Original Research
COPD Exacerbation Recognition Tool: Translation, Linguistic, and Cross-Cultural Validation

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Running Head: *Linguistic and Cultural Validation of the CERT*

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Abbreviations: CERT=COPD Exacerbation Recognition Tool; CERT-J=COPD Exacerbation Recognition Tool – Japan; COPD=chronic obstructive pulmonary disease; FDA=Food and Drug Administration; GAAPP=Global Allergy and Airways Patient Platform; ISO=International Organisation for Standardisation; LVC=linguistic validation consultant;

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Abstract

Background: The Chronic Obstructive Pulmonary Disease (COPD) Exacerbation Recognition Tool (CERT) was developed to improve patients' recognition of COPD exacerbations. This validation study concerned the cross-cultural and linguistic validation of 46 CERT translations across 25 countries and 6 continents.

Methods: This study employed a rigorous, certified (International Organisation for Standardisation [ISO]-17100) methodology. Dual forward translations for each language were developed by independent translators who were native speakers of the target language and then reconciled by a linguistic validation consultant (LVC). Independent linguists provided a back translation of the reconciled translation, which was reviewed by the LVC and project manager. Linguistic validation was performed for each language through cognitive debriefing interviews with at least five participants with COPD who were native speakers of the target language. These participants also reviewed seven sets of images produced for different global regions to reflect patients from a diversity of cultures, countries and religions, to determine if the images were representative of themselves and/or other people living with COPD. The images were amended as needed and reshown to the participants for approval.

Results: The translations were found to be conceptually equivalent to the original CERT and harmonised with each other. Participants found the CERT easy to use and understand and confirmed that the images were representative of themselves and/or other people living with COPD.

Conclusion: CERT translations were created using a patient-centric approach and appear to be easily understandable and valid across many languages and cultures.

Introduction

Chronic obstructive pulmonary disease (COPD) is one of the leading causes of morbidity and mortality worldwide and has a considerable economic burden.[1,2] COPD exacerbations have been shown to increase healthcare resource utilisation and costs and to negatively impact patients' quality of life.[3] Exacerbation frequency is an important determinant of lung function decline;[4] as exacerbation frequency and severity increases, the risk of future exacerbations and mortality also increases.[5] Despite this, patients experience difficulty recognising an exacerbation,[6] and approximately 40% of COPD exacerbations are not immediately reported by patients.[7-10] Additionally, patients have been shown to report exacerbations in some instances, but not in others.[10] Opportunities for treatment changes can therefore be missed, and this may have a subsequent impact on health status.[11,12]

The COPD Exacerbation Recognition Tool (CERT) was first developed in China to help patients to recognise when they are experiencing a COPD exacerbation and to encourage them to seek prompt medical assessment.[13] The development study aimed to identify the words and phrases used by patients in China to describe symptoms associated with the onset of a COPD exacerbation.[13] The key symptoms identified were worsening cough, increased sputum volume, shortness of breath, laboured breathing and limitation of activity.[13] Moderate or severe worsening in at least two of these symptoms relative to the patient's usual state had good sensitivity (91.8%) and specificity (100%) for an exacerbation.[13] A recent study conducted in China in a different population of patients with COPD has shown that the CERT has high sensitivity (92.4%) and specificity (72.1%) for moderate and severe exacerbations.[14] A second developmental study took place in Japan, independently of the development of the CERT in China.[15] Using similar methodology to the original CERT study, this Japan-specific CERT identified the same symptoms as those listed in the original CERT, with the addition

of a sixth symptom (change in sputum colour) that was added at the request of physician advisors.[15]

Another recent study, conducted in Germany, used a German translation of the CERT items in the form of a daily diary to identify whether the tool could identify the onset of a COPD exacerbation.[16] Patient responses to the CERT when it was used in this way were shown to predict exacerbations one day before the clinical diagnosis was made and showed good sensitivity and specificity (70% and 91%, respectively).[16]

To improve the accessibility of the CERT, it has been translated into over 60 languages, taking care to ensure that the translations were conceptually equivalent to the original, comparable across languages, culturally relevant to the context of the target country and easily understood by patients. To this aim, we conducted a cross-cultural and linguistic validation of 46 CERT translations. In this paper we focus the results on five translation languages from five different regions that represent a broad range of cultures and geographic scope: Indonesian, Korean, Norwegian, Spanish for use in Latin America, and Universal Arabic (Modern Standard).

Materials and Methods

CERT Translation

The original version of the CERT, written in Simplified Chinese (Mandarin), was translated into English.[13] The translations and cultural and linguistic validation of the CERT employed rigorous, certified (International Organisation for Standardisation [ISO]-17100) methodology and were performed in accordance with Food and Drug Administration (FDA) guidance[17] and industry standards.[18,19] This ensured that the translation was conceptually equivalent to the original English translation and harmonised with other translations. A total of 46 CERT

translations across 25 countries and 6 continents were linguistically and culturally validated in this study (**Table 1**). An overview of the CERT translation process is shown in **Figure 1**.

1. *Preparation and Concept Definitions*

An overview of the preparation of CERT translations and concept definitions is included in the online supplement. The concept elicitation guide is presented in **Supplemental Table 1** in the online supplement.

2. *Dual Forward Translations*

Two forward translations were developed by independent translators who were native speakers of the target language, fluent in English and experienced in the translation of clinical outcome assessment measures.

3. *Reconciliation of Forward Translations*

A linguistic validation consultant (LVC) reconciled the two forward translations into a third translation by comparing, choosing and combining the most appropriate translation and/or wording from the two initial translations, while ensuring that the reconciled version was conceptually equivalent to the English translation.

4. *Single Back Translation and Review*

A back translation of the reconciled translation was provided by independent linguists in the source language. In each case, the back translator was fluent in the target language and English and had no prior knowledge of the original CERT. The back translations were reviewed against a US-English translation of the Simplified Chinese source CERT by the project manager, who directed any queries to the LVC. The LVC then refined the translation to correct any discrepancies or errors based on recommendations and comments from the back review.

5. *Reconciliation and Expert Review*

The translation was submitted to the expert reviewers, who reviewed the decisions that had been made throughout the translation process up to this point. Any comments or questions that arose from this review were discussed between the project manager and the LVC until they were resolved.

6. *Cognitive Debriefing*

Linguistic validation was achieved through a series of individual interviews with at least five participants with COPD, conducted by the LVC. To be included in this study, participants needed to be diagnosed with COPD, aged ≥18 years (ideally ≥45 years as COPD is more prevalent in mature individuals[20]) and native speakers of the target language. We aimed to include participants of a mix of genders (ideally 2 male and 3 female, due to expected increase in prevalence of COPD in females compared with males[21]), education and socio-economic statuses. An overview of the interview process is included in the online supplement.

7. *Analysis of Cognitive Debriefing Feedback and Expert Review*

An overview of the analysis of cognitive debriefing feedback and expert review is included in the online supplement.

8. *Proofreading*

An overview of the proofreading process is included in the online supplement.

Cultural Adaptation of the Images

In addition to the creation of culturally appropriate wording, seven sets of images were produced for different global regions, including Mexico, US (Spanish-speaking population), Philippines, Central and South America, Western Europe and Australia, India and Asia–Pacific, the Middle East, and Turkey. These images were tested in the same participants who

were involved in the linguistic validation of the CERT, to determine if the participants thought that the images represented them. Prior to interviewing the participants, the questions were developed using a single forward translation of the questions from English into the target language. Participants were asked the following questions:

1. Do you feel these images (skin colour, eye colour, hair colour, hair texture, hair length, hair style, facial features, clothing, accessories, apparent age, etc.) represent you?

2. Do you feel these images (skin colour, eye colour, hair colour, hair texture, hair length, hair style, facial features, clothing, accessories, apparent age, etc.) represent patients with your condition?

3. How do these images make you feel?

4. Anything else you would like to share about these images?

The images were then updated based on the feedback according to different cultures, demographics and countries via an iterative process.

Ethics Approval and Informed Consent

As this study exclusively involved translations, no personally identifiable information or protected health information were collected and there was no drug intervention, Institutional Review Board Approval was not needed. Additionally, study results were in tabular form, and aggregated analyses omitted participant identification.

Prior to involvement in the linguistic and cultural validation of the CERT, participants were given a standardised form in their native language that explained the nature of the linguistic validation, how the cognitive debriefing interviews would be conducted and how their feedback would be used. Details concerning privacy and data protection were also included. Informed consent was obtained from all participants who contributed to the linguistic and cultural validation of CERT translations. This study complied with all applicable laws regarding participant privacy, as described in the Declaration of Helsinki.

Results

Examples of the CERT translated into different languages, along with representative images, are shown in **Figure 2**.

A total of 212 participants with COPD were involved in the whole translation programme across all 46 CERT translations. An overview of the demographics and characteristics of participants included in the cognitive debriefing interviews for five CERT translations are included in **Supplemental Table 2** in the online supplement.

