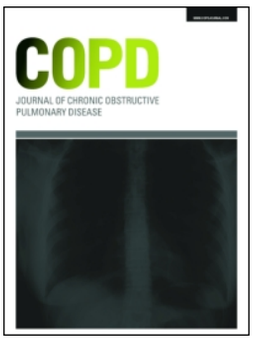

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ORIGINAL RESEARCH

Comprehensive Diagnostic Assessment of Health Status of Patients with Asthma or COPD: A Delphi Panel Study among Dutch Experts

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ABSTRACT

A comprehensive diagnostic assessment is needed to improve understanding of the health status of patients with chronic obstructive pulmonary disease (COPD) or asthma. Therefore, this study investigated which components and subsequent instruments should be part of a holistic assessment in secondary care. We also explored which data need to be exchanged for an adequate transfer of patients between primary and secondary care, and vice versa. A cross-sectional Web-based survey was conducted among Dutch healthcare professionals using a Delphi-like procedure; these included professionals working in primary or secondary care, medical advisors of health insurance companies and patients' representatives. The national guidelines were used as a starting point, resulting in a questionnaire addressing 55 components related to a comprehensive diagnostic assessment, covering the domains physiological impairments, symptoms, functional limitations and quality of life. Of the 151 experts and stakeholders invited, 92 (60.9%) completed the first round and 79 (52.3%) the second round; most respondents were pulmonologists. There was a high level of agreement between respondents from primary versus secondary care regarding which components should be measured during a comprehensive assessment of patients with asthma or COPD in secondary care and the instruments to measure these components. Regarding the exchange of information, upon referral, pulmonologists required little information from the general practitioners, whereas general practitioners required more extensive information after referral. An overview is provided of what should be part of a holistic assessment of health status in asthma and COPD. This information can be used as input for integrated care pathways.

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KEYWORDS
Holistic assessment; COPD management; monitoring; information exchange; health status

Background

Chronic obstructive pulmonary disease (COPD) is a complex and heterogeneous disease with pulmonary and systemic manifestations and multiple factors that affect a patients' health status as defined by four domains: physiological impairments, symptoms, functional limitations and quality of life (1–3). An assessment of all four domains might improve understanding of the burden of disease with subsequent guidance by treatable traits (4). A similar line of reasoning applies to patients with asthma, where multiple factors (e.g., airflow obstruction with dyspnoea and cough, bronchial hyperactivity, adherence to medication, overweight, a low level of physical activity, functional deficits and mood) affect the burden of disease (5). Assessing only one single factor (or a selection of these factors) might lead to an underestimation of the severity, incomplete management and disappointing outcome of care.

There is an increasing interest in the existence of a mixed COPD-asthma phenotype, known as the asthma-COPD overlap syndrome (ACOS). Although they have different characteristics, some individuals share features of both diseases (6,7). At first presentation, it may be difficult to distinguish between COPD, asthma and an overlap of both diseases. In particular, patients with more advanced or more complex COPD and/or asthma might benefit from a more structured approach towards assessment of all four domains of health status (8).

Although the relevance of each of these domains is acknowledged, there is little consensus on which components have to be addressed during routine assessment by pulmonologists (3). Furthermore, it is unclear which type of information needs to be exchanged between the general practitioner (GP) and the pulmonologist upon referral and on return to the GP after in-depth assessment for further treatment (9).

Therefore, the aims of this study are twofold. First, to determine which components experts consider being important in the comprehensive diagnostic assessment of the health status of patients with asthma and COPD by the pulmonologist. Second, to determine which data should be exchanged between the GP and the pulmonologist upon referral, and on return to the GP.

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In addition, we investigated whether opinions on these aspects differed between primary care (PC) and secondary care (SC), as well as between pulmonologists and respiratory nurses.

Methods

Study design

A cross-sectional Web-based survey was conducted among Dutch expert healthcare professionals using a Delphi-like procedure with two rounds, between February and October 2014 (10–12). First, we asked which components should be part of the comprehensive diagnostic assessment, and in the exchange of information between PC and SC. Second, we asked the expert panel how these components should (preferably) be measured.

