describes the selected study population in terms of their demographics and smoking habits, the diagnostic examination results, diagnostic certainty, co-morbidities, and use of respiratory and other medications.

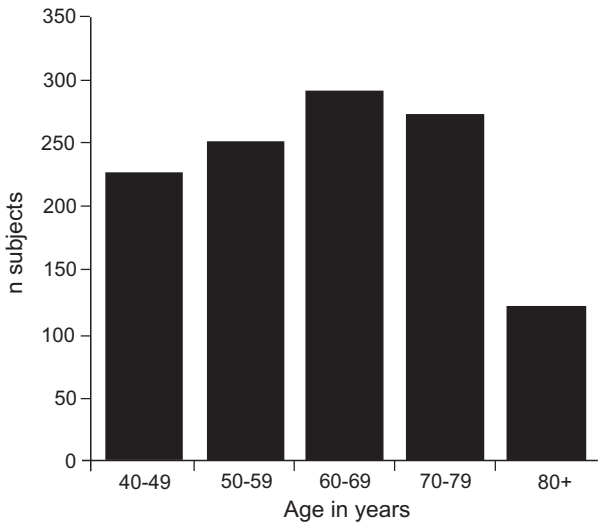
Methods

General design of the study

This was a retrospective, cross-sectional study in 26 Belgian teaching practices (of family medicine) in the first months of 2006. It was the first step of a larger study of the differential diagnosis between asthma and COPD in primary care. The participating practices were recruited on a voluntary basis. GP practices in both the French-speaking (11 centres) and the Dutch-speaking (15 centres) parts of the country, and rural and urban practices, participated.

The GPs were asked to review their electronic medical files and to select their last 50 contacts with different patients over 40 years of age who were taking bronchodilators and/or inhaled corticosteroids or who had known OAD. The following data on file were recorded: demographic data; smoking habits; respiratory diagnoses as filed in the problem list; respiratory diagnoses as filed in the medical diary; technical examinations of the respiratory system during the past two years; co-morbidity; respiratory medication; and other medication. In terms of co-morbidities, the following conditions were pre-defined: diabetes; coronary heart disease; heart failure; atrial fibrillation; arterial hypertension; dementia; stroke or transient ischemic attack (TIA); peripheral vascular disease; malignancy; osteoporosis; social problems; relational problems; alcohol problems; depression; and obesity. In addition, it was possible to indicate other diseases. For respiratory medication, the following classes were pre-defined: short-acting beta-agonists (SABA); short-acting anticholinergic agents (SAAC); SABA/SAAC combination inhalers; inhaled corticosteroids (ICS); long-acting beta-agonists (LABA); long-acting anticholinergic agents (LAAC); ICS/LABA combination inhalers; oral corticosteroids (OCS); theophyllines; anti-leukotrienes (ALT); N-acetylcysteine (NAC); and "other".

Figure 1. Age distribution of the study population.



After reviewing these data, the GPs were asked to give their actual diagnostic opinion. Six options were pre-defined: (1) asthma, (2) COPD, (3) asthma and COPD, (4) other OAD, (5) no OAD or (6) "I don't know". The GPs also indicated their degree of certainty of this diagnosis on a Likert-type scale ranging from 1 (totally uncertain) to 5 (absolutely certain). An absolutely certain diagnosis of asthma was defined as follows: a clinical history that is consistent with a diagnosis of asthma with evidence of reversible airway obstruction, where

Table 1. Smoking habits in different subgroups of patients [n (%)].

