Development and validation of quality indicators for physiotherapy COPD-care

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words : 2918 (excl. 349 abstract)

tables : 6

appendices : 3

Abstract:

Introduction: In the Netherlands over 300.000 patients are diagnosed with Chronic Obstructive Pulmonary Disease (COPD). Many of these patients are treated by physiotherapists within a multidisciplinary setting. A COPD evidence-based guideline for physiotherapists has been developed to support in clinical decision making. However, it is unclear, whether physiotherapists adhere to recommendations in the guideline. To measure this adherence quality indicators are developed and validated.

Methods: The RAND modified Delphi method was used to develop quality indicators based on recommendations of the COPD-guideline. Experts were used to establish content validity of the indicators. Feasibility, discrimination ability, and adherence to the quality indicators was measured using patient case vignettes. The vignettes were specifically designed for this study based on existing patients. Scores for adhering to the indicators were derived from answers to dosed multiple-choice questions for clinical decision making based on the presented vignettes. The case vignettes were distributed among 76 physiotherapists in three regions in the Netherlands.

Results: Fifty nine potential quality indicators were identified from the recommendations of the COPD-guideline. Content validity was established by an expert panel that selected 21 process indicators in two written rounds and a consensus meeting. These process indicators were built in three patient case vignettes representing mild, moderate and severe patients with COPD. Sixty five physiotherapists (85%) completed the case vignettes showing feasibility of the indicators. Interquartile range was $\underline{\geq}$ 1 in 42 out of 50 eligible indicator scores (84%). GOLD stage was scored correctly in 90% of the three vignettes. Average score for good adherence was 26% for assessment of physical activity, and 45% for the use of supplemented oxygen.

Discussion: This paper shows content validity for developing quality indicators by using the RAND modified Delphi method. Deriving indicators from an evidence based guideline strengthened this process. The use of real patient case vignettes appeared to be a feasible and discriminative tool to measure quality of clinical practice.

Conclusion: A set of quality indicators for physiotherapy COPD-care was tested in three patient case vignettes and turned out to be relevant, measurable, and discriminative to evaluate quality of care in patients with COPD.

Introduction

In the Netherlands approximately 323.000 patients are diagnosed with COPD of which the majority leads a sedentary lifestyle.[1-3] Physical inactivity in patients with COPD is a common factor with a negative impact on quality of life.[4] Multidisciplinary pulmonary rehabilitation programmes, including physiotherapy have an important role in increasing exercise capacity, reversing skeletal muscle dysfunction, raising fat free mass, lowering perceived fatigue, reducing dyspnea and thus improving quality of life.[5-7] The updated COPD guideline for Dutch Physiotherapists (KNGF) was published in 2008.[8;9] The KNGF-guideline COPD reflects the importance of physical activity by recommending supervised rehabilitation and exercise programmes, and the stimulation of self management to enhance daily physical activity.[8;9] The KNGF-guideline COPD is translated in English, German and Portuguese language and methodology for the development of KNGF-guidelines reflects high standard of quality according to international standards (AGREE collaboration).[8;10] However, it is not known, whether physiotherapists adhere to recommendations in the guideline. Treatment of patients with COPD requires specific competences of physiotherapists within a multidisciplinary setting. In the Netherlands and Belgium networks of physiotherapists have been established who collaborate in the multidisciplinary care for patients with COPD. In a current study, a process evaluation of an implementation strategy for the physiotherapy COPD guideline, using systematic problem analysis, is conducted to identify barriers and facilitators for adherence to recommendations in the guideline.[11;12] Effectiveness of an implementation strategy for the guideline will be measured with quality indicators built in paper patient cases (vignettes) which describe diagnosis, treatment and evaluation of care and by guideline driven Electronic Patient Record (EPR). Quality indicators are measurable elements of care based on evidence or consensus to be an indicator for quality of care. Quality indicators can be used as instruments for quality improvement.[13] Usually three types of indicators are distinguished: structure, process and outcome indicators. Structure indicators are conditional for high quality care, such as availability of facilities, knowledge

of the professional, and organizational aspects. Process indicators based on evidence based guidelines measure quality of best care, and are based on throughput and output of care, describing the care itself.[11] The focus of these indicators is to evaluate diagnostic, therapeutic and evaluation processes based on clinical reasoning and decision making. Outcome indicators measure the results of performed care.[14] Outcome indicators are very sensitive for confounders and mostly used by health-insurance companies, politicians and patients.[14]