Recruitment of experts

The sample comprised dedicated experts and stakeholders in Dutch healthcare with known interest in and knowledge of asthma and COPD. For this, we contacted the professional respiratory associations working groups. These working groups are responsible for the implementation of innovations, and they are mandated by the professionals to decide on the content of the guidelines in the Dutch healthcare system; national issues like this nationwide Delphi study will therefore always be referred to these working groups. This resulted in a panel of 151 experts and stakeholders, recommended by their respective professional associations. These included pulmonologists participating in the working group on asthma or COPD from the Dutch Society of Pulmonologists (in Dutch: NVALT), respiratory nurses working in SC and recommended by the Dutch Nursing Association, GPs who were members of the Dutch Organisation of GPs with special interest in asthma and COPD (in Dutch: CAHAG), medical advisors of health insurance companies (Achmea, Menzis, VGZ) and representatives of the Lung Foundation Netherlands.

Questionnaire round 1

The first round of the survey was conducted in February 2014. Part of the questionnaire was a list of 40 potentially important components of a comprehensive diagnostic assessment. The 40 components were obtained by a two-stepped method. The Dutch Standards of Care for patients with asthma and COPD were starting point of the list with components. These standards are developed by a working group in which experts of all disciplines are represented. The development is based on literature, from which the components of a diagnostic assessment were extracted and grouped into four domains: physiological impairment, symptoms, functional impairment and health-related quality of life (HRQoL). Based on these standards, a comprehensive and detailed list supplemented with components used in clinical care was presented to six independent Dutch key-opinion leaders. In the final list, their recommendations were included.

These components were allocated to the four domains of health: physiological impairments, symptoms, functional limitations and quality of life (3). Another 15 components grouped into the category 'interpretation of data' were added to explore to what extent the experts would value data and an explanation of the measurements and other relevant information, in order to complete a holistic assessment and establish an appropriate care plan.

Experts were asked to rate the importance of each of the 55 components using a 7-point Likert scale (range: 1 = very important; 7 = very unimportant). Next, the experts were asked to indicate which information about each component should be exchanged between PC and SC.

Examples of the questions are:

1) How important is this component in the comprehensive diagnostic assessment of asthma or COPD in SC?
2) How important is it to report this component during transfer from PC to SC for a comprehensive diagnostic assessment?
3) How important is it to report this component during transfer from SC back to PC for further treatment or shared care?

All three questions were asked separately for each component. Several components were specific for asthma or COPD, which was indicated for each specific question. After each question, experts were invited to add comments in an open space. In addition, experts were asked to select and rank the eight most important items. The responses obtained with questionnaire 1 were analysed in June 2014 and were used to design the questionnaire of round 2.

Questionnaire round 2

The second round was conducted in October 2014. The aim of the second round was to define which type of information is required for each component and how that information should be measured (i.e., which instrument, test, tool or questionnaire should be used). If ≤75% of the experts rated a component as important in the first round, it was excluded from the second round.

Two specific questions were addressed in the survey:

1) What would you like to know about the specific component?
2) Which measurement instrument(s) is (are) most appropriate?

For round 2, we approached the same experts as in round 1. Experts received a list of pre-selected options (obtained from clinical guidelines, literature and expert opinion) to choose from and were allowed to choose multiple items. In addition, space was provided after each question to add comments.

Data collection

All respondents received an email with an invitation letter and a link to a Web-based questionnaire: ThesisTool for the first round (www.thesistools.be) and SurveyMonkey for the second round (https://nl.surveymonkey.com). Email reminders were sent after 4 weeks. Participation in the study was voluntary. Experts and stakeholders participated anonymously to avoid the authority, personality or reputation of some participants from dominating others in the study process. To some extent, it might also free participants of their personal biases, allow free opinions and encourage open critique.

Table 1. Characteristics of the respondents.

	Round 1 (n = 92)		Round 2 (n = 79)	
	Secondary care	Primary care	Secondary care	Primary Care
Variable	N = 74 (80%)	N = 18 (20%)	N = 64* (81%)	N = 15** (19%)
Sex				
Male / Female	40% / 60%	56% / 44%	42% / 48%	47% / 27%
Age (years)				
< 35 years	17%	6%	14%	0%
35-45	29%	22%	28%	20%
45-55	42%	39%	30%	20%
> 55 years	12%	33%	19%	33%
Profession				
Pulmonologist	66%	0%	70%	0%
Respiratory nurse	34%	0%	30%	0%
General practitioner	0%	83%	0%	73%
Other stakeholders***	0%	17%	0%	27%
Work situation				
University Hospital	24%	0%	22%	0%
Teaching Hospital	43%	0%	28%	0%
General Hospital	16%	0%	31%	0%
Rehabilitation center	15%	0%	6%	0%
Primary Care	0%	83%	0%	73%
Other	2%	17%	13%	27%
Work experience****				
0-5 years			25%	13%
5-15 years			39%	13%
> 15 years			27%	47%
Work in current organization****				
0-5 years			27%	13%
5-15 years			44%	20%
> 15 years			20%	40%