	Smokers	Ex-smokers	Smokers+Ex	Never smokers	Unknown
Male	252 (39.6)	190 (29.8)	442 (69.4)	117 (18.4)	78 (12.2)
Female	178 (33.4)	67 (12.6)	245 (46.0)	213 (40.0)	75 (14.1)
<65 years	288 (46.4)	98 (15.8)	386 (62.2)	159 (25.6)	76 (12.2)
>65 years	144 (26.1)	159 (28.9)	303 (55.0)	171 (31.0)	77 (14.0)
Asthma	49 (15.4)	38 (11.9)	87 (27.4)	168 (52.8)	63 (19.8)
COPD	293 (54.1)	156 (28.8)	449 (82.8)	47 (8.7)	46 (8.5)
Asthma+COPD	56 (36.8)	37 (24.3)	93 (61.2)	39 (25.7)	20 (13.2)
Other obstruct disease	7 (13.5)	9 (17.3)	16 (30.8)	31 (59.6)	5 (9.6)
No airflow obstruct	18 (25.7)	10 (14.3)	28 (40.0)	30 (42.9)	12 (17.1)
Unknown diagnosis	9 (23.7)	7 (18.4)	16 (42.1)	16 (42.1)	6 (15.8)
Dutch	243 (32.5)	142 (19.0)	385 (51.5)	241 (32.3)	121 (16.2)
French	190 (44.4)	115 (26.9)	305 (71.3)	89 (20.8)	34 (7.9)

the forced expiratory volume in one second (FEV_1) increased by at least 12% and reached at least 80% of the predicted value after medication. An absolutely certain diagnosis of COPD was defined as follows: a clinical history that is consistent with COPD and evidence of airway obstruction that is not completely reversible; i.e. the FEV_1 did not increase by 12% or more and did not reach 80% of the predicted value after medication, including high doses of corticosteroids, either by inhalation or by mouth.

Statistical methods

The data were analysed using frequency tables, chi-square tests, odds ratios and logistic regression using MedCalc® version 4.1, Mariakerke, Belgium.

Results

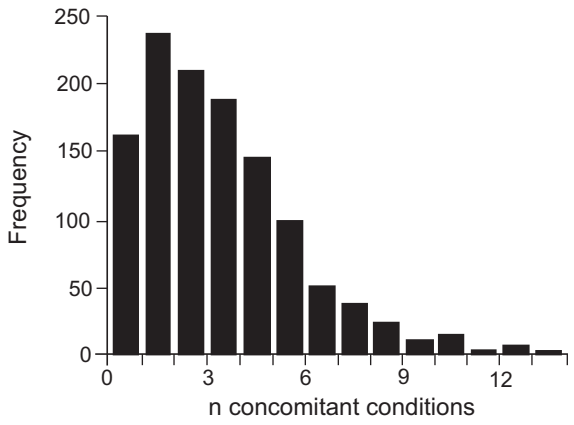
Demographic data

We were able to analyse 1172 patient files; 534 (45.1%) were for women and 638 (53.9%) for men. The age distribution of the study population is shown in Figure 1. Most patients (n=745, 63.5%) were recruited by Dutch-speaking GPs, and 427 (36.5%) were treated in French-speaking centres.

Smoking habits

The smoking habits in the study population are shown in Table 1. The proportion of current smokers was higher in younger patients (<65 years of age) than in older patients, in those classified as having COPD versus other diagnostic labels, and in French-speaking versus Dutch-speaking patients. The proportion of ex-smokers was higher in men than in women, in patients older than 65, and in those with a diagnostic label of "COPD" or "asthma+COPD". Those who had never smoked were more frequently women than men, and were more likely to have asthma or other airway obstruction compared with other diagnostic labels. Unknown smoking status was less frequently encountered in subjects labelled as having COPD and "other airway obstruction" than in those with other diagnostic labels, and in French-speaking centres compared with Dutch-speaking centres.

Figure 2. Co-morbidity: number of co-existing diseases.



Co-morbidity

Figure 2 shows the frequency of co-morbid conditions. The mean was 2.8 (95% CI, 2.65–2.91), and the range was 0–13. French-speaking centres tended to have patients with more co-morbidity than did Dutch-speaking centres (p=0.049). Table 2 shows the frequency of the different conditions for men and women, and for three different diagnostic labels (asthma, COPD, or no obstruction). In comparing gender differences, odds ratios were adjusted for patient age. More

Table 2. Co-morbidity in different subgroups (%). The last row shows the arithmetic mean (95% CI) of the number of concomitant conditions per category.

