International consensus on airway clearance techniques for patients hospitalised with acute exacerbations of COPD: a European Delphi study

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European-based physiotherapists report using a variety of airway clearance techniques, with some regional preferences. Consensus was reached for patients hospitalised with AECOPD under a range of clinical circumstances. https://bit.ly/3XlqEGQ

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Abstract

Introduction Despite being a proposed treatment, there is no agreement on airway clearance management for patients hospitalised with an acute exacerbation of chronic obstructive pulmonary disease (AECOPD). The aim of this work was to establish international consensus on the selection of airway clearance techniques (ACTs) for these patients and identify which ACTs are commonly used.

Methods A modified Delphi study was employed. A panel of experienced physiotherapists working in Europe (n=162, 12 countries) was invited to respond to two online Delphi survey rounds. A 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree) was used; consensus was defined as a median score of $\leqslant 2$ or $\geqslant 4$ and 75% agreement.

Results Consensus was reached for the use of seven ACTs, including forced expiratory techniques (FETs), positive expiratory pressure (PEP) and oscillatory positive expiratory pressure (OPEP), in cases of limited treatment time, obesity, low patient motivation or for localised secretions. Consensus was reached against the use of five ACTs, including manual percussion, vibrations and shaking, in patients with resting breathlessness, frailty, obesity or high resting lung volumes. The most used ACTs among participants were PEP, FETs and active cycle of breathing techniques. Participants from nine countries identified ACTs that are commonly used by all of the country's participants.

Conclusions European-based physiotherapists report using a variety of ACTs, with some regional preferences noted in certain countries. Consensus was able to be reached regarding which ACTs should be used or avoided for patients hospitalised with AECOPD under a range of clinical circumstances.

Introduction

Chronic obstructive pulmonary disease (COPD) is a common respiratory disease that affects over 300 million people worldwide [1, 2]. An acute exacerbation of COPD (AECOPD) is a sudden worsening in

respiratory symptoms that may be caused by infections or environmental stress, or triggered or worsened by comorbidities such as heart disease [3, 4]. Exacerbations are associated with decreased quality of life, increased rates of hospitalisation and mortality, and a higher risk of future exacerbations [5–8].

Patients with AECOPD commonly present with increased sputum production and retention [9, 10], thereby indicating prescription of airway clearance techniques (ACTs). Mucus plugging of medium- to large-sized airways in patients with COPD has been identified as an independent predictor of all-cause mortality, irrespective of lung function and other confounding variables [11]. ACTs encompass various strategies designed to remove excess secretions from the airways [12]. These techniques can be performed independently, with assistance and/or with the use of devices [13–15]. A wide range of ACTs are available and can be used by physiotherapists to treat patients with AECOPD [16]. However, current literature does not support any single ACT as superior over another and airway clearance recommendations in major international COPD guidelines lack clarity to effectively inform evidence-based decision-making for patients hospitalised due to AECOPD [8, 10, 17–20]. Consequently, technique choice can vary widely depending on the setting and availability, the preferences of healthcare professionals and patients, or even the country of care.

The lack of evidence-based recommendations encourages seeking clinical guidance through expert-informed Delphi methods to aid decision-making and optimise ACT selection, especially for treating hospitalised patients with AECOPD. In the absence of robust research evidence, the Delphi method provides a recognised approach to formulating clinical agreement based on the opinion of a purpose-built panel and through a structured consensus-building process [21, 22]. The main objective of this study was to establish an international consensus on the selection and use of ACTs for hospitalised patients with AECOPD, using Delphi methodology. The secondary objective was to identify which ACTs are clinically used for patients hospitalised with AECOPD across Europe.