*6 respondents did not fill out the socio-demographic data.
**4 respondents did not fill out the socio-demographic data.
***Medical advisors of health insurance companies (Achmea, Menzis, VGZ) and representatives of the Lung Foundation Netherlands.
****These questions only asked in Round 2.

In both rounds, respondent's socio-demographic data such as age, gender, profession, employed in PC/SC and years of work experience were also collected.

Data analysis

In the first round, a component was defined as relevant when ≥75% of the respondents chose either 'important' or 'very important' (Likert scale 1–2). Binary logistic regression analysis with 'component selected as important' as dependent variable and 'age' and 'gender' as co-variables was used to assess whether there was a difference in importance ratings between professionals working in PC and in SC. Binary logistic regression was also performed to investigate whether there was a difference in importance ratings between pulmonologists and respiratory nurses. The results were expressed as odds ratios (OR) and 95% confidence interval. Results of the second round were summarised with descriptive statistics (n, percentage by professional).

Results

Respondents' characteristics

Of the 151 participating experts and stakeholders, 92 (60.9%) completed the first round and 79 (52.3%) the second round. Most of the respondents in both rounds were pulmonologist (53% and 57%, respectively). In the first round, 27% of the respondents were respiratory nurses and 17% GPs. In the second round, 24% of the respondents were respiratory nurses and 14% GPs. Table 1 summarises the respondents' characteristics. Most of the respondents were working in a hospital setting and had ≥5 years of work experience (Table 1).

Results of the first round

How important is the component in the comprehensive diagnostic assessment in secondary care?

Table 2 shows the importance ratings of the 55 components, which are grouped into the four health domains and the additional interpretation category (middle column). 39 (71%) of the 55 components were rated as important by ≥75% of the respondents. In particular, almost all the components in the domains functional limitation and quality of life were considered important. Most of the components found to be less important (i.e., <75% of respondents rated this as important) were in the physiological impairment domain or referred to disease categorization (e.g., asthma phenotype or GOLD A–D) in 'Interpretation of data' (Table 2). Three components, 'peak flow measurement', 'inflammatory assessment' and 'vocal symptoms' were considered unimportant because only 30% of the respondents rated them as important.

The right-hand side of Table 2 shows the difference in scoring between PC and SC. The adjusted ORs ≥1 show that

Table 2. Components to be measured in a secondary care assessment.