During the cognitive debriefing stage (when participants were asked to reword the instructions, items and responses in the CERT to confirm their understanding) most participants demonstrated good comprehension of the tool (**Table 2**; **Supplemental Table 3** in the online supplement). In instances where phrases in a CERT translation were interpreted slightly differently than intended by a majority of participants, the wording was updated and retested among the participants. For example, in the Norwegian translation, most participants interpreted the translation of 'shortness of breath' as 'kortpustethet' to mean 'difficulty breathing'. However, when this was updated to 'åndenød', participants interpreted this as feeling like there is not enough air, which was closer to the original meaning. The final wording was subsequently updated to 'åndenød'.

Overall, the CERT was well received by participants, and the translations were judged to be conceptually equivalent to the English source CERT and harmonised with each other (**Table 2**; **Supplemental Table 3** in the online supplement). Most participants found the tool easy to use with 54.5% of participants specifically describing the tool as clear, simple and/or easy, and an additional 24.2% of participants commenting that the tool was well understood (**Table 2**).

Of the 30 participants who provided responses to all questions in the cognitive debriefing interviews of the Universal Arabic, Korean, Indonesian, Norwegian and Latin-American Spanish translations of the CERT, 24 (80.0%) agreed that the images were representative of themselves (**Table 3**). In particular, participants commented that the presentation of the symptoms in the CERT corresponded to how they and/or other people with COPD usually appear when experiencing the same symptoms. A total of four (13.3%) participants who did not find the images to be representative of themselves responded that the images were likely to represent other patients with COPD instead. However, four participants (13.3%) commented that people in the images looked younger than themselves and/or other people with COPD.

Discussion

COPD exacerbations are often under-reported by patients[6,11]. Possible reasons may include lack of patient awareness early in their diagnosis of what an exacerbation is, and inadequate provision of information on how to identify exacerbations (**Supplemental Table 5A** and **5E** in the online supplement). Therefore, access to tools like the CERT is important if patients are to better recognise the early signs of an exacerbation and seek prompt assessment and treatment. This study linguistically and cross-culturally validated 46 CERT translations across 25 countries and 6 continents and found that they appeared to be conceptually

equivalent to the original CERT and harmonised with each other. Participants found the CERT easy to use and understand and confirmed that the images were representative of themselves and/or other people living with COPD. This was the largest of a number of translation projects for the CERT to date and brings the total number of translations to over 60, which are all now available on the Global Allergy and Airways Patient Platform (GAAPP) (https://gaapp.org/cert)[22] (**Supplemental Table 4** in the online supplement).

Images included alongside the text in the CERT can aid patient understanding of medical terminology (**Supplemental Table 5C** in the online supplement), and the addition of pictures in healthcare communications has been shown to improve comprehension and adherence to health instructions.[23] The images were culturally adapted according to participant input to ensure that they reflected patients from a diversity of cultures, countries and religions, aiming to improve global accessibility and health literacy. The majority of participants specifically commented that the CERT is easy, clear and/or simple, or commented that the tool was well understood. The tool may be particularly useful in helping newly diagnosed people with COPD or people who are unable to access care easily (**Supplemental Table 5B** and **5D** in the online supplement). However, 13.3% of participants who provided responses in the cognitive debriefing interviews regarding the Universal Arabic, Korean, Indonesian, Norwegian and Latin-American Spanish translations of the CERT found that the images of the people in the tool appeared younger than themselves and/or people with COPD. This may be due to the cartoon nature of the images. As the majority of the participants did find the images representative of themselves and/or other participants with COPD, no changes were made.

Although subtleties had to be captured when translating the CERT, the tool contains only a small number of symptoms that are universally experienced by patients with COPD. Participants who reviewed the CERT during the cognitive debriefing stage would have been able to recognise the symptoms that they experience during a COPD exacerbation and to

think of appropriate words that they themselves would use. This is particularly important as a previous study identified a disconnection between patients' experiences of exacerbations and the language and definitions for exacerbations used in clinical practice.[6]

Whilst the CERT is now accessible to patients in over 60 languages, it is necessary to continue the process of translation and validation into as many languages and regional dialects as possible. The alternative of producing a CERT in every country would require extensive research and the close similarity between the original CERT developed in China and the CERT-J developed in Japan suggests that similar items would be identified in other countries.[13,15] We argue that the process of translating and validating the tool, as described here, is a proven methodology that is in accordance with FDA guidance and industry standards[17-19]. Furthermore, using translated versions derived from a single original version ensures a consistent approach across countries. In this context, it should be noted that the PACE study, which demonstrated that the tool can reliably identify the onset of an acute exacerbation of COPD one day before clinical diagnosis with good sensitivity and specificity, was performed using a German translation of the CERT.[16]

One potential limitation of the translation and cultural and linguistic validation of the CERT is that the participants included in the cognitive debriefing stage may have had a respiratory disease other than COPD; therefore, in the cultural and linguistic validation of the Korean CERT translation, the terms 'chronic bronchitis' and 'emphysema' were used. However, the results of the cultural and linguistic validation of the Korean CERT translation were consistent with other translations, so we do not think that this will have affected the results. Another potential limitation of the study is that when participants were interviewed to determine if the images included in the tool had been sufficiently culturally adapted, they were not asked whether the images also aided their understanding of the tool. Future translation and linguistic validation studies of patient education tools should consider

including a question in the participant interviews to determine if imagery improves participants' comprehension of the tool as previous research suggests.[23]

Whilst there is scope to expand the translation and linguistic validation of the CERT by testing the items included in the tool in each individual country, the results of our study and the recent PACE study[16] indicate that this is unnecessary. Additional languages for CERT translation continue to be considered and country-specific implementation programmes are in progress; it is anticipated that these translations and programmes will further facilitate patient accessibility to the tool.

Conclusions

This study cross-culturally and linguistically validated 46 CERT translations across 25 countries and 6 continents. The CERT is easy for patients to understand, and the translations can be considered to be equivalent regardless of country or language. These translations may support healthcare professionals in multiple global regions in educating patients to recognise and act upon early signs of a COPD exacerbation.

Declaration of Interest

Rainer Gloeckl is a member of the CERT governance board which is led by GAAPP. Ruth Tal-Singer is a retiree and shareholder of GSK and reports share options from ENA Respiratory, and personal fees from AstraZeneca, Boehringer Ingelheim, COPD Foundation, ENA Respiratory, the Global Allergy and Airways Patient Platform, Global Skin, GSK, ImmunoMet, ItalyAndBeyond, Janssen, Renovion, Roche, Samay Health, Teva and Vocalis Health. Peter Deussen has received fees from Biomedical Research Group Oxford and GAAPP for public and patient involvement. Russell Winwood is a patient consultant for Inogen Global. Tharishini Mohan, Megan Turner, Mohamed Hamouda, and Mandeep Moore are employees of and/or hold financial equities in GSK. Paul Jones is a contractor to and holds financial equities in GSK.

Additional information

A summary of these results was presented at the European Respiratory Society 2025 congress, Amsterdam, Netherlands, 27 September–1 October 2025 (Poster PA2019), which was then encored at the Korean Academy of Tuberculosis and Respiratory Diseases International Conference 2025, Seoul, Korea, 29–31 October 2025 (Poster PP2-03). A summary of these results will also be encored at the 30th French-Language Pulmonary Congress, Lille, France, 30 January–1 February 2026.

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Tables

Table 1. CERT Translations That Were Culturally and Linguistically Validated

Country	Language
Australia	English
Belgium	Dutch, French, German
Brazil	Portuguese
Canada	English, French
Cuba	Latin-American Spanish[a]
Denmark	Danish
Egypt	Universal 'Modern Standard' Arabic
Finland	Finnish, Swedish
France	French
Germany	German
India	Assamese, Bengali, Gujarati, Hindi, Kannada, Malayalam, Marathi, Oriya, Punjabi, Tamil, Telugu, Urdu
Indonesia	Indonesian
Korea	Korean
Mexico	Latin-American Spanish[a]
Netherlands	Dutch
Norway	Norwegian
Philippines	Cebuano, English, Hiligaynon, Ilocano, Tagalog
Saudi Arabia	Universal 'Modern Standard' Arabic
Spain	Spanish
Sweden	Swedish

Taiwan	Traditional Chinese
Thailand	Thai
Turkey	Turkish
UK	English
United Arab Emirates	Universal 'Modern Standard' Arabic
USA	English,[b] Latin-American Spanish[a]

[a] Linguists from these Latin-American countries reviewed the forward translation prior to cognitive debriefing interviews, but the forward translator was not debriefed with participants from these countries

[b] Translation from Traditional Chinese used as a source

Table 2. General Participant Feedback on the CERT Obtained During the Cognitive Debriefing Interviews

Language	Participant Responses
Indonesian translation (Indonesia) (N=5)	R1: Well understand. R2: Well understand. R3: Well understand. R4: Well understand. R5: Well understand. LVC general comments: The questionnaire is well understood by the respondents.
Korean translation (South Korea) (N=5)	R1: Easy, clear. No difficulty in choosing one answer among the four; the answer choices are clearly differentiated. R2: Nothing's difficult; clear. R3: Generally easy, clear; Answer choices are distinct and no difficulty in choosing one answer.