The aim of this study is to develop and to validate quality indicators (i.c. process indicators) of care in patients with COPD, and to measure feasibility, acceptability, discrimination ability and adherence to these indicators by physiotherapists.[15]

Methods

Recommendations from the evidence based KNGF-guideline COPD were used to develop quality indicators for measuring quality of the physiotherapeutic performance in patients with COPD. No gold standard exists for developing and validating quality indicators, but a recently developed manual for development of quality indicators for KNGF guidelines was used.[16] Methods for initial selection and validation (face-validity and content-validity) of the quality indicators were based on the RAND modified Delphi method.[15;17;18] Adherence to the quality indicators was measured using patient case vignettes, which were specifically developed for this study. The case vignettes were presented to physiotherapists in three participating regions: Limburg, Nijmegen and Eindhoven.

The aim of this study was to estimate construct (convergent) validity of the indicators by comparing scores from the case vignettes with the indicators scores from an Electronic Patient Record (EPR) for patients with COPD. The EPR-COPD was developed by Maastricht University in cooperation with FastGUIDE® (Fast Guideline Driven Expertsystem). FastGUIDE is a live benchmarking tool that accompanies Health Care Guidelines. Indicators were built in the EPR-COPD and scored via electronic data collection by participating physiotherapists using the EPR-COPD. It was expected that by the end of data collection (June 2010) sufficient data would be available for comparisons.

Detailed description of developing the quality indicators and case vignettes

Steps described in the manual to develop quality indicators are presented in Table 1. A Steering Committee, representing KNGF, Maastricht University and Nijmegen University, supervised the development and validation of quality indicators for internal quality improvement of care in patients with COPD. Target group were members of regional quality networks of chest physiotherapists specialized in COPD-care in the Netherlands (step 1). Two members (CZ, PW) of the research group derived potential indicators from the recommendations of the KNGF-guideline COPD. This first list was presented to a guideline expert and an author of the KNGF-guideline COPD (EH, DL) for a first check (step 2). The list of potential indicators was presented to an expert panel (n= 20) for selecting and specifying the indicators. They were asked to score the indicators on a five point Likert scale for relevancy and to comment on measurability, acceptability and feasibility, based on clinical reasoning of the care process. After collecting for relevancy and opinions on the other items a consensus meeting was organized to discuss outcomes of this written round. Outcomes from the consensus meeting were sent again to the expert panel for final comments. A priority of the selected indicators was also asked (step 3). Case vignettes were used for measuring adherence to the KNGF-guideline COPD. Three case vignettes that reflected real patients were developed (CZ) to score the indicators for adherence to the guideline. The case vignettes were based on three different levels of burden of disease conform the new Dutch Multidisciplinary Standard of COPD-care.[19] In this Standard, patients with COPD are characterized by the integrated context of their symptoms and not lung function only. The case vignettes were pre-tested by three members of the expert panel (EB, PW, RG). Finally the case vignettes were presented to the target group of physiotherapists in a web based system, with questions for clinical decision-making in physiotherapy diagnosis and treatment. A key was made for rating the indicators in the case vignettes measuring adherence to the KNGF-guideline COPD (step 4). Based on this practice test the indicators will be endorsed by the steering committee (step 5).

Analysis

For identification of relevant indicators items with a median score 4 and 5 on the five-point Likert scale were selected in the first Delphi round. For ordinal data discrimination ability of the indicator scores was tested by rating inter quartile range (IQR). IQR of ≥ 1 was considered adequate. Descriptive statistics were used to calculate adherence to the indicators for each of the three case vignettes. We anticipated on testing construct validity (convergent validity) by calculating Intra Class Correlation (ICC), based on comparison of the indicators in the EPR-COPD with the case vignettes. SPSS 15 for Windows was used for all analyses.