Components	% respondents rating component important*	Odds ratios of PC (N = 21) versus SC (N = 71) **
Physiological impairments	Overall percentage*	Adjusted odds ratios** (CI 95%)
Family history	62	3.78* (1.07 - 13.34)
Pulmonary history	**97**	0.31 (0.23 - 4.21)
Comorbidity	**98**	NE
Smoking status	**95**	0.53 (0.08 - 3.38)
Exposition	**85**	1.85 (0.37 - 9.21)
Exacerbation frequency last year	**95**	NE
Hospital admission last year because of exacerbations	**97**	NE
IC admission last year as a result of exacerbations	**95**	0.9 (0.09 - 9.10)
Pulmonary medication	**98**	NE
Non pulmonary medication	**86**	1.37 (0.26 - 7.35)
Physical examination	**91**	1.87 (0.21 - 16.62)
Routine laboratory	60	3.61* (1.07 - 12.82)
Arterial blood gas analysis	54	1.25 (0.46 - 3.42)
Allergic assessment (asthma)	**87**	1.36 (0.26 - 6.98)
Sputum culture (bacterial)	41	0.8 (0.27 - 2.34)
Chest x-ray	**78**	0.67 (0.20 - 2.27)
HRCT	34	2.08 (0.75 - 5.74)
Peak flow measurement	22	0.97 (0.28 - 3.54)
Spirometry	**97**	NE
Airway obstruction and reversibility	**95**	NE
Lungvolumina (restriction; static hyperinflation)	**87**	1.44 (0.27 - 7.55)
Dynamic hyperinflation	**78**	1.29 (0.37 - 4.47)
Diffusion capacity (DL,CO)	**83**	0.28 (0.08 - 1.00)
Inflammatory assessment	26	0.73 (0.21 - 2.54)
Nutritional status	**89**	2.76 (0.21 - 2.54)
Cardiac analysis	58	1.38 (0.49 - 3.83)
Classification COPD in GOLD (I - IV)	**78**	2.05 (0.53 - 7.98)
Symptoms	Overall percentage*	Adjusted odds ratios** (CI 95%)
General symptoms	74	1.89 (0.54 - 6.61)
Respiratory symptoms	**98**	NE
Allergic symptoms	**86**	0.97(0.23 - 4.04)
Fatigue	66	1.48 (0.54 - 6.61)
Cardiac symptoms	**86**	1.76 (0.35 - 8.93)
Vocal symptoms	30	0.81 (0.25 - 2.60)
Anxiety and depression	**82**	6.27 (0.77 - 51.43)
Functional limitations	Overall percentage*	Adjusted odds ratios** (CI 95%)
Physical activity subjective	**92**	1.68 (0.17 - 16.52)
Physical activity objective	**89**	NE
Exercise capacity	**79**	7.4 (0.91 - 60.35)
Muscle strength	57	8.1* (2.01 - 32.67)
Quality of life	Overall percentage*	Adjusted odds ratios** (CI 95%)
Quality of life subjective	**79**	2.43 (0.60 - 9.93)
Quality of life measured by questionnaires	**90**	NE
Interpretation of data	Overall percentage*	Adjusted odds ratios** (CI 95%)
Description spirometry	**90**	NE
Specification of diagnosis asthma or COPD	**99**	NE
Disease control of patients with asthma	**92**	NE
Classification COPD in GOLD (I - IV)	69	1.03 (0.36 - 3.02)
Classification COPD in ABCD	58	1.62 (0.58 - 4.53)
Phenotyping COPD	59	3.72* (1.12 - 12.36)
Phenotyping asthma	63	2.73 (0.80 - 9.29)
Burden of disease	**83**	2.56 (0.52 - 12.58)
Individual careplan and goals	**82**	2.65 (0.54 - 13.04)
Pharmacological treatment advice	**98**	NE
Non-pharmacological treatment advice	**95**	1.1 (0.11 - 10.94)
Reply to medical question at referral	**83**	2.48 (0.49 - 12.63)
Justification treatment in secondary care	**83**	NE
Indicate casemanager	**86**	NE
Next scheduled control visit	**78**	6.57 (0.82 - 52.99)

Components that were considered important by at least 75% of the respondents are printed in bold.
*Secondary care and primary care respondents.
**Adjusted odds ratios primary care versus secondary care adjusted for differences in age and gender.
NE= can not be estimated because of insufficient variation in responses.

respondents from PC were more likely to rate components of the functional limitation domain and the 'Interpretation of data' category as being important than respondents from SC. Significant ORs were found for 'family history', 'routine laboratory', 'muscle strength' and 'phenotyping COPD'. No components were found to be significantly more important by respondents from PC or from SC.

Furthermore, respiratory nurses were more likely to rate 'quality of life' and 'family history' as more important than pulmonologists (data not shown).

What components are important to exchange between primary care and secondary care, and vice versa?

Table 3 (second column) shows the components considered necessary for an adequate documentation of a patient at referral from PC to SC. Ten components, mostly from the domain physiological impairment (8/10), were considered important for an adequate referral from PC to SC by ≥75% of the respondents.

Table 3 (fourth column) shows that PC professionals rated many more components as being important (indicated by an OR >1) to report at referral to SC than respondents from SC. Again, no components for referral were rated more important by PC or SC professionals. More items were considered relevant for transfer from SC to PC for further treatment by the GP or shared care. Table 3 (fourth column) shows that, of the 55 components, 38 (69%) were marked as important by at least 75% of the respondents. The components 'peak flow measurement' and 'vocal symptoms' were considered irrelevant (<30%).

Again, respondents from PC rated more components as being more important than respondents from SC (Table 3, fourth column).

Results of the second round

We excluded the PC in the second round because of the low response rate.