R4: It's simple. No difficult words, and clear to understand. But I wonder what are the criteria of the answer choice severities, whether it's from patients' position or healthy people's position. It would also be different for people of different ages. So you need to add a clause giving that information.

R5: It's about the symptoms COPD patients have. The symptoms are severe for some, and mild for others. So, this questionnaire is asking to know if a patient's symptoms are mild or severe. Nothing's difficult and all are clear. No difficulty in choosing the answer among the answer choices. The answer choices are clearly different between each other.

LVC general comments: Respondents didn't find any item, question items or answer choices, difficult or unclear by itself. But I'm not sure of their distinction between 'shortness of breath' and 'labored breathing', and their understanding of answer choices are not in line with the author's intention as can be presumed from the composition of the questionnaire. These two issues are those that I think require checking with the author with him being given the report of respondents' suspected lack of clear and accurate distinction between two question items and the discrepancy in their reasonable understanding the answer choices from the suspected intention of the author.

Latin-American Spanish translation (N=9; US=3, Argentina=3, Colombia=3)	R1: It is an easy survey to answer, the images fit perfectly to each of the symptoms. A relatively short survey. R2: It's short and easy to fill out. No problem at all. R3: It's a survey about this illness and I think all the terminology is clear and easy to follow and understand. R4: The questionnaire is perfect. I look at it and it is perfect. I selected "moderate" in three options. "Serious" none. The instructions are clear. The only option I would change is "mild". I don't like that one. To me "mild" is "a little". The only thing I understand is that it is less than "moderate". There are no options to choose from if I improved. Because I improved this symptom, but I can't choose any option here. I would add one more option. R5: It is simple, easy to understand, the drawings are fine … Maybe item 3 and 4 sounds quite similar. The disease characteristics are fine. R6: I think it is very good. The number of options is correct. It shows the progression of the disease. R7: Very easy questionnaire. Easier and more amiable with the illustrations. R8: The questionnaire is easy, to understand the questions and to answer them. R9: The images shown are clear and help to imagine the symptoms and answer the questionnaire.

	LVC general comments (US): All respondents understood and paraphrased correctly.
	LVC general comments (Argentina): They all understood well the questionnaire. I noticed that none of them were struck by the physical appearance of the drawings. I insisted on commenting something about it, but they limited themselves to talking about the symptoms they represented. I understand that they did not notice anything that shocked them enough to comment and, therefore, they feel represented, with the exception of the age comment. As for the suggestion to change "leve" (mild) to "un poco" (a little), I think it is acceptable. Maybe "leve" is too abstract, while "un poco" the respondent can imagine a degree of quantity of the worsening of the symptom.
	LVC general comments (Colombia): The questionnaire was well-received and easily answered by the three participants.
Norwegian translation (Norway) (N=5)	R1: The questionnaire was fine. The questions made sense to me in my situation, and they were easy to understand. R2: This was fine. I had no problems with it. R3: Everything was easy to understand. No problems whatsoever. R4: It was all fine. I didn't find anything to be confusing or anything.

	R5: This was pretty easy to understand, and the instructions helped. I had no problems with any of this. LVC general comments: All respondents were clear as to what was being asked here, and we had no issues with any of this.
Universal 'Modern Standard' Arabic translation (N=9; Egypt=3, Saudi Arabia=3, UAE=3)	R1: The questionnaire is about a serious illness that deserves to be studied to see how it affects the entire family. R2: A useful medical questionnaire that sheds light on the symptoms of the disease in a brief and interesting way. R3: Despite this being a short questionnaire, it provides valuable information about the disease. R4: Easy and understood survey. R5: The questionnaire is quite good and easy to fill. R6: The questionnaire is well worded and uncomplicated. R7: Questions and responses were clearly understood. R8: Questions and responses were clearly understood. R9: Questions and responses were clearly understood.

	LVC general comments (Egypt): Answers and comments are in English.
	LVC general comments (Saudi Arabia): Short and straightforward.
	LVC general comments (UAE): The wording is direct and understandable to the subjects.

LVC=linguistic validation consultant; R=respondent; UAE=United Arab Emirates; US=United States

Table 3. Participant Responses to the Cultural Adaption of the CERT Images in Five Different CERT Translations

Language	Responses			
	Do you feel these images (skin colour, eye colour, hair colour, hair texture, hair length, hair style, facial features, clothing, accessories, apparent age, etc.) represent you?	Do you feel these images (skin colour, eye colour, hair colour, hair texture, hair length, hair style, facial features, clothing, accessories, apparent age, etc.) represent patients with your condition?	How do these images make you feel?	Anything else you would like to share about these images?
Indonesian translation (Indonesia) (N=5)	R1: Yes. R2: Yes. R3: Yes. R4: Yes.	R1: Yes. R2: Yes. R3: Yes. R4: Yes.	R1: I feel sick. R2: I think about the cough with phlegm that I have. R3: I saw pictures of	R1: Nothing more. R2: Nothing more. R3: Nothing more. R4: Nothing more.

			complaints from sick people that I experienced. R4: Coughing and shortness of breath like I experienced. R5: Picture of complaints of coughing and shortness of breath.	R5: Nothing more.
	R5: Yes.	R5: Yes.		
Korean translation (South Korea) (N=5)	R1: Yeah, it looks similar to my expressions when I'm having a hard time. R2: They look younger than me, and they have short hair. R3: Yes, they are similar (to my image), like the	R1: Yeah, the same. Asian skin colour, the depiction of having a hard time, spitting out phlegm. It's the same as the image of me having a hard time. R2: Not similar. Those in the pictures look healthy.	R1: It's the same as when I'm really sick and have a hard time with this chronic disease. R2: They generally look young and have bright expressions, not particularly having a hard	R1: The images mostly fit the conditions. R2: Nothing. R3: Nothing. R4: They look young and pretty. We don't actually look at these images when answering the

	coughing image. R4: They look younger than me. R5: Yeah, they seem to look similar to me. They have broad faces like ordinary Korean people.	And their expressions are bright, though their actions represent coughing and things like that. R3: The expressions having a hard time looks similar to those of patients. R4: They are in different age group from us, and their complexions are good while patients are usually pale. R5: The people in the images have big heads and plumpy faces, but COPD patients are gaunt.	time. In the 4th and 5th pictures, though, they seem to look like having a hard time with the sweats. R3: They depict sick people. R4: They are just cartoon pictures. R5: [No response]	questionnaire. R5: Nothing.

		COPD patients are generally older and have more wrinkles than those in the images. The images don't look like they are having a hard time, out of breath, or having difficulty breathing. The last image of activity restriction looks like out of breath.		
Latin-American Spanish translation (N=9; US=3, Argentina=3,	R1 (US): You can see that they represent a person who is sick, probably with COPD. Their age is not clear; they look like children but in the facial	R1 (US): The images do perfectly represent the disease of each of them. R2 (US): Yes, they represent very well a person who is having	R1 (US): Each one makes you feel the symptoms; for example the first one makes me feel like I'm coughing too much and the last one makes me	R1 (US): Maybe define the face a little more so that the person can identify the patient's age. R2 (US): No. R3 (US): No. I think they

Colombia=3)	features you can see that they have like wrinkles, so it is a little hard for me to determine their age, skin, hair, eye color and everything. They seem to represent a person who is suffering and each of the images perfectly shows each of the symptoms they are asking about at the moment. I would not say that they represent me in particular but they do represent a person who is having COPD symptoms.	COPD symptoms. R3 (US): Yes. For example, the one who is sweating and the color of her skin is somewhat strange, the child also represents the same thing. They seem to be coughing too much and having to cover their mouth; he's coughing too much. So, overall, they do work as a good representation of a person with my illness. R4 (AR): Yes, yes because I get red like this,	look like I am straining, like when you're climbing stairs or walking a long distance. R2 (US): It makes me feel like these people in the images, who are having quite a few difficulties with COPD and they are also short of breath, they are not able to breathe. R3 (US): They make me feel like I am having lots of COPD symptoms. R4 (AR): When I see these images, they make me feel	match the answer choices well. R4 (AR): No, nothing. Because here I see the boy who has a hard time climbing the stairs and it's the same as me. I have to hold on, wait and then go up. Or I have to hold on to my daughter's arm and walk like that. They reflect very well what happens to me. R5 (AR): No, I think I just said everything. R6 (AR): No, I have

R2 (US): The images represent what it says below. It seems that they indicate that you're coughing a lot and you're going to have to self-medicate or go to the hospital. Short of breath, not able to breathe properly. An old lady somewhere in her 50s and 60s. It's okay for the age it seems. I guess they would represent a person, not necessarily myself, but a COPD patient.