Results

Selection of the quality indicators

Fifty nine potential quality indicators were initially derived from the recommendations of the evidence based KNGF-guideline COPD. An expert panel of twenty physiotherapists (table 2) selected forty nine indicators in the first written round, rating relevancy and appropriateness. After this first round the expert panel discussed this outcome in a consensus meeting (n=12) and made suggestions for clustering indicators that were rating the same construct. Example: type of training (endurance versus interval), training intensity, frequency of training, time of exertion, and duration of training under supervision were all separate indicators. These items were combined in the indicator 'exercise training' with different aspects (see also table 6A for this example). This reduced the number of indicators enormously. The experts also suggested differentiation in the various phases of the care process: screening & diagnosis, therapy, evaluation & aftercare, based on the level of evidence and clinical relevancy. This resulted in nineteen process indicators and two structure indicators. Neuro-Muscular Electronic Stimulation (NMES) which reflects a specific group of patients, with a high burden of disease and a extreme loss of skeletal muscle function, were added to the list after the consensus meeting. Thus twenty process indicators and two structure indicators were selected. The process indicators were built into the case vignettes and the case vignettes were pre-tested by three

members of the expert panel. This led to small changes in formulation of questions and categories of answers. Supplemented oxygen use was added as an indicator to two of the three case vignettes, representing patients with large desaturation during physical training. Finally twenty-one process indicators were produced (table 3).

Patient case vignettes

Twenty-one process indicators were built in the case vignettes. Three disease profiles were distinguished in the case vignettes conform the Multidisciplinary Dutch Standard of COPD-care. Two types of questions were used: multiple choice questions allowing for choosing only one answer category (see table 6A for an example) and multiple choice questions allowing for choosing more than one answer category (see table 6B for an example). For questions with only one correct answer category this resulted in nominal data with a correct (good adherence) or wrong answer (low adherence). Questions with more than one correct answer category resulted in ordinal data and are presented as excellent/ good, moderate and low adherence to the KNGF-guideline COPD. Two scoring systems for ordinal data were used: (1) scoring points in questions corresponding good, moderate and low adherence and (2) questions which scored two or one good answers (good adherence), one good and one wrong answer (moderate adherence), one wrong or two wrong answers (low adherence).

Acceptability, feasibility and discrimination ability of the indicators

The case vignettes were presented to seventy six eligible physiotherapists in the trial from three participating regions. Characteristics of the participating physiotherapists are presented in table 4. Adherence to twenty-one process indicators (inclusive supplemented oxygen use) was measured for each of the three patient case vignettes, reflecting adherence of physiotherapists to the KNGF-guideline COPD.

Feasibility is guaranteed through the use of an online data system, which gathered accurate and consistent data on micro (individual physiotherapist) and meso (practice or hospital) level. Sixty four colleagues scored all three cases and one scored two cases proving good acceptability and measurability of the quality indicators in the case vignettes. Response rate was 85%. Discrimination ability of the indicators measured by inter quartile range (IQR) for ordinal scores are presented in table 3. Out of 62 indicator scores (3 vignettes x 21 indicators), 50 scores were eligible for calculating IQR. Values of IQR were ≥ 1 for 42 indicators and < 1 in the remaining eight indicators. IQR of assessment of peripheral muscle strength (indicator #4) scored zero in all three case vignettes. Assessment of physical activity (indicator #6) showed the highest IQR with scores of 3, 3.5, and 1 for vignette one, two and three respectively.