Methods

Study design and Delphi process

This modified Delphi consensus study comprised two rounds of structured, online surveys (figure 1). Invitations to the Delphi rounds were sent by email from September 2023 to January 2024. The identified eligible participants received an email invitation, including a letter explaining the purpose of the study, the study plan, definitions of ACTs and AECOPD, and the Delphi survey link. Each Delphi survey round lasted approximately 3 weeks, with email reminders. Participants had a minimum of 2 weeks to complete the survey. When applicable, the invitations and/or reminders were sent from those in the research group with the closest links to the nationality of the invited participant, in order to increase engagement and response rates. Participation in the study merited membership of the Current use of Airway Clearance Techniques in hOspitalS (CACTOS) Delphi Panel and authorship of the scientific publication of the final document. The surveys were in English and responses were collected and stored in REDCap *via* Aarhus University, Denmark (https://redcap.au.dk/).

Delphi panel participants

Purposeful sampling through nominal and snowball techniques were used to ensure representation from different European countries in the Delphi panel. Physiotherapists were eligible to participate if they declared that they either 1) treated patients with AECOPD in a hospital using ACTs within the last 3 years and/or 2) had worked on or supervised a research project for patients with AECOPD in a hospital using ACTs within the last 3 years. Participants who did not confirm their eligibility in Delphi survey round 1 were excluded.

During an international workshop related to the study in Aarhus, Denmark (June 2023), a group of 12 potential Danish participants was identified. To ensure a balanced representation, we aimed to include approximately 12 participants from each of the countries involved.

This was a low-risk survey-based study that did not include sensitive information or potentially sensitive topics; therefore, ethics approval was not required. The study adhered to the Declaration of Helsinki and has been reported to the Danish Data Protection Agency through registration at Aarhus University Hospital (record number: 1-16-02-266-23). Anonymity of responses was assured; all participants were assigned a unique identification number.

Delphi survey development

Delphi survey round 1 was developed through a scoping review [23], a team of experts comprising international physiotherapists, medical researchers and clinicians, and input from the participants of three

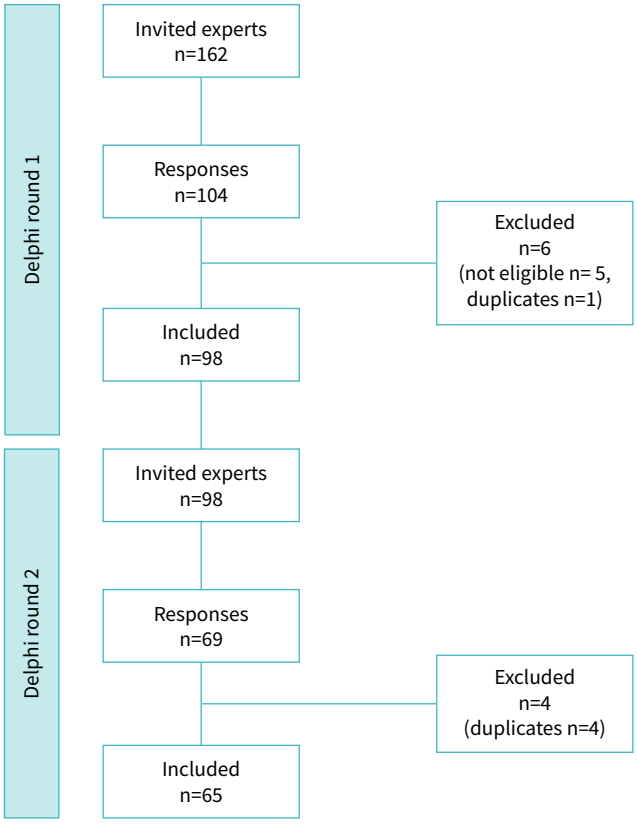

FIGURE 1 Flowchart of the Delphi process.

international workshops held in Aarhus (Denmark), London (UK), and Brussels (Belgium) that involved research physiotherapists, clinicians and a methodologist. The surveys consisted of a descriptive and a consensus part. The descriptive part included questions about eligibility to participate and the demographics of the participants (age, gender, country, *etc.*). Participants were also asked to indicate whether they used specific ACTs and had access to specific ACT equipment.