I start sweating. I get red when I can't breathe and everything swells up down here, in my neck, and I start sweating. Yes, these images represent me. I also see them sad. One feels that way.

R5 (AR): Yes, of course they represent the disease. And they are represented very well. Yes, perhaps not individually, but all the images together clearly represent the disease. If

really bad because I see that I am like this.

R5 (AR): If you are referring to how it affects me psychologically, we are all touched differently. I have a way of being that ... I don't feel like a victim, I don't worry about my health, I just take care of it, that's why I go to the doctors. I am not affected by these drawings. I have what I have, period.

R6 (AR): I feel like I don't want my situation to get

nothing further to comment. The colors of the options are well represented, because green is like softer and red is always linked to something more intense, more alert, caution.

R7 (CO): If I have something else to add about the images. – No.

R8 (CO): Any additional comment about the images, if I want to share it. – No.

R9 (CO): I am asked about

R3 (US): Yes, I think they do. The features listed, like skin color and so forth can vary from person to person, but overall I see they show brown people and that is fine.

R4 (AR): Yes, from the physical point of view, I feel identified. I think they are fine. Honestly, when I see them, I don't pay attention to the appearance, but they are ok.

R5 (AR): The thing I don't

you take the drawing in isolation, you may not realize that it is trying to represent COPD, but all the drawings together are the disease. They identify the disease very well. In general, patients may look like this.

R6 (AR): These are all symptoms that patients with more severe or moderate COPD have. I can say that the pictures represent the patients suffering from this disease.

worse, because I wouldn't want to get to any of those 5 states.

R7 (CO): My personal feelings when looking at the images. – Ok, they are nice ("divertidas").

R8 (CO): What these images make me feel like, if I can relate to them or reject them. – Well, I can accept them as general representations.

R9 (CO): The feeling I experience in general when looking at each one

giving another comment about how I perceive the images. – No.

feel identified with is that these five are young people, I'm much older than that. Then, except for the phlegm theme [LVC: because he/she doesn't have this symptom], I do feel identified with all the drawings. Any person with COPD, in this case me, suffers from what the picture shows. That is why I feel identified, the physical aspect is secondary. There is nothing that catches my

R7 (CO): If these images with the features really illustrate a person who like me suffers symptoms related to COPD. – Yes, any person with a respiratory disease like COPD.

R8 (CO): If what the images show, meaning also the gestures and what they are doing represent my disease: coughing, sneezing, etc. – Yes, they represent any general patient with COPD.

of the four images and what they are trying to show about the symptoms. – They add something light to the questions.

	attention to comment on. R6 (AR): They don't represent me because luckily I don't have any symptoms now. The pictures are fine. They are like standard people. R7 (CO): If I can identify with the images shown, illustrating the color of a person's eyes, his skin and hair color and how long is the hair and the style (i.e. pushed back or how it is parted now), and also his physical	R9 (CO): How accurately the four images are showing the symptoms that I usually or sometimes have. – Yes, they depict well the COPD symptoms in the questionnaire.	

characteristics, like long nose, shape of the lips, the age he seems to have and the clothing, jewelry. – Yes, I can identify with these images. R8 (CO): How do I personally relate to and feel, about the images, if they depict a person correctly. They are including a possible color of the skin and the eyes and the hair, with a texture (thick) the style, like if it is parted-side or in the			

middle, and longer (women) or shorter (men), and the clothes they are wearing and other characteristics like the size of the mouth and gestures … and how old or young they are looking. – The images are ok, represent people in general. R9 (CO): If I feel that these images represent a person like me or like a person in general, man or woman. How I feel when looking at the hair, at the eyes, the			

	skin, the color and shape, if the hair is longer or shorter and the hairstyle meaning the type of cut, layered and not too short or long, and the shape of the face, the clothes, and what age they seem to have in the images. – Yes they do.			
Norwegian translation (Norway) (N=5)	R1: Yes, they were representative and fine. R2: I think they were ok, I had no problem with them, and they represent me. R3: The images were ok, I	R1: Yes, they do. R2: Sure, they can represent us, as we are probably of higher age. R3: Yes, I guess most of us are older.	R1: I don't really feel anything in particular. Neither negative nor positive, this is just the way it is. R2: I can't say I have any	R1: Not really. R2: They are fine, I've got nothing more to say, really. R3: No. R4: No.

	can see them representing me in a way. R4: They were ok. No problem with them, they are representative, I think. R5: The pictures represent me fine.	R4: Yes, they can represent someone with my condition. R5: I think they can, yes.	feelings about them in any form, I guess I feel fine. R3: They make me feel ok, I don't always struggle as hard as some of the images. R4: The pictures don't really affect my emotions in any way. The way they struggle resembles how I sometimes feel, so I guess that makes me a bit sad, but not very much. R5: I have no particular feelings about this either way.	R5: No, I don't have any more comments.

Universal 'Modern Standard' Arabic translation (N=9; Egypt=3, Saudia Arabia=3, UAE=3)	R1: Yes, I possess specifications that are close to those in the images in general, with a slight difference in skin colour, freshness, and apparent age. R2: I feel like these images do not represent me well because my condition is much worse than the situations shown therein. R3: Yes, these images are good to some extent as examples of my medical	R1: Yes, these images represent them to a great extent, and depict their reaction to coughing, shortness of breath, and sweating, with slight differences in skin colour and apparent age. R2: Yes, I feel these images can generally represent patients suffering from my condition, with varying degrees of severity of the disease and apparent age. R3: Yes, they represent	R1: These images make me feel that I'm not alone, but that there are many others who are suffering from the same illness and condition as me. Thus, makes me feel supported. R2: These images stir a feeling of sadness in me, because they reflect conditions that seem better than my current situation. R3: These images make me feel optimistic. R4: [No response]	R1: No thanks. R2: In my opinion, the images cannot reflect the medical condition 100% accurately. R3: No thanks. R4: [No response] R5: [No response] R6: [No response] R7: No, I don't like to add anything about the pictures. R8: No, I don't like to add anything about the pictures. R9: No, I don't like to add

	condition where I suffer from the same attacks due to shortness of breath. R4: [No response] R5: [No response] R6: [No response] R7: No, I do not feel these pictures represent me such as (skin colour, eyes, hair, hair touch, hair length, face traits, accessories, age, etc.). R8 No, I do not feel these pictures represent me. R9: No, I do not feel these pictures represent me.	other patients who suffer from my condition in one way or another, but not in terms of general appearance, clothing, accessories, and apparent age. R4: [No response] R5: [No response] R6: [No response] R7: Yes, I do feel these pictures represent other people with the same sickness (skin colour, eyes, hair, hair touch, hair length, face traits,	R5: [No response] R6: [No response] R7: Nothing, how do these pictures make me feel? R8: Nothing, how I feel when I see these pictures? R9: Nothing, how do these pictures make me feel?	anything about the pictures.

		accessories, age, etc.). R8: Yes, I do feel these pictures represent other sick people with the same disease (skin colour, eyes, hair, hair touch, hair length, face traits, accessories, age, etc.). R9: Yes, I do feel these pictures represent other sick people with the same disease (skin colour, eyes, hair, hair touch, hair length, face traits, accessories, age, etc.).	

AR=Argentina; CO=Colombia; COPD=chronic obstructive pulmonary disease; R=respondent; UAE=United Arab Emirates; US=United States

Figures

Figure 1. CERT Translation Process

COPD=chronic obstructive pulmonary disease

Figure 2. Examples of the CERT in Different Languages

The actual CERT consists of a single row of images in a single language

CERT=COPD exacerbation risk tool; COPD=chronic obstructive pulmonary disease;

UK=United Kingdom

Select the most accurate description for you today compared with your usual state.

If you choose at least two items in red, you are probably experiencing a COPD exacerbation, and should visit your doctor.

Online Supplement

Preparation and Concept Definitions

We first conducted an internal assessment to investigate which countries were interested in having the Chronic Obstructive Pulmonary Disease (COPD) Exacerbation Recognition Tool (CERT) available in the target language. Subsequent translations were requested through the Global Allergy and Airways Patient Platform (GAAPP). Contact was then established with an in-country linguistic validation consultant (LVC), and a concept elicitation guide and forward translations were developed (Supplemental Table 1).

Cognitive Debriefing

During the interview, each participant was given a copy of the translated CERT and were asked a series of open-ended, probing questions about each instruction and item, question key words and response options to assess if the translation was understood clearly and as intended in the English translation of the CERT. The participants were also asked to provide general feedback regarding their impressions of the clarity and consistency of the language used in the CERT.

Analysis of Cognitive Debriefing Feedback and Expert Review

The LVC summarised all participant responses in a single report, along with any recommendations and/or comments they had regarding the translation, including suggestions for changes to the wording where appropriate. Participant anonymity was maintained throughout this process. The report was then reviewed by the project manager, who discussed any issues with the LVC until a satisfactory resolution was achieved, to ensure that the translation was clear.