Adherence to the indicators

Participating physiotherapists scored indicators at three domains: (1) screening and diagnosis, (2) treatment, and (3) evaluation and aftercare in all three patient case vignettes. The results are presented in table 5. In screening and diagnosis, GOLD stage was scored correctly in 95%, 91% and 83% in respectively case vignette one, two and three. Scores for assessment of physical activity in case vignette one was as follows: Good (23%), Moderate (22%) and Low (55%). In case vignette two good, moderate and low scores for assessment of physical activity were 28%, 15% and 57% respectively. For case vignette three this was 28%, 14% and 58%. In the domain treatment supplemented oxygen use scored in case vignette one 51% good adherence and in case vignette three 41%, respectively 45% good adherence. In level evaluation and aftercare scored indicator twenty organizing aftercare in case vignette three 25% good adherence to the KNGF-guideline COPD. Results from the Electronic Patient Record (EPR-COPD) were not available at the end of June 2010. It was therefore not possible to compare the outcomes of the vignettes with the EPR-COPD to estimate construct validity.

Discussion

The aim of this study was to develop and validate quality indicators of care in patients with COPD. The use of the RAND modified Delphi method to develop clinical quality indicators, which combined written comments by an expert panel with discussion and argumentation in a latter round as described in the method of this paper showed face- and content validity.[15] Deriving indicators from an evidence based guideline strengthened this process.[18]

Reliability was guaranteed by pre-testing the indicators in patient case vignettes by experts and the use of real patient cases in the case vignettes.[16] Accurate and consistent information systems such as an Electronic Patient Record (EPR) are also considered important for collecting reliable data.[15]

Scoring case vignettes showed acceptable validity to measure guideline adherence among large groups of physiotherapists.[20] Peabody described that vignettes are a valid tool for measuring the quality of clinical practice.[21] Case vignettes appear to be a comprehensive method that directly focuses on the process of care provided in actual clinical practice.[1]

The acceptability and measurability of the case vignettes was high with 85% response rate, but may have been influenced by offering eligible participants a master class COPD free of charge in return for scoring the case vignettes. Only the real interested colleagues in COPD may have responded, resulting in possible bias with a positive discrepancy in outcome of the adherence of the guideline in practice. All indicators except assessment of peripheral muscle strength (indicator #4) showed discrimination ability based on IQR calculations. In assessing peripheral muscle strength most physiotherapists scored the correct measurement scales. For this item the discrimination ability is very low, because almost everyone scored the correct answers. Streiner described discrimination ability as a check for the utility of an item.[22] In this context it showed good adherence to the KNGF-guideline COPD.

Assessment of physical activity (indicator #6) scored the highest IQR, consequently with a high discrimination ability. Adherence to this indicator was very low, suggesting large room for improvement in clinical practice with respect to this item. This item is new in the KNGF-guideline

COPD, and strong evidence supports the importance of this item.[23-25] This may have important implications for further strategy, with a focus on implementing scientific evidence into clinical practice.[26]

High adherence to the KNGF-guideline COPD to GOLD scores in indicator #2 (with good scores of 95%, 91% and 83% for the three case vignettes) showed sufficient knowledge in this group of specialized physiotherapists. Adherence to assess exercise tolerance (indicator #3) was low (good adherence of only, 25%, 19% and 22% in respectively case vignette one to three). This adherence was low, because a large number of physiotherapists were testing exercise capacity in patients with COPD themselves for example by the Åstrand test. They experienced resistance in requests for a maximal exercise test supervised by a physician as recommended in the KNGF-guideline. This is of great concern to the condition of the patient with COPD according to National Primary Care Agreements.[27] Defining correct treatment goals also scored low (good adherence of only, 31%, 15% and 54% in respectively case vignette one to three) to adherence. It appeared that correct treatment goals were better established in complex patients as represented in vignette three. In the more easy case vignette two (GOLD 1 + 2 with MRC < 2) it appeared there is an overtreatment according to the KNGF-guideline COPD, where advice to enhance physical activity was sufficient, patients were referred to an exercise programme. In case vignette three, physiotherapists scored much better to adherence. Probably they were treating more patients with a higher burden of disease and were more familiar with these severe patient cases.