In the consensus part, participants were asked to rate their agreement with the use of a list of individual ACTs, based on specific clinical statements that reflected common patient physiology and symptoms (hypoxia, cardiac stability, *etc.*), as well as potential barriers and enablers of ACTs (limited treatment time, *etc.*). This part was presented as clinical statements accompanied by relevant ACTs and associated equipment items. The included statements and items were discussed among the researchers between the Delphi survey rounds, which resulted in the addition of new items to the ACTs or merging similar items. Moreover, during round 1, participants could suggest ACTs that were not included in the survey or modifications to the clinical statements and ACT items [24].

All items that did not reach consensus in round 1 were carried forward to round 2. Eligibility items, demographic items, items that reached consensus in round 1 and items with more than 30% of "unable to score" or missing responses in round 1 were removed. Additionally, new items proposed by the participants and agreed by the research team through discussion and voting were added in round 2. For each round, the final version of the survey was pilot-tested by the researchers, to ensure clarity of the items and to identify any technical issues.

Rating and consensus

Participants were asked to rate each ACT item on a 5-point Likert scale from 1 (strongly disagree) to 5 (strongly agree) [25]. An "unable to score" option was added to each item, to avoid forced decisions [26]. Consensus was defined as items with a median score of either $\leqslant 2$ or $\geqslant 4$ on the Likert scale and $\geqslant 75\%$ agreement in a combined score of 1 (ACTs not to use) and 2 or a combined score of 4 and 5 (ACTs to use) [27]. Statements with a level of agreement between 70–75% were considered "near consensus", as a

70% cutoff for consensus is often used in other studies [28–30]. The remaining items were considered "no consensus" items.

The rating was based on the participant's own experience and opinion. Each participant of round 2 received individual and group average ratings from round 1, including the number of participants, demographics and the distribution of responses to each statement and ACT item. Participants were asked to consider the group's average ratings of those items that did not reach consensus, along with their individual responses, and to rate each of the new items and those that did not reach consensus previously.

Analysis

Descriptive statistics, such as distribution (frequency and percentages of agreement or disagreement), central tendencies (median and mode) and dispersion (interquartile range), were used. Strength of agreement or disagreement was assessed using the median score and its qualitative descriptor and was reported for all items as per Audag *et al.* [31]. Response rates were reported, as well as rates of missing data and the "unable to score" option. All available responses were included in the analysis, *i.e.* including responses from participants who only completed the round 1 and surveys with missing items. Demographic data for round 2 were reported and extracted from participation in round 1. Analyses were performed with Stata 17.0 (StataCorp, College Station, TX, USA).

Results

Delphi panel participant recruitment and demographics

12 European countries were represented in both Delphi survey rounds (table 1). 162 physiotherapists were invited to participate in the study and 104 participants completed round 1 (64.2% response rate). Six participants were excluded due to eligibility and duplicates. 98 physiotherapists were invited to participate in round 2 and 65 of them completed this round (66.3% response rate). Participant demographics were similar in both rounds (table 2). Most of the participants were women, worked in public hospitals and had a master's degree. The participants reported using ACTs in approximately 10 hospitalised patients with AECOPDs per month (table 2).

Delphi surveys

Delphi survey round 1 had nine statements with 96 ACT items: eight statements with 11 ACT items and one statement with eight ACT items (table 3 and the online supplement). This part also included two open-ended questions inviting participant suggestions on statements and ACT items. In addition, round 1 included information about the participants, including confirmation of fulfilling the eligibility criteria and demographic data such as age, gender, country of graduation as a physiotherapist, current country of employment, type of hospital of current employment, level of education and clinical cases encountered in current practice.