Table 4 shows the preferred instruments to measure the components as selected by the SC professionals (n = 64, 81%; of which 45 pulmonologists and 19 respiratory nurses). Measurements chosen by <50% of the respondents are presented in the online supplement.

In general, there was a high preference for registering information as open format in the medical files. If a standardised measurement was chosen, short questionnaires were preferred, like the Medical Research Council (MRC), Asthma Control question (ACQ) and the Clinical COPD question (CCQ). Overall, there was a high level of agreement between pulmonologists and respiratory nurses. Pulmonologists gave less priority to more specific nursing skills, such as inhaler device handling and nutritional assessment.

Discussion/conclusion

Our multidisciplinary expert panel showed an overall high level of agreement among respondents about the components that should be measured during a comprehensive assessment of patients with asthma or COPD in SC. Moreover, both PC and SC professionals had similar opinions regarding the components to be measured. Less agreement was found between PC and SC with regard to the exchange of information on referral, especially regarding the components on referral from PC to SC. When the expert panel was asked how each component should be measured by questioning if applicable, they showed a preference for short questionnaires.

Agusti and MacNee (4) suggested to implement a 'control panel' that includes *three* different domains of the disease to optimise the assessment of individual patients with complex diseases as COPD, whereas Vercoulen et al. (3,13,14) argued that a detailed assessment needs to include *four* domains. The Dutch Standards of Care for patients with asthma or COPD were built on these examples and adopted a model in which the assessment is based on four domains: physiological impairment, symptoms, functional impairment and quality of life (including HRQoL) (15,16). Such an assessment requires a combination of several instruments. However, there is relatively little guidance on the exact content and corresponding instruments to measure these domains. This observation was the main reason to conduct the current study which, to our knowledge, is the first that systematically asks experts from both PC and SC what components should be measured to cover the four domains, and which instruments are most useful to measure them. In contrast to other studies, we added a category 'Interpretation of data'. This final step integrates the available information into a truly holistic evaluation of the patient's health status with subsequent therapeutic implications. All earlier publications on holistic assessments lack this final and essential step based on the data of the four domains (2–4,14).

In general, respondents agree on the components that should be measured in the assessment. These responses are in line with the recommendations currently made in the Dutch standards of care for Asthma or COPD but require even more extensive information (15,16). This is also consistent with the elements of the recently developed Dutch Assessment of Burden of COPD (ABC) tool, which visualises multiple different aspects of the burden of COPD, thereby facilitating shared decision-making (17).

In particular, several items that reflect (lack of) consensus seem remarkable and are discussed below by category.

Regarding the physiological impairments, there is ongoing debate concerning the role of high-resolution computed tomography as part of routine diagnosis in COPD and asthma. Gupta et al. (18) recommend (HR)CT in all patients with asthma to detect common abnormalities (particularly bronchiectasis), and Hardin et al. (19) promote (HR)CT in all patients to better characterise the clinical features of the asthma-COPD overlap group. However, only 34% of our respondents endorse this opinion. Although (HR)CT provides unique COPD phenotyping information that is potentially predictive of exacerbations in subgroups of patients, the clinical importance with subsequent treatable traits of the (HR)CT in asthma and COPD is still debated (20,21).

This also applies to measurement of the diffusion capacity for carbon monoxide (D_L, CO). A vast majority of the respondents (83%) designated D_L, CO as important. Indeed, D_L, CO is an excellent test to unravel the physiological disorder in severe COPD. An impaired D_L, CO can be used as additional argument for co-existing COPD in smokers with asthma. Hence, the D_L,

Table 3. Exchange of information.