A limitation of this study was the inability to estimate construct validity. This was not measured yet because lack of data from the EPR-COPD until June 2010. It was disappointing to see that the use of a web based EPR-COPD as designed by Maastricht University and Fastguide® overwhelmed physiotherapists with the given information and time spent to fill in all possible questions at this moment. Improving skills and experience by physiotherapists in using the EPR-COPD will take some time, but then gathering data will be better. Informed consent from patients was less than expected

for retrieving data from the EPR-COPD. As there were more data in the EPR-COPD it would be worthwhile to test construct validity in a latter phase.

Another limitation of this study was that all participating physiotherapists came from the south east of the Netherlands. Further research under more participants in different regions in the Netherlands could validate this indicators even more for the Dutch situation. The clinical implication of this study is very promising, because with the use of quality indicators adherence to the guideline can be measured.

Conclusion

Authors developed a valid set of quality indicators for physiotherapy COPD-care tested in three case vignettes. Quality indicators built in case vignettes are relevant, measurable, reliable, valid, and discriminative to evaluate quality of care in patients with COPD. Adherence to the indicators shows a large variety, suggesting that large improvements in clinical practice are feasible.

Acknowledgements

Expert panel of COPD physiotherapists: Joan Adrichem, Thea Barendse MSc, Emmylou Beekman MSc, Chris Burtin MSc, Annemieke Fastenau MSc, Harm Gijsbers, Prof. R. Gosselink PhD, Erik Hendriks PhD, Alex van 't Hul PhD, Sandra Jongenotter, Machteld Jongmans, Mariska Klaassen, Daniel Langer PhD, Bill Paterson, Gerda Reinsma MSc, Ellen Toet, Frits van Trigt, Prof. Thierry Troosters PhD, Mirjam Verhoef, Paul Weltevreden.

Patients which gave their informed consent for using data of the EPR-COPD.

Participating physiotherapists which scored the case vignettes and gave their informed consent for using data of their EPR-COPD.

The Royal Dutch Society of Physiotherapy - KNGF for using their office and support.

Sara de Die, Master Student Health Sciences – Movement Science at Maastricht University for research assistance.

Special thanks to Prof. Dr. R. Gosselink for his critical comments on designing the case vignettes.

Appendices: (all in Dutch)

- Score charts
- Indicators
- Case vignettes (3) in relation to indicators

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Table 1: Steps to develop quality indicators [16]

Step 1	Goal setting and defining the target group
Step 2	Derivating recommendations from the KNGF-guideline COPD
Step 3	Selecting and specifying indicators
Step 4	Practice test (Case vignettes)
Step 5	Establish indicator set by steering committee

Table 2: Characteristics Expert Panel COPD

Expert panel (N=20)	
Male /female	10/10
Age in years: mean (range)	43,3 (27-61)
Worksetting	Primary care (n=11) [University-] Hospital (n=7) Rehabilitation centre (n=2)
Function (all physiotherapist)	Professor (n=2) Manager (n=2) Researcher (n=9) Lecturer (n=14)
Education level	Bsc (n=10) Msc (n=5) PhD (n=5)