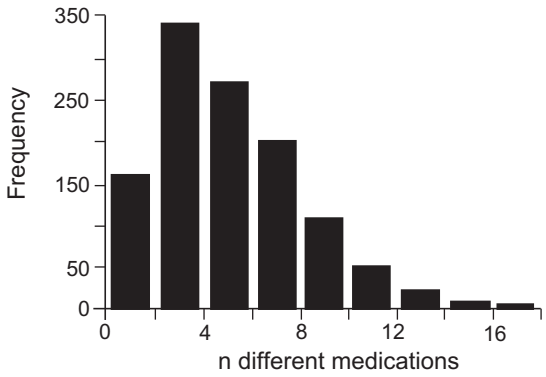
	Male	Female	Asthma	COPD	No Obstruct
Diabetes	19.0	14.3	14.4	18.6	22.9
Coronary disease	19.8	9.9	9.7	19.7	5.7
Heart failure	9.4	7.7	5.6	11.4	2.9
Atrial fibrillation	7.8	4.5	3.4	8.9	1.4
Arterial hypertension	43.8	43.3	38.2	45.9	40.0
Dementia	0.6	2.6	1.9	1.8	1.4
Stroke or TIA	4.2	4.9	2.5	6.6	2.9
Peripheral vascular disease	14.8	6.0	5.3	15.1	5.7
Malignancy	9.4	6.2	7.2	10.5	1.4
Osteoporosis	4.6	12.2	8.8	8.9	2.9
Social problems	13.2	13.7	10.7	17.2	10.0
Relational problems	10.7	9.6	8.8	10.9	7.1
Alcohol problems	13.0	4.7	4.7	13.5	5.7
Depression	13.0	20.8	15.4	18.5	12.9
Obesity	22.3	22.3	23.8	22.9	17.1
Mean n diseases/conditions	**2.9 (2.7-3.1)**	**2.6 (2.4-2.8)**	**2.2 (2.0-2.4)**	**3.2 (3.0-3.4)**	**2.1 (1.6-2.5)**

men reported diabetes (aOR 1,46; 95%CI, 1,07-2,01), coronary heart disease (aOR, 2.47; 95% CI, 1.72–3.53), peripheral vascular disease (aOR, 2.8; 95% CI, 1.84–4.35) and alcohol problems (aOR, 2.89; 95% CI, 1.84–4.54). The following conditions were more frequent in women: dementia (aOR, 4.4; 95% CI, 1.64–13.78) and osteoporosis (aOR, 3,13; 95% CI, 1.97–4.96). There was no significant sex difference for the number of concomitant diseases or the frequency of atrial fibrillation, heart failure, hypertension, malignancy, stroke or TIA, obesity, depression or social problems. Compared with patients with asthma, patients with COPD had significantly more co-morbidity involving the following conditions: coronary heart disease (OR, 2.47; 95%CI, 1.60–3.81); heart failure (OR, 2.29; 95%CI, 1.32–4.00); atrial fibrillation (OR, 2.70; 95%CI, 1.38–5.28); arterial hypertension (OR, 1.40; 95%CI, 1.05–1.85); peripheral vascular disease (OR, 3.20; 95%CI, 1.86–5.52); stroke or TIA (OR, 2.77; 95%CI, 1.27–6.50); alcohol problems (OR, 3.22; 95%CI, 1.81–5.73); and social problems (OR, 1.15; 95%CI, 1.15–2.68). Patients with asthma or COPD did not differ in their frequency of co-existing diabetes, dementia, osteoporosis, malignancy, depression, relation problems or obesity.

Medications

The mean number of medications was 4.6 (95% CI, 4.4–4.8), and the range was 0 to 17 (Figure 3). Patients with presumed COPD took significantly more different drugs than other patients in other categories (mean 5.1; 95% CI, 4.8–5.3). There was no significant difference in the number of medications between men and women, or between French-speaking and Dutch-speaking patients. Table 3 shows the frequency table for respiratory medications according to the different diagnostic subgroups. Combination products were prescribed most frequently – 46.7% of this population were using a LABA/ICS combination inhaler, and 30.5% a SABA/SAAC combination. SAAC products were used least frequently (2.0%). The "other respiratory medication" used comprised mainly antihistamines and intranasal corticosteroids.