Components	Referral to secondary care(SC)		Referral back to primary care (PC)	
	% of respondents* that rated a component as important	Odds ratios of PC (N = 21) versus SC (N = 71)**	% of respondents* that rated a component as important	Odds ratios of PC (N = 21) versus HC (N = 71)**
Physiological impairments				
Family history	55	3.61*	51	1.42
Pulmonary history	**87**	0.53	**84**	0.31
Comorbidity	**91**	NE	**95**	0.19
Smoking status	**90**	NE	**92**	0.16*
Exposition	57	4.34*	**78**	0.99
Exacerbation frequency last year	**90**	3.31	**90**	0.41
Hospital admission last year because of exacerbations	**77**	1.16	**89**	3.07
IC admission last year as a result of exacerbations	**79**	1.26	**87**	1.65
Pulmonary medication	**96**	0.99	**99**	NE
Non pulmonary medication	**89**	NE	73	1.29
Physical examination	40	5.41*	71	3.03
Routine laboratory	35	4.51*	58	2.14
Arterial blood gas analysis	16	1.23	58	0.85
Allergic assessment (asthma)	52	4.91*	**85**	1.85
Sputum culture (bacterial)	17	0.44	52	1.55
Chest x-ray	34	2.04	**87**	3.25
HRCT			59	4.28*
Peak flow measurement	12	0.36	24	3.45*
Spirometry	61	4.3*	**95**	NE
Airway obstruction and reversibility	52	5.88*	**96**	NE
Lungvolumina (restriction. static hyperinflation)	22	4.07*	**79**	1.02
Dynamic hyperinflation			**86**	1.73
Diffusion capacity (DL,CO)			**78**	1.12
Inflammometric assessment			70	1.53
Nutritional status	71	1.57	**88**	2.93
Cardiac analysis	53	2.62	33	1.14
Classification COPD in GOLD (I - IV)	41	3.72*	**80**	1.83
Symptoms				
General symptoms	74	1.43	73	0.7
Respiratory symptoms	**89**	1.2	**96**	0.73
Allergic symptoms	59	11.79*	**75**	1.15
Fatigue	52	1.17	61	0.84
Cardiac symptoms	74	1.77	**82**	1.6
Vocal symptoms	26	0.73	30	1.14
Anxiety and depression	**79**	2.10	**84**	2.23
Functional limitations				
Physical activity subjective	70	2.77	**87**	0.94
Physical activity objective	54	8.93*	**90**	2.28
Exercise capacity	24	3.22*	**77**	2.28
Muscle strength	15	2.65	54	4.22*
Quality of life				
Quality of life subjective	64	1.58	**78**	1.68
Quality of life measured by questionnaires	61	22.27*	**94**	NE
Interpretation of data				
Description spirometry			**94**	1.79
Specification of diagnosis asthma or COPD			**99**	NE
Disease control of patients with asthma			**92**	NE
Classification COPD in GOLD (I - IV)			**76**	1.02
Classification COPD in ABCD			52	1.41
Phenotyping COPD			54	4.61*
Phenotyping asthma			61	2.59
Burden of disease			**86**	1.95
Individual careplan en personal goals			**84**	2.04
Pharmacological treatment advice			**98**	NE
Non-pharmacological treatment advice			**94**	1.53
Reply to medical question at referral			**94**	NE
Justification treatment in secondary care			**87**	NE
Indicate casemanager			**88**	NE
Next scheduled control visit			**77**	7.53

Percentages of components that were considered important by at least 75% of the respondents are printed in bold.
*Secondary care and primary care respondents.
**Adjusted Odds ratios primary care versus secondary care adjusted for differences in age and gender.
NE = can not be estimated because of insufficient variation in responses.

Table 4. How would secondary care like to measure this component?