Table 3: Selected indicators and IQR

Proces indicators: (n=21)	**IQR (n=….)**		
The physiotherapist:	**Case 1**	**Case 2**	**Case 3**
Screening and diagnosis:			
1. Contacts physician for missing relevant information and discusses treatment plan	1 (62)	n.a.	n.a.
2. Identifies symptoms and interprets referral information (spiro-/ ergometry/ etc.)			
- Assessment goals	1 (65)	0 (65)	2 (65)
- Mucus	n.a.	2 (13)	1 (39)
- Dyspnea	2 (53)	2 (54)	2 (50)
- Additional information	n.a.	2 (65)	n.a.
3. Assesses and interprets exercise tolerance (6 MWT/ SWT)	1 (64)	1 (63)	1 (51)
4. Assesses and interprets peripheral muscle strength by handheld dynamometry	0 (58)	0 (44)	0 (59)
5. Assesses and interprets respiratory muscle strength by measuring mouth pressure	1 (17)	1 (20)	0 (32)
6. Assesses and interprets physical activity	3 (52)	3,5 (45)	1 (43)
7. Assesses and interprets quality of life	1 (43)	1 (34)	1 (44)
8. Chooses and defines the right treatment plan	1 (65)	1 (65)	1 (64)
9. Inventorizes patient needs and selects treatment goals	1 (65)	1 (65)	1 (64)
Treatment:			
10. Organizes exercise training (endurance/ interval training)	Nominal	Nominal	Nominal
10A. Organizes oxygen use in exercise training	Nominal	n.a.	Nominal
11. Organizes muscle training			
– peripheral muscle training	1 (32)	1 (9)	2 (56)
– respiratory muscle training	Nominal	Nominal	Nominal
12. Organizes NMES	n.a.	n.a.	n.a.
13. Organizes breathing exercises against dyspnea	2 (51)	1 (38)	2 (48)
14. Organizes breathing exercises for mucus clearance	n.a.	n.a.	1 (56)
15. Supports self management to active healthy lifestyle	1 (58)	0,75 (56)	1 (39)
16. Informs, advices and motivates patient stop smoking	1 (58)	0,75 (56)	1 (39)
17. Checks nutrition and refers to dietician	1 (58)	0,75 (56)	1 (39)
18. Supports self management about exacerbations	n.a.	1 (63)	n.a.
Evaluation and aftercare:			
19. Rapports to physician	n.a.	1 (65)	Nominal
20. Organizes after care	n.a.	1 (65)	Nominal

n.a. = not applicable

IQR = Inter Quartile Range meaning there is discriminative power when IQR $\geq$ 1

(n=…) = number of physiotherapists, who scored the question

Table 4: Characteristics of the research population

Population (n=65)	**Region Eindhoven** (n=17)	**Region Nijmegen** (n=33)	**Region Limburg** (n=15)
Age Physiotherapists (median)	31-35	36-40	36-40
Male/ female (n=)	6/11	22/11	13/2
Work-Setting (%) Primary Care Hospital Rehabilitation Centre	 100 0 0	 81 14 5	 100 0 0
Work experience in years (median)	6-10	11-15	16-20
Work experience with COPD in years (median)	0-5	0-5	0-5
Practice holder/ Employee (n=)	6/11	6/27	10/5

Table 5A: Adherence to the KNGF guideline COPD / Screening and diagnosis

Quality indicators	Case 1 (n=65)			Case 2 (n=65)			Case 3 (n=64)		
%	excellent/ good	moderate	low	excellent/ good	moderate	low	excellent/ good	moderate	Low
Screening and Diagnosis									
Ind.1: contact physician completing info contact physician	 95 [1] 21 [1B] 85 [5]	 - 47 -	 5 32 15	 n.a. n.a. n.a.			 63 [1] n.a. 66 [5]	 - -	 37 34
Ind.2: Symptoms and info referral + Assessment goals + GOLD + Mucus + Dyspnea + Red Flags + Factors + Discussion	 46 [3] 95 [2] n.a. 54 [3D] 69 [4] n.a. 14 [5A]	 46 - 28 - 54	 8 5 18 31 32	 23 [3] 91 [1] n.a. 52 [3D] 97 [4] 51 [2] n.a.	 60 - 32 - 37	 17 9 17 3 12	 40 [3] 83 [2] 8 [3A] 55 [3D] 65 [4] n.a. n.a.	 25 - 34 22 - 	 35 17 58 23 35
Ind.3: Assess exercise tolerance	25 [3B]	59	16	19 [3B]	46	36	22 [3B]	51	27
Ind. 4: Assess peripheral muscle strength	80 [3E]	9	11	57 [3E]	11	32	72 [3E]	17	11
Ind. 5: Assess respiratory muscle strength	n.a. [3F]	-	-	n.a. [3G]	-	-	45 [3F]	5	50
Ind. 6: Assess physical activity	23 [3C]	22	55	28 [3C]	15	57	28 [3C]	14	58
Ind. 7: Assess quality of Life	51 [3G]	12	37	42 [3F]	6	52	52 [3G]	12	36
Ind. 8: - Programme - Intervention	 45 [6] 32 [8]	 - 54	 55 14	 54 [5] 37 [7]	 - 42	 46 21	 89 [6] 63 [8]	 6 22	 5 15
Ind. 9: Defining treatment goals	31 [7]	68	1	15 [6] 49 [10]	57 49	28 2	54 [7]	28	18

n.a. = not applicable

* = in these questions the right choice is made and is scored the intervention itself