Proofreading

The translation was sent for monolingual review by an independent linguist who was a native speaker of the target language, was fluent in English and had not previously worked on the translation project. The LVC carried out a review of the translation in parallel. Both linguists were asked to check the translation for errors (spelling, grammar, punctuation and typography) and to confirm the suitability of the language used for the intended purpose. The LVC then gave feedback on the suggested changes and implemented any that were relevant. The final instruments were then prepared and checked by the LVC to ensure accuracy of presentation and layout compared with the English source CERT.

Supplementary Table 1. Concept Elicitation Guide

	Wording of Source Instrument	**Term/Phrase**	**Concept Explanation**	**Translation Tips**	**Possible Alternatives**
1	Select the most accurate description for you today compared with your usual state		Select the closest representation for you to your normal condition on the current day.		
		Accurate	The quality of being correct, precise, or free from errors.		Reflective, representative
		Usual state	This concept implies a baseline or standard state against which variations or changes can be measured.		Typical or normal condition
2	Worsening cough		A cough that is getting worse/increasing in severity.		
		Cough	A sudden and often repetitive reflex action that helps to clear the airways of irritants, mucous, or foreign substances. It involves a forceful expulsion of air from the lungs through the mouth, accompanied by a distinctive sound.		
3	Increased volume of sputum		Greater amount of sputum.		
		Sputum	The material expelled from the lower respiratory tract, including the bronchi and lungs. It is often produced during coughing and is more likely to contain cellular debris,		Phlegm

	Wording of Source Instrument	Term/Phrase	Concept Explanation	Translation Tips	Possible Alternatives
			microorganisms, and other components beyond just mucous.		
4	Shortness of breath		A sensation of difficulty or discomfort in breathing, where an individual feels that they are not able to take in enough air.		Breathlessness, difficulty breathing
5	Laboured breathing		A type of breathing that requires more effort and is often accompanied by visible or audible difficulty. It is characterized by increased work of the respiratory muscles, making each breath more challenging and strenuous.		
6	Limitation of activity		Where an individual experiences restrictions or constraints in their ability to engage in certain physical or functional tasks/activities.		Limited activity
7	As usual		The same as normal (for the respondent).	Please ensure that this response option scales well with the following three and that they are well spaced.	
8	Mild		Slight		
9	Moderate		Medium	This response option is neither too severe	

	Wording of Source Instrument	**Term/Phrase**	**Concept Explanation**	**Translation Tips**	**Possible Alternatives**
				nor too mild but falls somewhere in the middle in terms of intensity or severity.	
10	Severe		Strong		
11	If you choose at least two items in red, you are probably experiencing a COPD exacerbation and should visit your doctor		In the event that you select two choices in red (that is moderate or severe) you are likely going through a COPD exacerbation and must go to see your doctor.	Please see formatted version for context around this instruction. In the event that there is confusion about which ones are the items in red, can be added between brackets '(answers "moderate" and "severe")'.	
		COPD	Chronic obstructive pulmonary disease. It is a progressive and chronic respiratory condition characterised by obstructed airflow to the lungs. The primary components of COPD are chronic bronchitis and emphysema.	This acronym should not be kept if not widely used in the target country. Please translate in full if necessary.	
		COPD exacerbation	A sudden worsening of symptoms in individuals with COPD. During an exacerbation, there is a notable increase in the severity of respiratory symptoms beyond		COPD flare-up

	Wording of Source Instrument	Term/Phrase	Concept Explanation	Translation Tips	Possible Alternatives
			the day-to-day variations that individuals with COPD may experience.		
		Doctor	A professional who holds a degree in medicine and is licensed to practice medicine.		
12	© 2023 GSK Group of companies			The copyright remains in English.	
		GSK	GlaxoSmithKline.	Please do not transliterate.	

COPD=chronic obstructive pulmonary disease

Supplemental Table 2. Demographics of Participants Included in the Cognitive Debriefing Stage of Five Separate CERT Translations

Characteristic	Indonesian Translation (Indonesia) (N=5)	Korean Translation (South Korea) (N=5)	Latin-American Spanish Translation (N=9; US=3, Argentina=3, Colombia=3)	Norwegian Translation (Norway) (N=5)	Universal 'Modern Standard' Arabic Translation (N=9; Egypt=3, Saudia Arabia=3, UAE=3)
Age bracket (years)	1 participant aged 51–60 3 participants aged 61–70 1 participant aged 71–80	2 participants aged 41–50 2 participants aged 61–70 1 participant aged 71–80	1 participant aged 18–24 1 participant aged 31–40 2 participants aged 41–50 3 participants aged 51–60 2 participants aged 61–70	1 participant aged 41–50 2 participants aged 51–60 1 participant aged 61–70 1 participant aged 71–80	3 participants aged 18–24 1 participant aged 25–30 1 participant aged 31–40 1 participant aged 41–50 3 participants aged 51–60
Sex	4 male participants 1 female participant	3 male participants 2 female participants	5 male participants 4 female participants	3 male participants 2 female participants	5 male participants 4 female participants
Pathologies of participants	5 participants with COPD	3 participants with chronic bronchitis[a] 1 participant with emphysema[a] 1 participant with COPD	9 participants with COPD	5 participants with COPD	9 participants with COPD
Education level	3 participants with a senior-high school level education 2 participants with an elementary school level education	2 participants with a college level education 1 participant with a technical college level education 2 participants with a high school level education	2 participants with a high school level education 2 participants with a university level education 1 participant with tertiary/college level education 2 participants with a technical college level	2 participants with a junior college level education 1 participants with a university level education 1 participant with a high school level education 1 participant who	3 participants with a college level education 4 participants with a university level education 1 participant with an intermediate level education

Characteristic	Indonesian Translation (Indonesia) (N=5)	Korean Translation (South Korea) (N=5)	Latin-American Spanish Translation (N=9; US=3, Argentina=3, Colombia=3)	Norwegian Translation (Norway) (N=5)	Universal 'Modern Standard' Arabic Translation (N=9; Egypt=3, Saudia Arabia=3, UAE=3)
			education 1 participant with secondary school education 1 participant with primary school level education	completed technical courses after high school	1 participant with a military academy education
Occupation	1 participant who patches tires 1 busker 1 housewife 1 pedicab driver 1 unemployed participant	1 engineer 1 cook 1 construction worker 1 landlord 1 nurse aide	1 student 1 driver 1 account manager 1 administrative clerk 1 business administrator 1 salesperson, 3 retired participants	1 administrative assistant 1 taxi driver 1 financial consultant 2 retired participants	3 unemployed participants 3 retired participants 1 IT support worker 2 housewives

[a] As many patients are unfamiliar with the term 'COPD' in Korea, patients with chronic bronchitis and emphysema were also recruited

COPD=chronic obstructive pulmonary disease; UAE=United Arab Emirates; US=United States

Supplemental Table 3. Translation History Example: Indonesian CERT Translation

	Source	Indonesia – Indonesian (Bahasa)	First Back Translation	Cognitive debriefing stage		Comments
				1. What does the instructions/question/ response choice mean for you? (encourage the respondent to reword the item using other words than those used and if this is not sufficient, to give examples)	**2. Did you have difficulty understanding the instructions/ question/response choice? Are there words that you find difficult to understand? If yes, how would you change the wording?**	
1	Select the most accurate description for you today compared with your usual state.	Pilih {MQ} gambaran yang paling tepat mengenai kondisi Anda hari ini dibandingkan dengan kondisi Anda biasanya.	Select {MQ} the illustration that is most accurate regarding your condition today, compared to your usual condition.	**R1**: Choose the description that fits today condition compared to usual condition. **R2**: Choose the illustration that describe the change in the current condition from the usual condition. **R3**: Choose the illustration that fits current condition compared to usual situation. **R4**: Choose the option that describe the difference	**R1**: No. **R2**: No. **R3**: No. **R4**: No. **R5**: No.	BTR: Fine. BTR-LSP-PM: Okay CDR: No changes needed. CDR-PM: Is the translation of "most accurate" clear in the translation? The participants do not mention it. CDR-LVC: Yes, they understand the instruction, although they didn't mention the "most accurate" but what they said already described what they supposed to do,

Source	Indonesia – Indonesian (Bahasa)	First Back Translation	Cognitive debriefing stage		Comments
			1. What does the instructions/question/ response choice mean for you? (encourage the respondent to reword the item using other words than those used and if this is not sufficient, to give examples)	**2. Did you have difficulty understanding the instructions/ question/response choice? Are there words that you find difficult to understand? If yes, how would you change the wording?**	
			between your current situation and usual. **R5**: Choose the illustration that describe current condition compared to usual condition.		and they could do the following instructions. CDR-PM: Okay no change.