Figure 3. All medication (respiratory and other).



Compared with patients classified with COPD, patients with asthma took more SABA (OR, 3.98; 95%CI, 2.77–5.73), ICS (OR, 1.85; 95%CI, 1.31–2.62), ALT (OR, 5.94; 95%CI, 3.26–10.84) and other medications, predominantly antihistamines (OR, 2.12; 95%CI, 1.26–3.59).

Compared with COPD patients, the asthma patients took fewer combination products comprising SABA plus SAAC (OR, 0.42; 95%CI, 0.30–0.58), LAAC (OR, 0.21; 95%CI, 0.12–0.37) or NAC (OR, 0.31; 95%CI, 0.15–0.65). Asthma and COPD patients did not differ significantly in their consumption of SAAC or LABA, or combination products of LABA and ICS, or OCS, or theophylline.

Diagnostic labelling and certainty

In 46 patients (3.9%), the GPs were almost or completely certain

Table 3. Respiratory medication in diagnostic subgroups (% of the subgroup). For the abbreviations of the medication: see page XXX.

	Asthma	COPD	Asthma+COPD	Other obstruct disease	No airflow obstruct	Diagnosis unknown	All
SABA	31.3	10.3	17.1	11.5	4.3	21.1	**17.0**
SAAC	1.3	2.8	1.3	1.9	0.0	5.3	**2.0**
SABA+SAAC	20.1	37.5	34.9	26.9	28.0	13.2	**30.5**
LABA	9.1	7.6	3.9	7.7	2.9	7.9	**7.3**
LAAC	5.6	19.7	34.9	7.7	1.4	2.6	**12.8**
ICS	24.8	15.9	22.4	40.4	15.7	18.4	**20.2**
LABA+ICS	54.9	47.0	49.3	32.7	17.1	34.2	**46.7**
OCS	5.6	6.8	7.9	5.8	1.4	2.6	**6.1**
Theophyllin	6.6	10.3	8.6	3.8	1.4	2.6	**7.9**
NAC	3.8	10.9	9.2	9.6	4.3	2.6	**8.0**
ALT	14.4	2.8	5.9	0.0	1.4	0.0	**6.1**
Other 1	11.6	5.5	3.3	9.6	0.0	2.6	**6.7**
Other 2	1.6	1.1	1.3	1.9	0.0	2.6	**1.3**

Table 4. Self-rated certainty of diagnosis per diagnostic label [n (%)].

	Certain diagnosis	Almost certain diagnosis	Uncertain diagnosis
Study population	157 (13.9)	446 (39.6)	523 (46.4)
Asthma	50 (15.7)	132 (41.5)	136 (42.8)
COPD	95 (17.5)	251 (46.3)	196 (36.2)
Asthma+COPD	2 (1.3)	37 (24.3)	113 (74.3)
Other obstr disease	10 (19.7)	26 (50.0)	16 (30.8)
No obstr disease	2 (2.9)	44 (62.9)	24 (34.3)

that there were no valid arguments for OAD. Of the remaining 1126 patients, 603 (53.6%) received a 'certain' or 'almost certain' diagnostic label (Table 4). In 523 patients (46.4%), a diagnostic work-up was judged necessary. Adding the 446 patients with an 'almost certain' diagnosis to this number gave 969 patients (86.1%) who needed further examination.

A large majority of patients (860 or 73.3%) were classified as having asthma or COPD. The highest level of certainty was reached for the label "other obstructive disease". The average length of time since the first diagnosis was 13.7 years (95% CI, 8.7–10.0 years) for asthma, 8.3 years (95% CI, 7.6–9.0 years) for COPD, and 3.5 years (95% CI, 2.6–4.4 years) for patients judged to have "no airway obstruction".

The technical respiratory examinations performed in the two years before this survey are shown in Table 5. Less than 33% of the study population underwent spirometry during this period. Measurement of exhaled nitric oxide (NO) was largely unknown at the time of this survey.