Questions	Secondary care N = 64	Pulmonologist N = 45	Respiratory nurses N = 19
Physiological impairments	**%**	**%**	**%**
How do you want to measure comorbidity?			
As an open question in the medical dossier	69	62	84
How do you want to measure smoking habit?			
As an open question in the medical dossier	86	82	95
Calculate pack years smoking	64	60	74
Motivation as an open question	56	58	53
Motivation test	80	80	79
Hand-lung coordination	53	44	74
How do you want to get your information about use of pulmonary medication?			
As an open question in the medical dossier	80	73	95
Medication list pharmacist	77	71	89
Medication list patient	53	58	42
Check inhaler technique	80	76	89
How do you want to get your information about use of non-pulmonary medication?			
Medication list pharmacist	86	82	95
Medication list patient	52	60	32
How do you want to get your information about lung function?			
Pulmonary Function Lab secondary care	97	98	95
How do you want to measure Static hyperinflation?			
Body plethysmography	78	9	53
How do you want to measure Dynamic hyperinflation?			
Metronome-paced tachypnoea (MPT)	59	71	32
How do you want to measure nutritional status?			
Nutritional assessment	55	36	100
Body mass index	86	87	84
Boimpedance measurements	69	69	68
Symptoms			
How do you want to measure allergies?			
Total eosinophils in the blood	72	84	42
Allergen-specific immunoglobulin E (IgE)	73	78	63
Radioallergosorbent test (RAST)	70	73	63
How do you want to measure bronchial hyperresponsiveness?			
As an open question in the medical dossier	78	76	84
Histamine provocation test	86	91	74
Reversibility FEV1	56	67	32
How do you want to get your information about respiratory complaints in COPD?			
As an open question in the medical dossier	88	87	89
Medical Research Council (MRC)	67	62	79
Clinical COPD question (CCQ) questions 1-6	69	64	79
Nijmegen Clinical Screening Instrument (NCSI)	50	51	47
How do you want to get your information about respiratory complaints in Asthma?			
As an open question in the medical dossier	84	84	84
Asthma Control Questionnaire (ACQ) questions 1,2,4,5,6	80	82	74
How do you want to get your information about cardiac complaints?			
As a open question in the medical dossier	88	89	84
How do you want to measure anxiety and depression of youre COPD patient?			
Clinical COPD question (CCQ) question 3-4	56	60	47
Nijmegen Clinical Screening Instrument (NCSI)	59	58	63
How do you want to measure anxiety and depression of your Asthma patient?			
Nijmegen Clinical Screening Instrument (NCSI)	53	51	58
Functional limitations			
How do you want to get your information about exercise behaviour subjectively?			
As an open question in the medical dossier	84	84	84
How do you want to get your information about exercise behaviour objectively?			
Move Monitor	59	56	68
How do you want to get your information about exercise capacity?			
Six-minute walking test	84	89	74
Cycle ergometry	70	69	74
Quality of life			
How do you want to measure quality of life of your COPD patient?			
As an open question in the medical dossier	63	58	74
Clinical COPD question (CCQ)	61	62	58
Nijmegen Clinical Screening Instrument (NCSI)	66	64	68
How do you want to measure quality of life of your Asthma patient?			
As an open question in the medical dossier	61	56	74
Asthma Control question (ACQ)	67	71	58
Nijmegen Clinical Screening Instrument (NCSI)	50	51	47

Components that were considered important by at least 75% of the respondents are printed in bold.

CO measurement has relevant diagnostic but little therapeutic consequences (22,23). This is in contrast with airflow obstruction and (dynamic) hyperinflation, which may define important targets for medical treatment in both asthma and COPD.

Regarding the symptoms domain, the component fatigue was selected by 66% of the respondents as important, which is below our threshold of priority. Reason for this low response is probably because the factors that contribute to fatigue are diverse and perhaps poorly understood, so that the impact of treatment on fatigue is viewed as limited. However, fatigue is a disruptive symptom that inhibits normal functional performance in daily activities and is ranked as an important symptom by patients. This is why the Netherlands Respiratory Society included fatigue as one of the five themes in the National Program Lung Research. Furthermore, fatigue is also an item in the Assessment of Burden of COPD (ABC) Tool. Earlier studies proposed to integrate the Functional Assessment of Chronic Illness Therapy scale for fatigue (FACIT-F) in the assessment (24).

Regarding the domain functional limitation, patients with asthma, and especially COPD, have impaired yet subjectively overestimated performance of physical activity that seems to be related to their impaired health status (25,26). Despite this, monitoring physical activity is not yet commonly included in patients' assessments during routine care. The scores indicating high importance for physical activity and exercise capacity support their clinical importance and suggest increased awareness in both PC and SC. Respondents prefer an accelerometer as objective measurement tool. We suggest that objective physical activity measurement strategies and interventions aiming to increase physical activity should be implemented (25,27).

Regarding the category 'Interpretation of data' of measurements, disease categorisation, and more specifically, phenotyping in asthma versus specifying the GOLD ABCD classification in COPD, has no particular interest for the respondents. The first could be explained by the fact that phenotyping as first step in the assessment of asthma might not have direct added value in the treatment. However, the importance of phenotyping in difficult asthma has been reported (8). The lack of interest for the ABCD GOLD strategy in COPD might be explained by the fact that the consequences of the treatment recommendations as part of the ABCD strategy have not yet been validated in the clinical context.

When asking what information should be exchanged upon referral, pulmonologists generally require little information from the GP, i.e., even less than the GP is willing to provide. This is probably because the pulmonologist will in any case repeat the assessment, especially in case of lung function measurements: only 31% of the SC professionals will use the spirometry performed in PC. This might be due to perceived quality issues (28). In addition, pulmonologists probably prefer to measure spirometry as part of a more extensive lung function test in their own laboratory.