	Source	Indonesia – Indonesian (Bahasa)	First Back Translation	Cognitive debriefing stage		Comments
				1. What does the instructions/question/ response choice mean for you? (encourage the respondent to reword the item using other words than those used and if this is not sufficient, to give examples)	**2. Did you have difficulty understanding the instructions/ question/response choice? Are there words that you find difficult to understand? If yes, how would you change the wording?**	
2	Worsening cough	Batuk semakin parah	Coughing of increasing seriousness	**R1**: Is there Frequent coughing? **R2**: Is the cough more often? **R3**: Is the cough getting worse? **R4**: Is the cough increases from previous days? **R5**: Do I experience coughing more often?	**R1**: No. **R2**: No. **R3**: No. **R4**: No. **R5**: No.	BTR: It has the same meaning as the concept: A cough that is getting worse/increasing in severity. BTR-LSP-PM: Okay thanks for explaining. CDR: No changes needed. CDR-PM: Was this also understood as the intensity of the cough getting worse? CDR-LVC: Yes. CDR-PM: Okay no change.
3	Increased volume of sputum	Dahak bertambah banyak	Greater amount of phlegm	**R1**: Is there more phlegm or not? **R2**: Is the phlegm stubborn? **R3**: Is the phlegm	**R1**: No. **R2**: No. **R3**: No. **R4**: No.	BTR: Fine, it uses the possible alternative mentioned. BTR-LSP-PM: Would it not be preferable to use "large" increase of "Greater"? "Greater" is in the comparative form that

Source	Indonesia – Indonesian (Bahasa)	First Back Translation	Cognitive debriefing stage		Comments
			1. What does the instructions/question/ response choice mean for you? (encourage the respondent to reword the item using other words than those used and if this is not sufficient, to give examples)	2. Did you have difficulty understanding the instructions/ question/response choice? Are there words that you find difficult to understand? If yes, how would you change the wording?	
			increases? **R4**: Is there any increasing phlegm expelled? **R5**: Is the phlegm increases as coughing?	**R5**: No.	implies that there is more sputum compared to something. Please advise. BTR-LVC: Well, in that sense, I think increased is also comparative, and this questionnaire indeed compares the condition of the respondents today with their usual state. BTR-LSP-PM: Okay no change. CDR: No changes needed. CDR-PM: What does R2 mean by the phlegm being "stubborn"? CDR-LVC: The phlegm that can't be eliminated as usual. CDR-PM: Okay. In general, this is therefore well

	Source	Indonesia – Indonesian (Bahasa)	First Back Translation	Cognitive debriefing stage		Comments
				1. What does the instructions/question/ response choice mean for you? (encourage the respondent to reword the item using other words than those used and if this is not sufficient, to give examples)	2. Did you have difficulty understanding the instructions/ question/response choice? Are there words that you find difficult to understand? If yes, how would you change the wording?	
						understood then.
4	Shortness of breath	Kesulitan bernapas	Difficulty breathing	R1: Do you short of breath or not? R2: Is there tightness? R3: Is there difficulty breathing or not? R4: Is there shortness of breath or not? R5: Do you have difficulty breathing or not?	R1: No. R2: No. R3: No. R4: No. R5: No.	BTR: Fine. BTR-LSP-PM: Okay. CDR: No changes needed. CDR-PM: What does R2 mean by "tightness"? CDR-LVC: It's the feeling of difficult to breath like the chest is being tied. CDR-PM: Okay.
5	Labored breathing	Napas terengah - engah	Panting	R1: Do you often felt panting? R2: Is there a feeling of breathlessness? R3: Do you gasping for breath?	R1: No. R2: No. R3: No. R4: No. R5: No.	BTR: I tried to choose a word that could describe the concept as simple as possible. And I think panting is the sign of labored breathing that will easily comprehended by the respondent, I hope it would

Source	Indonesia – Indonesian (Bahasa)	First Back Translation	Cognitive debriefing stage		Comments
			1. What does the instructions/question/ response choice mean for you? (encourage the respondent to reword the item using other words than those used and if this is not sufficient, to give examples)	**2. Did you have difficulty understanding the instructions/ question/response choice? Are there words that you find difficult to understand? If yes, how would you change the wording?**	
			R4: Do you feel panting? R5: Do I have panting more often?		be acceptable. BTR-LSP-PM: I think "panting" refers to the source meaning. Can you just clarify if the BT a direct translation of the Indonesian version? The translation has 3 words? BTR-LVC: Actually the Indonesian version has two words, the last word uses the hyphen to make it clear that it is one word. The back translation for Indonesian version would be panting breathing. BTR-LSP-PM: Okay no change. Thanks for explaining. AR: Can they offer alternatives to 'panting' for us to cognitively debrief please? We can try the panting one too, but I'd like a

Source	Indonesia – Indonesian (Bahasa)	First Back Translation	Cognitive debriefing stage		Comments
			1. What does the instructions/question/ response choice mean for you? (encourage the respondent to reword the item using other words than those used and if this is not sufficient, to give examples)	**2. Did you have difficulty understanding the instructions/ question/response choice? Are there words that you find difficult to understand? If yes, how would you change the wording?**	
					2nd option. AR-V2: napas megap-megap. AR-BT: gasping for breath. AR-V3: napas mengi. AR-BT: wheezing breath. AR-V4: mengeluarkan usaha tambahan ketika bernapas. AR-BT: exerting additional effort when breathing. AR-DEV: Thanks – let's debrief both the original translation of "panting" and the above V4 (highlighted). CDR: No changes needed. CDR-PM: Was there a clear difference for the participants between the translation in row 4

	Source	Indonesia – Indonesian (Bahasa)	First Back Translation	Cognitive debriefing stage		Comments
				1. What does the instructions/question/ response choice mean for you? (encourage the respondent to reword the item using other words than those used and if this is not sufficient, to give examples)	2. Did you have difficulty understanding the instructions/ question/response choice? Are there words that you find difficult to understand? If yes, how would you change the wording?	
						and here? CDR-LVC: Yes there was. They understood it. CDR-PM: Okay.
6	Limitation of activity	Keterbatasan aktivitas	Limitation of activity	R1: Does the daily work disrupted? R2: Does the symptoms interfere with daily activities? R3: Is there any disruption of activities from breathlessness? R4: Does the homework got disturbed from short of breath? R5: Can I still walk long distances or climb stairs?	R1: No. R2: No. R3: No. R4: No. R5: No.	BTR: Fine. BTR-LSP-PM: Okay. CDR: No changes needed. CDR-PM: This seems clearly understood with the participants referring to their own personal experiences it seems. Can you confirm? CDR-LVC: Yes, they usually refer it with the activities they usually can do. CDR-PM: Okay.

	Source	Indonesia – Indonesian (Bahasa)	First Back Translation	Cognitive debriefing stage		Comments
				1. What does the instructions/question/ response choice mean for you? (encourage the respondent to reword the item using other words than those used and if this is not sufficient, to give examples)	2. Did you have difficulty understanding the instructions/ question/response choice? Are there words that you find difficult to understand? If yes, how would you change the wording?	
7	As usual	Seperti biasa	As usual	R1: No additions. R2: Same as before. R3: Complaints do not get worse. R4: Complaints are not annoying. R5: Complaints do not interfere with daily activities.	R1: No. R2: No. R3: No. R4: No. R5: No.	BTR: Fine. BTR-LSP-PM: Okay. CDR: No changes needed. CDR-PM: Was this clearly understood as the symptoms as the same as before? CDR-LVC Yes, it is. They also think about it as their normal. CDR-PM: Okay.
8	As usual	Seperti biasa	As usual	R1: There is no phlegm. R2: Same amount of phlegm. R3: Phlegm does not increase. R4: Slight phlegm is felt. R5: Phlegm is still often felt.	R1: No. R2: No. R3: No. R4: No. R5: No.	BTR: Fine. BTR-LSP-PM: Okay. CDR: No changes needed.

	Source	Indonesia – Indonesian (Bahasa)	First Back Translation	Cognitive debriefing stage		Comments
				1. What does the instructions/question/ response choice mean for you? (encourage the respondent to reword the item using other words than those used and if this is not sufficient, to give examples)	2. Did you have difficulty understanding the instructions/ question/response choice? Are there words that you find difficult to understand? If yes, how would you change the wording?	
9	As usual	Seperti biasa	As usual	R1: No difficulty breathing. R2: Normal breath. R3: No shortness of breath. R4: No shortness of breath. R5: No shortness of breath.	R1: No. R2: No. R3: No. R4: No. R5: No.	BTR: Fine. BTR-LSP-PM: Okay. CDR: No changes needed.
10	As usual	Seperti biasa	As usual	R1: [No response] R2: Just walk normally. R3: Don't feel short of breath. R4: Able to do housework. R5: Does not interfere with daily activities.	R1: No. R2: No. R3: No. R4: No. R5: No.	BTR: Fine. BTR-LSP-PM: Okay. CDR: No changes needed.
11	As usual	Seperti biasa	As usual	R1: Able to work. R2: Able to work.	R1: No. R2: No.	BTR: Fine. BTR-LSP-PM: Okay.