Table 6 shows the diagnostic terms found in the medical files, and the diagnostic label that was assigned by the GP, after having reviewed all available data. In COPD patients, the "correct" label was found in the problem list in 67.7% of diagnoses, chronic bronchitis in 18.3%, emphysema in 15.5%, and asthma in 7.2%. In asthma patients, the "correct" label accounted for 76.5% of the diagnoses in the problem list, "asthmatiform bronchitis" was found in 17.2% and COPD in 6.0%.

Table 5. Technical examinations performed in the 2 years preceding the survey (% per diagnostic label).

	Asthma	COPD	Asthma+COPD	Other obstruct disease	No airflow obstruct	Diagnosis unknown	All
Spirometry	31.0	36.7	26.3	26.9	18.6	18.4	**32.5**
Reversibility test	13.5	15.3	9.2	15.4	4.3	7.9	**13.9**
Chest x-ray	27.9	43.2	34.9	42.3	28.6	34.2	**37.5**
Chest computed tomography	5.3	17.0	7.9	11.5	4.3	7.9	**12.1**
Diffusion capacity	13.5	17.3	7.9	23.1	10.0	10.5	**15.4**
Total lung capacity	13.5	20.1	11.8	25.0	10.0	10.5	**17.3**
Bronchial provocation test	4.7	3.5	3.3	1.9	4.3	2.6	**4.5**
Exhaled nitric oxide	0.9	1.3	0.7	0.0	0.0	0.0	**1.7**

Table 6. Diagnoses as found in the problem list of the medical file (% per diagnostic label at the end of the survey).

Final diagnostic label	Asthma	COPD	Asthma+COPD	Other obstruct disease	No obstruct	Don't know
Diagnoses in medical record						
Asthma	76.5	7.2	29.6	3.8	4.3	23.7
COPD	6.0	67.7	37.5	17.3	7.1	10.5
Chronic bronchitis	5.6	18.3	16.4	11.5	5.7	7.9
Asthmatif. bronchitis	17.2	7.9	21.7	15.4	8.6	21.1
Emphysema	2.5	15.5	8.6	13.5	2.9	7.9
Airway obstruction	5.6	9.0	10.5	11.5	1.4	2.6
Hyperreactivity	9.1	4.4	9.9	26.9	10.0	13.2
Chronic cough	4.7	8.1	6.6	1.9	8.6	10.5
Bronchospasm	3.4	3.5	2.6	1.9	1.4	7.9
Pneumoconiosis	0.6	0.7	0.7	1.9	0.0	0.0
Tuberculosis	1.6	3.1	3.3	3.8	1.4	0.0
Other respiratory diagnosis	2.8	6.3	1.3	17.3	7.1	7.9

Discussion

Diagnostic accuracy

Our survey shows that in this population a high proportion of patients with presumed airway obstruction needed a further diagnostic work-up. According to guidelines,[1,3] every patient with suspicion of airway obstruction should undergo at least one spirometry test, but this was documented for only 32.5% of this study population. A reversibility test was documented in only 15.3% of the patients classified as having COPD and in 13.5% of the patients classified as having asthma. Total lung capacity and diffusion capacity were documented in at least as many patients in both subgroups. The latter tests are not performed in the primary care setting, indicating that almost all the spirometry tests were performed in a specialised setting.

It is reassuring that after a review of the data on file, the diagnostic label switched from asthma to COPD, or vice versa, in only 6–7.2% of the patients. However, this was only the first step in a larger diagnostic work-up which was to take place for 86.1% of patients whose diagnosis was uncertain. The appearance of terms such as chronic bronchitis, emphysema and asthmatiform bronchitis in more than 10% of the medical files illustrates the heterogeneity of the clinical descriptions in these patients.

It is uncertain whether these conclusions can be generalised to the Belgian population. There was probably some selection bias because the study population was recruited in teaching practices, where the GPs may have wider knowledge of the GOLD and GINA guidelines than the average GP. The recruited practices showed at least some special interest in the respiratory field. We offered the incentive of a portable spirometer, an Internet-based course on office spirometry, and two training sessions. At the time of this survey, office spirometry was not reimbursed by the Belgian social security system, and training in office spirometry for GPs was only starting. These arguments lead us to conclude that, at the time of the survey, the diagnostic accuracy for patients with presumed airway obstruction in the general population was probably not any better than that observed in our survey. We expect that widespread introduction of office spirometry into primary care will change these figures,[10] but this remains to be proven. Given the free access to chest physicians, it is probable that a proportion of the Belgian population with asthma or COPD are seldom or never seen in general practice.