[…] = question number in case vignette

Table 5B: Adherence to the KNGF guideline COPD: Treatment

Quality indicators	Case 1 (n=65)			Case 2 (n=65)			Case 3 (n=64)		
%	excellent/ good	moderate	low	excellent/ good	moderate	low	excellent/ good	moderate	low
Treatment									
Ind. 10: Exercise training - Endurance - Interval	 85* [8C] 79 [8D]	 - -	 15 21	 n.a. [7C] n.a. [7D]			 88* [8C] 86 [8D]	 - -	 12 14
Ind. 10A: Oxygen use - All regions - Eindhoven - Limburg + Nijmegen	 51 n.a. n.a.	 -	 49	 n.a. n.a. n.a.			 n.a. 41 45	 - -	 59 55
Ind. 11: - Peripheral muscle strength - Respiratory muscle strength	 31 [8E] 82* [8F]	 9 -	 60 18	 n.a. [7E] n.a. [7F]			 62 [8E] 39 [8F]	 8 -	 30 61
Ind. 12: NMES	n.a. [8E]	-	-	n.a. [7E]	-	-	n.a. [8E]	-	-
Ind.13: Breathing exercise against dyspnea	22 [8B]	34	44	n.a. [7B]			54 [8B]	15	31
Ind. 14: Breathing exercise stimulating mucus transport	n.a. [8A]			n.a. [7A]			38 [8A]	32	30
Ind. 15/16/17: Education - Eindhoven - Limburg + Nijmegen	28 [8G] n.a. n.a.	59	13	31 [7G] n.a. n.a.	34	35	n.a. 58 [8G] 55 [8G]	 12 13	 29 32
Ind. 18: Exacerbation prevention	n.a.			2 [9]	54	44	n.a.	-	-

n.a. = not applicable

* = in these questions the right choice is made and is scored the intervention itself

[…] = question number in case vignette

Table 5C: Adherence to the KNGF guideline COPD: Evaluation and aftercare

Quality indicators	Case 1 (n=65)			Case 2 (n=65)			Case 3 (n=64)		
%	excellent/ good	moderate	low	excellent/ good	moderate	low	excellent/ good	moderate	low
Evaluation and aftercare									
Ind. 19: Rapports physician	77 [10]	-	23	52 [8]	43	5	n.a.	-	-
Ind. 20: Organizes aftercare	77 [10]	-	23	52 [8]	43	5	25 [10]	-	75^

n.a. = not applicable

^ = physiotherapists scored 51% maintenance training once a week (this is common policy in the Netherlands, but this is not the recommendation in the KNGF-guideline COPD).

[…] = question number in case vignette

Table 6 A: nominal data (pie charts)