	Source	Indonesia – Indonesian (Bahasa)	First Back Translation	Cognitive debriefing stage		Comments
				1. What does the instructions/question/ response choice mean for you? (encourage the respondent to reword the item using other words than those used and if this is not sufficient, to give examples)	2. Did you have difficulty understanding the instructions/ question/response choice? Are there words that you find difficult to understand? If yes, how would you change the wording?	
				R3: Can do daily activities. R4: Daily activities are not disturbed (cooking, bathing). R5: Able to do daily work.	R3: No. R4: No. R5: No.	CDR: No changes needed.
12	Mild	Ringan	Mild	R1: Coughing increases. R2: Cough more often. R3: Coughing is felt more often. R4: Coughing more often than usual. R5: Coughing sometimes.	R1: No. R2: No. R3: No. R4: No. R5: No.	BTR: Fine. BTR-LSP-PM: Okay. CDR: No changes needed. CDR-PM: Was this clearly understood as the symptoms are mild/minor? The respondents do not refer to this notion but mainly talk about increase in the symptom. Please advise. CDR-LVC: Well, they think it's a slight increase from their

	Source	Indonesia – Indonesian (Bahasa)	First Back Translation	Cognitive debriefing stage		Comments
				1. What does the instructions/question/ response choice mean for you? (encourage the respondent to reword the item using other words than those used and if this is not sufficient, to give examples)	2. Did you have difficulty understanding the instructions/ question/response choice? Are there words that you find difficult to understand? If yes, how would you change the wording?	
						usual/normal state. CDR-PM: Okay.
13	Mild	Ringan	Mild	R1: Phlegm starts increasing. R2: More phlegm than usual. R3: More phlegm collected. R4: Phlegm starts annoying. R5: Phlegm increases than usual.	R1: No. R2: No. R3: No. R4: No. R5: No.	BTR: Fine. BTR-PM: Okay. CDR: No changes needed.
14	Mild	Ringan	Mild	R1: A little tired. R2: Sometime difficult to inhale. R3: Feels a bit breathless. R4: Breathing feels heavy.	R1: No. R2: No. R3: No. R4: No.	BTR: Fine. BTR-PM: Okay. CDR: No changes needed.

	Source	Indonesia – Indonesian (Bahasa)	First Back Translation	Cognitive debriefing stage		Comments
				1. What does the instructions/question/ response choice mean for you? (encourage the respondent to reword the item using other words than those used and if this is not sufficient, to give examples)	**2. Did you have difficulty understanding the instructions/ question/response choice? Are there words that you find difficult to understand? If yes, how would you change the wording?**	
				R5: Feeling short of breath during heavy activity.	R5: No.	
15	Mild	Ringan	Mild	R1: A little breathless.	R1: No.	BTR: Fine.
				R2: Feels a little tired.	R2: No.	BTR-PM: Okay.
				R3: Inhale feels heavy.	R3: No.	CDR: No changes needed.
				R4: Breathing feels heavier.	R4: No.	
				R5: Gasping for heavy activity (long walks).	R5: No.	
16	Mild	Ringan	Mild	R1: Work is slightly disturbed.	R1: No.	BTR: Fine.
				R2: if the road is crowded.	R2: No.	BTR-PM: Okay.
				R3: Homework is slightly disturbed.	R3: No.	CDR: No changes needed.
				R4: Activities are sometimes disrupted.	R4: No.	
				R5: Activities at home are	R5: No.	

	Source	Indonesia – Indonesian (Bahasa)	First Back Translation	Cognitive debriefing stage		Comments
				1. What does the instructions/question/ response choice mean for you? (encourage the respondent to reword the item using other words than those used and if this is not sufficient, to give examples)	2. Did you have difficulty understanding the instructions/ question/response choice? Are there words that you find difficult to understand? If yes, how would you change the wording?	
				slightly disturbed.		
17	Moderate	Sedang	Moderate	R1: Coughing more often. R2: Slight increase in coughing. R3: Coughing sometimes interferes with activities. R4: Cough feels persistent. R5: Coughing is felt more often.	R1: No. R2: No. R3: No. R4: No. R5: No.	BTR: Fine. BTR-LSP-PM: Okay. CDR: No changes needed. CDR-PM: Was this clearly understood as the symptoms are moderate, between severe and mild? The respondents do not refer to this notion but mainly talk about increase in the symptom. Please advise. CDR-LVC: Yes, indeed, it's an increase from what they think as mild. CDR-PM: Okay.
18	Moderate	Sedang	Moderate	R1: Cough always contains phlegm.	R1: No. R2: No.	BTR: Fine. BTR-PM: Okay.

	Source	Indonesia – Indonesian (Bahasa)	First Back Translation	Cognitive debriefing stage		Comments
				1. What does the instructions/question/ response choice mean for you? (encourage the respondent to reword the item using other words than those used and if this is not sufficient, to give examples)	2. Did you have difficulty understanding the instructions/ question/response choice? Are there words that you find difficult to understand? If yes, how would you change the wording?	
				R2: More phlegm felt in the chest. R3: More and more phlegm starts make shortness of breath. R4: Chest felt almost full with phlegm. R5: More phlegm felt in the chest.	R3: No. R4: No. R5: No.	CDR: No changes needed.
19	Moderate	Sedang	Moderate	R1: Breathing feels heavier, more tiresome. R2: More often in difficult taking breath. R3: Breathing feels heavier. R4: It feels more difficult to breathe.	R1: No. R2: No. R3: No. R4: No. R5: No.	BTR: Fine. BTR-PM: Okay. CDR: No changes needed.

	Source	Indonesia – Indonesian (Bahasa)	First Back Translation	Cognitive debriefing stage		Comments
				1. What does the instructions/question/ response choice mean for you? (encourage the respondent to reword the item using other words than those used and if this is not sufficient, to give examples)	2. Did you have difficulty understanding the instructions/ question/response choice? Are there words that you find difficult to understand? If yes, how would you change the wording?	
				R5: Shortness of breath is felt more often.		
20	Moderate	Sedang	Moderate	R1: Gasping. R2: Breathing faster than usual. R3: Taking a shower and taking water feels breathless. R4: Walking inside the house feels suffocating. R5: Breathless, unable to walk around the house.	R1: No. R2: No. R3: No. R4: No. R5: No.	BTR: Fine. BTR-PM: Okay. CDR: No changes needed.
21	Moderate	Sedang	Moderate	R1: If you walk it feels tight. R2: If you walk, you feel panting. R3: Walk with tight breathing.	R1: No. R2: No. R3: No. R4: No.	BTR: Fine. BTR-PM: Okay. CDR: No changes needed.

	Source	Indonesia – Indonesian (Bahasa)	First Back Translation	Cognitive debriefing stage		Comments
				1. What does the instructions/question/ response choice mean for you? (encourage the respondent to reword the item using other words than those used and if this is not sufficient, to give examples)	2. Did you have difficulty understanding the instructions/ question/response choice? Are there words that you find difficult to understand? If yes, how would you change the wording?	
				R4: Walk with short breathing. R5: Shortness of breath and tired quickly.	R5: No.	
22	Severe	Berat	Severe	R1: Continuous coughing. R2: Always coughing. R3: Continuous cough. R4: Cough until you feel very tired. R5: Severe cough, until you feel tired.	R1: No. R2: No. R3: No. R4: No. R5: No.	BTR: Fine. BTR-LSP-PM: Okay. CDR: No changes needed. CDR-PM: Okay.
23	Severe	Berat	Severe	R1: A lot of phlegm comes out and cannot be relieved. R2: Phlegm comes out frequently. R3: Phlegm felt full in the	R1: No. R2: No. R3: No. R4: No.	BTR: Fine. BTR-PM: Okay. CDR: No changes needed.

	Source	Indonesia – Indonesian (Bahasa)	First Back Translation	Cognitive debriefing stage		Comments
				1. What does the instructions/question/ response choice mean for you? (encourage the respondent to reword the item using other words than those used and if this is not sufficient, to give examples)	2. Did you have difficulty understanding the instructions/ question/response choice? Are there words that you find difficult to understand? If yes, how would you change the wording?	
				chest. R4: Collected phlegm cannot be expelled and make breathing difficult. R5: Chest full of phlegm.	R5: No.	
24	Severe	Berat	Severe	R1: Inhale very heavy. R2: can't take a breath. R3: Inhale very hard. R4: Shortness of breath, look for a position to breathe (bend over). R5: Inhale and exhale feel very heavy.	R1: No. R2: No. R3: No. R4: No. R5: No.	BTR: Fine. BTR-PM: Okay. CDR: No changes needed.
25	Severe	Berat	Severe	R1: can't do anything because of tightness. R2: Difficult breathing.	R1: No. R2: No. R3: No.	BTR: Fine. BTR-PM: Okay. CDR: No changes needed.