According to the definition for 'absolutely certain COPD' used in this study, the patients with GOLD class I were excluded (FEV_1 post bronchodilator> 80% predicted). This might artificially lower the degree of certainty for the diagnosis COPD. Nevertheless, the number and the ratio of patients with a 'certain' or 'almost certain' diagnosis of COPD exceeded those for asthma (Table 4). The lowest degree of certainty was noted for the label "asthma and COPD".

Co-morbidity

Even if there was a selection bias for the practitioners involved in this survey, this is not necessarily true for the study population itself. The 26 practices were spread throughout the country. The prevalence of co-morbidity and the use of medication can probably be generalised to the whole Belgian population over 40 years of age with airway obstruction who attend their family physician.

We confirmed the association between COPD and other tobacco-related diseases such as coronary heart disease, heart failure, stroke or TIA, and peripheral vascular disease.[11-13] The strong association between COPD and social and alcohol problems underlines the important psychosocial factors in the pathogenesis of the disease. Early detection, correct diagnosis and compliance with treatment options are problematic in this subgroup. The prevalence of identified depression did not differ between patients with asthma and COPD. Other studies have reported diverging results on this topic, probably related to different methodology.[14-16] The fact that obesity was as frequent in patients with COPD as in the global study population is probably explained by the high prevalence of patients with milder forms of COPD who do not generally show muscle wasting and cachexia. Comprehensive care for older patients with multiple morbidity will be a key issue in future.[17,18]

Smoking habits

Our study sample had a higher prevalence of smokers (36.9%) than in the overall Belgian population aged over 15 in the same period (22.0%).[19] It was not surprising that most (54.1%) of the COPD patients were still smoking and that fewer patients with asthma smoked (15.4%). It is possible that this latter figure was an underestimate because smoking status was not documented in the electronic medical file for 19.8% of the asthma patients, compared with 8.5% of those with COPD. This finding confirms the conclusion of a previous survey[20] that there is lack of correct registration of smoking habits in Belgian general practice. This can at least partially be explained by the fact that the current software for electronic medical records does not provide a standardised way for registering risk factors. We do not know why the French-speaking centres were more accurate in registering the smoking habits than were the Dutch-speaking centres. The difference in national prevalence of daily smokers between the French-speaking (28.2%) and the Dutch-speaking (17.4%) parts of the country[19] was confirmed in this survey (44.3% vs. 32.5%, respectively).

Medications

The prescription rate of combination inhalers was high. The usefulness of the combination LABA/ICS inhaler is well documented in patients with severe and very severe COPD who have frequent exacerbations.[21,22] This combination therapy was prescribed in 47% of the COPD patients. It does

not seem probable that nearly half of the patients with COPD in primary care present with GOLD stage 3 or 4. This combination therapy may also be indicated for patients with asthma which is not controlled by inhaled corticosteroids alone,[23,24] and it was prescribed in 54% of the asthma patients. Yet, some treatments did not seem logical – for example, anti-leukotrienes (ALT) for patients with COPD, or long-acting anticholinergics (LAAC) for patients with asthma. However, we note that the diagnostic opinion at the end of this survey related only to the start of the diagnostic work-up in most of the patients studied. We will report later about changes in medication patterns during the follow-up.

Conclusion

This survey confirms the underuse of spirometry as a diagnostic tool in patients with presumed airway obstruction in primary care.[25,26] Nearly half of the patients older than 40 years of age taking bronchodilators and/or inhaled corticosteroids needed a diagnostic work-up. Tobacco smoking remains a major problem in patients with OAD. This population had a significant prevalence of co-morbidity and polypharmacy. Comprehensive care for these patients is a typical primary care task and an important challenge for the future given the increasing prevalence of OAD.

Conflicts of interest

None declared.

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