In contrast, the GP demands extensive information on all four domains of health status when patients are referred back to PC. The need for more information in this situation suggests awareness of multiple health status indicators and their implications for further treatment in PC. It also indicates that the GP judges the pulmonologist to be the designated expert to deliver this information. The need for extensive information also requires an adequate and standardised exchange of information. Inadequate information exchange might be a reason for poor outcomes in the management of chronic disorders (9). Han et al. (21) have pleaded for smooth and adequate communication between healthcare providers, stating that truly integrated care allows the patient to transition smoothly and seamlessly between health providers.

In general, there was a high level of agreement on the instrument and tools to collect the required information. There is high preference for registering information as open format in the medical records. Although this may seem easy, it hampers uniformity of registration and subsequent treatment. Co-morbidity potentiates the morbidity of COPD, increases the risk of hospitalisation and healthcare costs, and needs to be evaluated to develop treatment guidelines to improve benefits for the individual patient (29). A more structured registration by the Charlson Comorbidity Index, or clustering in five identified clusters, has been recommended (30,31). In addition, registration of HRQoL might benefit from structured, transparent, interchangeable registration, in this respect with validated questionnaires. Short validated instruments (like the CCQ, ACQ and MRC) are preferred to the more extensive but internationally accepted instruments like the Saint George's Respiratory Questionnaire. Short instruments are easy to use and implement in daily clinical practice and provide direct feedback (32).

The present study has several strengths and limitations.

The Dutch Standards of Care for asthma and COPD recommend a productive interaction between SC and PC in which the diagnostic secondary care assessment adds to the diagnostic assessment in primary care. Due to this integrated approach, we decided to include respondents from PC and SC.

While this subject is innovative and in the Dutch healthcare system still in development, the sample of respondents consists of specifically dedicated disciplines from PC and SC with adequate participation of specific asthma and COPD working groups. These working groups are responsible for the implementation of innovations, and they are mandated by the professionals to decide on the content of the guidelines in the Dutch healthcare system; national issues like this nationwide Delphi study will therefore always be referred to these working groups. This is the most common and accepted way in the Netherlands to address disease-specific issues and has several advantages; knowledge is concentrated and up-to-date, and it may ensure a higher commitment if conclusions from this study regarding the measurements are to be implemented in daily practice. The disadvantage of this selection is the probability of a higher consensus than among a random sample of GPs.

It should be noted that SC was relatively over-represented in round 2 of the Delphi procedure. The lower number of GP responses in round 2 is probably due to the specific nature of the questions, addressing diagnostic issues in SC. However, as round 2 asked about tools that should be used during the assessment in SC, it is not a major shortcoming.

As in many studies, our concern was adequate response. Overall, the response in the first round was 60.9%, and that in the second round was 52%. This is in line with other Delphi procedures (33,34). However, response among the individual disciplines is low. Several studies argue that a sample size of 9 to maximally 13 participants is sufficient because inclusion of more

participants does not generate new insights, i.e., saturation is achieved (12,35). In the first round, 15 GPs (44%) responded, and in the second round, only 8 responded. Therefore, we decide to exclude the GPs in the second round. This is shown in Table 4.

We used a modified version of the Delphi procedure, with a cut-off of 75% scoring of 6 or 7 on a 7-point Likert scale in order to define a component as important. Although this cut-off point is somewhat arbitrary, it is not unrealistic compared with that of other studies (36,37). Moreover, cut-offs vary widely between different Delphi procedures.

The optimal care for patients with asthma and COPD requires an individualised approach that recognises all aspects of the diseases and commitment from all the stakeholders. Although several integrated care programs, which apply such an individualised approach, are available, they all lack a detailed specification of instruments used in the holistic assessment (3,38,39). The present study provides more insight into the preferred components of such an assessment and the instruments used to measure them (38). This information might also be used as input for shared care programs, the development of Information and Communication Technology (ICT) systems that support the standardised recording of the assessment results, and perhaps to support reimbursement negotiations with healthcare insurance companies. The components for which no clear consensus is reached (Table 2) should not be ignored but need to be analysed further.

Declaration of interest

The authors report no conflicts of interest.

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