	Source	Indonesia – Indonesian (Bahasa)	First Back Translation	Cognitive debriefing stage		Comments
				1. What does the instructions/question/ response choice mean for you? (encourage the respondent to reword the item using other words than those used and if this is not sufficient, to give examples)	2. Did you have difficulty understanding the instructions/ question/response choice? Are there words that you find difficult to understand? If yes, how would you change the wording?	
				R3: Breathing feels very heavy. R4: Difficulty breathing to the point of not being able to talk. R5: Shortness of breath feels very severe.	R4: No. R5: No.	
26	Severe	Berat	Severe	R1: Can't do activities. R2: Can't do anything. R3: sitting, unable to do activities. R4: Can't do anything. R5: Shortness of breath, feeling tired and unable to do activities.	R1: No. R2: No. R3: No. R4: No. R5: No.	BTR: Fine. BTR-PM: Okay. CDR: No changes needed.
27	If you choose at	Jika Anda {MQ}	If you {MQ}	R1: See a doctor	R1: No.	BTR: PPOK is the Indonesian

	Source	Indonesia – Indonesian (Bahasa)	First Back Translation	Cognitive debriefing stage		Comments
				1. What does the instructions/question/ response choice mean for you? (encourage the respondent to reword the item using other words than those used and if this is not sufficient, to give examples)	2. Did you have difficulty understanding the instructions/ question/response choice? Are there words that you find difficult to understand? If yes, how would you change the wording?	
	least 2 items in red {MQ} you are probably experiencing a COPD exacerbation, and should visit your doctor.	memilih setidaknya 2 jawaban dalam kotak merah, {MQ}mungkin Anda mengalami perburukan gejala PPOK, dan harus berobat ke dokter Anda.	selected at least two answers in the red box, {MQ}you might have worsening PPOK symptoms, and must go to your doctor.	immediately. R2: Return to the pulmo clinic. R3: Come to the ER because of shortness of breath. R4: Come for treatment to a pulmonary doctor. R5: Return to my pulmonary doctor.	R2: No. R3: No. R4: No. R5: No.	term for COPD; BTR: Red box in here is to give a clear instruction for the respondent; BTR: The term exacerbation was translated as worsening of symptoms to deliver the concept with the most simple language that familiar with the respondent. BTR-LSP-PM: Okay thanks for clarifying. Is it necessary to have "symptoms" in the translation though? It is not included in the source. Here we are talking about the diseases worsening, not just the symptoms, which are different things. BTR-LVC: It actually uses the concept explanation of COPD exacerbation (A sudden

	Source	Indonesia – Indonesian (Bahasa)	First Back Translation	Cognitive debriefing stage		Comments
				1. What does the instructions/question/ response choice mean for you? (encourage the respondent to reword the item using other words than those used and if this is not sufficient, to give examples)	**2. Did you have difficulty understanding the instructions/ question/response choice? Are there words that you find difficult to understand? If yes, how would you change the wording?**	
						worsening of symptoms in individuals with Chronic Obstructive Pulmonary Disease (COPD)).
						BTR-LSP-PM: Okay we'll check with the author if it is okay to leave symptoms.
						AR-DEV: OK with leaving "symptoms" in.
						CDR: No changes needed.
						CDR-PM: Was the translation of "If you choose at least 2 items in red you are probably experiencing a COPD exacerbation" clear to all respondents? They do not rephrase this part. Please advise.
						CDR-LVC: Yes, they

	Source	Indonesia – Indonesian (Bahasa)	First Back Translation	Cognitive debriefing stage		Comments
				1. What does the instructions/question/ response choice mean for you? (encourage the respondent to reword the item using other words than those used and if this is not sufficient, to give examples)	2. Did you have difficulty understanding the instructions/ question/response choice? Are there words that you find difficult to understand? If yes, how would you change the wording?	
						understand it and they know what should they do if that happen. CDR-PM: Okay.
28	Country/Language	Indonesia/Bahasa	County/ Language	R1: Indonesia. R2: Indonesia. R3: Indonesia. R4: Indonesia. R5: Indonesia.	R1: No. R2: No. R3: No. R4: No. R5: No.	BTR: Fine CDR: No changes needed. CDR-PM: This stays in English as our internal reference.

AR=author review; BT=back-translator; BTR=back-translation review; CDR=cognitive debriefing review; COPD=chronic obstructive pulmonary disease;

DEV=developer; LSP=language service provider; LVC=linguistic validation consultant; PM=project manager

Supplementary Table 4. All available translations of the CERT as of November 2025

Country	Language
Belgium	**Dutch**, **French**, **German**
Brazil	**Portuguese**
Bulgaria	Bulgarian
Canada	**English**, **French**
China	Chinese (Simplified), **Chinese (Traditional)**
Czechia	Czech
Denmark	**Danish**
Estonia	Estonian, Russian
Finland	**Finnish**
France	**French**
Germany	**German**
Greece	Greek
Hungary	Hungarian
India	**Assamese**, **Bengali**, **Gujarati**, **Hindi**, **Kannada**, **Malayalam**, **Marathi**, **Oriya**, **Punjabi**, **Tamil**, **Telugu**, **Urdu**
Indonesia	**Indonesian**
Israel	Arabic (Universal 'Modern Standard'), English, Hebrew, Russian
Italy	Italian
Korea	**Korean**
Latin America	**Spanish**
Latvia	Russian
Lithuania	Lithuanian
Netherlands	**Dutch**
Norway	**Norwegian**
Philippines	**Cebuano**, Filipino, **Hiligaynon**, Ilocano, **Tagalog**
Poland	Polish
Russia	Russian
Serbia	Serbian, Serbian (Latin)
Slovakia	Slovak
Slovenia	Slovenian
Spain	**Spanish**
Sweden	**Swedish**
Thailand	**Thai**
Turkey	**Turkish**
UK	**English**
Ukraine	Russian, Ukrainian

| USA | **English** |
| Vietnam | Vietnamese |

Requests for translations are received via GAAPP

This list includes translations that were linguistically and culturally validated during this study

(indicated with bold text)

CERT=Chronic Obstructive Pulmonary Disease Exacerbation Recognition Tool; UK=United Kingdom;

USA=United States of America

Supplementary Table 5. Narrative of the Published CERT Translations from Patients with COPD

A

Why the CERT is needed
"Early in my diagnosis I was unsure what an exacerbation was. This meant it took longer to book an appointment with my doctor. By the time I have seen my doctor and started taking the prescribed medication I had become quite ill. Now I am fully aware of an exacerbation I can access medication well before my symptoms become severe."
"I have lived with COPD since 2006. Through that period of time, I've self-empowered myself to manage my disease and keep on top of it. I do get flare ups, but I can tell which ones are causing me a problem and coughing up blood caused by a bacterial infection. Exercise is key. Pain in upper chest and tightness of chest are a sign of an exacerbation. It is important to find out what type of exacerbation is being experienced."

B

Translation and validation of the CERT
"I think both the wording an imagery work well and are easily understood. I would argue sometimes a worsening in one of those symptoms would be reason enough to visit doctor."
"I understand the CERT completely, PPI do understand the terminology as researchers have tailored documentation to a level the general public can understand. Any imagery connected with text is especially helpful for patients with COPD. Having any patient involved in research documentation is very important; it's the patient who is going to benefit at the end of the day and their input is very important."

C

Cultural adaptation of the images
"This is not so important to me. The importance for me is the ease of understanding CERT."
"A picture paints a thousand words, any image helps you to understand any of the terminology, especially medical terminology. Images are perfect, I don't have a problem with any of them. They are well decided and well thought through."

D

Impression of the tool overall
"I think the tool is more relevant to newly diagnosed patients or patients not able to access care easily. It's important not to make things overly complicated and I believe this tool achieves this."
"The tool is extremely useful and something which patients like myself should seriously look at and take on board what's been put forward and what's been suggested. It is important to translate the CERT as COPD is global. The GAAPP is a global organisation. People with COPD are not only English speaking and are placed all around the world. Translation into every language, to the cover the basics, is important."

E

Visions for the CERT in the future
"It needs to be easily accessible and widely disseminated. Any tools which a patient relies on should be stepped through with their doctor and personalised to their COPD."
"The 5 Symptoms are obviously essential and very useful for COPD patients. However, as a COPD patient who has had numerous exacerbations over the last few years there are 3 more symptoms that I believe should be considered which I have personally experienced. 1. Tightness in the chest no matter how slight. 2. Any pain or ache usually in the upper front chest area. 3. Lastly: If a COPD patient coughs up blood in their mucus, no matter how small, it should be taken very seriously and medical help sort. If the colour of your mucus changes to green, this means there is an infection and is a sign of a flare up. There are many indications that you could be getting a flare-up. Older generations live on their own and rely on carers and family members and it is essential for them to understand their disease as they're not always told this information."

Patients who provided narrative were not involved in the linguistic and cross-cultural validation of the CERT

CERT=COPD Exacerbation Recognition Tool; COPD=chronic obstructive pulmonary disease; GAAPP=Global Allergy and Airways Patient Platform; PPI=patient and public involvement