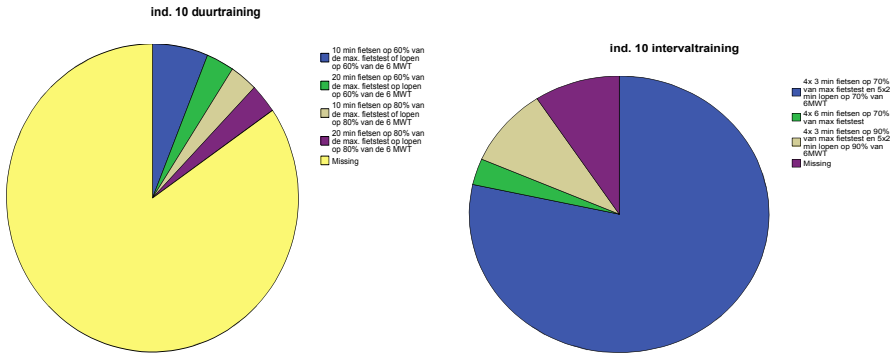
Example indicator 10 exercise training in question 21 and 22 in the case vignette 1 (just one answer is right)
Question 1: choice for endurance training (I specify endurance training as follows:) - 10 minutes cycling at 60% Wmax or 10 minutes walking at 60% speed from 6 MWT # - 20 minutes cycling at 60% Wmax or 20 minutes walking at 60% speed from 6 MWT - 10 minutes cycling at 80% Wmax or 10 minutes walking at 80% speed from 6 MWT - 20 minutes cycling at 80% Wmax or 20 minutes walking at 80% speed from 6 MWT Question 2: choice for interval training (I specify interval training as follows:) - 4x 3 minutes cycling at 70% Wmax and 5x 2 minutes walking at 70% speed from 6 MWT - 4x 6 minutes cycling at 70% Wmax - 4x 3 minutes cycling at 90% Wmax and 5x 2 minutes walking at 90% speed from 6 MWT - 4x 6 minutes cycling at 90% Wmax # Wmax = maximum Wattage and 6 MWT = six minute walking test
Key: Right is choice for interval training for at least 20 minutes at 70% Wmax and 70% speed of 6 MWT in short intervals smaller than 3 minutes, because of great desaturation under 90%. So the right answer is answer 1 in question 2!   

Table 6B1/2 ordinal data (IQR)

6B-1: Example indicator 9 treatment goals in question in the case vignette – ordinal data

Question in patient case 1: treatment goals in patient case 1: (all variables could be scored)

- decreasing dyspnea
- improving exercise tolerance
- improving peripheral muscle strength
- improving respiratory muscle strength
- improving physical activity
- improving mucus clearance
- improving self management through information, education and recommendation
-

Scoring: Key: mucus - - / others + (range: +6 t/m -2)

In this patient is mucus not a treatment goal – all other treatment goals are appropriate

- 6-5 points= Good
- 4-3 points = Moderate
- 2-1 point(s) = Low
- 0- -2 point(s) = Very low

6B-2: Example indicator 3 assesses exercise tolerance

Question in patient case 3: To assess exercise tolerance I use the following measurements (max. 2 variables could be scored)

- Inspection/ observation thorax
- Inspection/ observation/ auscultation breathing
- Inspection sputum
- Saturation
- BORG score (dyspnea and fatigue)
- Blood pressure
- Body Mass Index (BMI)
- Fat Free Mass Index (FFMI)
- 6 Minute Walk Test
- Shuttle Walk Test
- Astrandtest
- Muscle strength (extension knees / abduction arms and handgrip power)
- Muscle strength abdomen
- Respiratory muscle strength
- Shortness of breath – Medical Research Council - dyspnea (MRC)
- Physical Activity scale (Marshall)
- Physical Activity scale (Baecke)
- International Physical Activity Questionnaire (IPAQ)
- Physical Activity Readiness Questionnaire (PARQ)
- Activity level measured by pedometer or accelerometer
- Patient Specific Complaint list (PSK)
- Timed Up and Go test (TUG)
- Clinical COPD Questionnaire (CCQ)
- Chronic Respiratory Disease Questionnaire (CRDQ)
- St. George Respiratory Questionnaire (SGRQ)
- Quality of Life for Respiratory Illness Questionnaire (QoL-RIQ)
- Euroqol-5D (EQ-5D)
- RAND 36
- Other, namely……

Scoring:

Key: 6 MWT +/ SWT +/ Astrand - - / others - (range: 2 to -3)

- 2 points = 2 good answers = excellent : excellent/ good adherence
- 1 point = 1 good answer = good : excellent/ good adherence
- 0 points = 1 good and 1 wrong answer : moderate adherence
- -1 point = 1 wrong answer or 1 good and Astrand : low adherence
- -2 points or -3 points (Astrand) = 2 wrong answers : low adherence