TABLE 1 Invited experts and included participants in Delphi survey rounds 1 and 2, per country

Country	Experts invited	Expert participants in Delphi round 1	Expert participants in Delphi round 2
Denmark	12	10	7
Norway	11	11	10
Sweden	9	5	4
United Kingdom	13	6	4
Portugal	12	6	3
Spain	10	4	3
Italy	17	14	12
Greece	16	9	4
Switzerland	18	7	2
Belgium	15	10	6
France	18	11	7
Turkey	11	5	3
Total	162	98	65

Data presented as numbers (n). Participants were included only if they submitted complete and valid responses. All invited experts were asked to complete Delphi survey round 1. All participants of Delphi survey round 1 were invited to complete round 2.

TABLE 2 Delphi panel participant demographic characteristics in Delphi survey round 1 (n=98) and 2 (n=65)

Characteristic	Delphi round 1	Delphi round 2
Age[#]	42.4±10.2	43.1±10.5
Gender		
Female	59 (60.2)	46 (70.7)
Male	39 (39.8)	19 (29.2)
Type of hospital currently working in		
Public	78 (79.6)	47 (72.3)
Private	9 (9.2)	7 (10.8)
Other or more than one type of hospital	11 (11.2)	11 (16.9)
Highest completed education		
Bachelor's degree	15 (15.3)	7 (10.7)
Master's degree	45 (45.9)	32 (49.2)
PhD	33 (33.7)	23 (35.4)
Other	5 (5.1)	3 (4.6)
Average number of patients with an AECOPD treated per month[¶]	10 (5–15)	10 (5–12.5)

All characteristics are presented as number (%) except for columns marked with [#], which are presented as mean±SD, and [¶], which are presented as median (interquartile range). AECOPD: acute exacerbation of COPD; PhD: doctor of philosophy.

Round 2 had 12 statements with 170 ACTs items, including four statements with 16 ACT items, four statements with 15 ACT items, three statements with 12 ACT items and one statement with 10 ACT items (table 1 and the online supplement). This round included three new statements with five new ACT items for each of them, based on the open-ended questions in round 1. Participant suggestions that did not move forward to round 2 were excluded due to the pre-specified definitions used in this study, with the voting results and reasons for exclusion being recorded and made available.

Airway clearance consensus items

Consensus was achieved for 14 of the 96 ACT items in round 1 (15%) and for 12 additional ACT items out of the 170 items in round 2 (7%). Moreover, 13 items approached consensus in round 2 (8%). The

TABLE 3 Delphi survey statements and the number of their related airway clearance techniques (ACTs) that could reach consensus in Delphi survey round 1 (total items, n= 96) and 2 (total items, n=170)

Statement	ACTs in Delphi round 1	ACTs in Delphi round 2
1) If I have limited time, I would use the following ACT	11	12
2) If I treat a patient with breathlessness at rest, I would use the following ACT	11	15
3) If I treat a patient who is physically very tired, I would use the following ACT	11	15
4) If I treat a patient who is frail, I would use the following ACT	11	12
5) If I treat a patient who is very obese (BMI >40 kg·m^{-2}), I would use the following ACT	11[#]	10[#]
6) If I treat a patient with low motivation for airway clearance, I would use the following ACT	11	15
7) If my patient is not able to perform ACT independently, I would use the following ACT	11	16
8) If my patient cannot easily follow instructions, I would use the following ACT	11	16
9) If my patient is currently on NIV, I would use the following ACT	8	12
10) If I treat a patient showing evidence of localised secretions (X-ray, computed tomography scan, auscultation) during AECOPD, I would use the following ACT	NA	16
11) If I treat a patient with having highly viscous or viscoelastic secretion during AECOPD, I would use the following ACT	NA	16
12) If I treat a patient with high resting lung volume (*i.e.* hyperinflation, evidenced either *via* lung function test or clinically) during AECOPD, I would use the following ACT	NA	15

The table presents the number of possible ACTs to choose from in each round. In Delphi round 1, it is all ACTs that were included in the survey. In Delphi round 2, it is the ACTs that were included in the survey, incorporating the newly selected ones, but excluding the ACTs that already reached consensus in round 1 and those with >30% missing values. AECOPD: acute exacerbation of COPD; BMI: body mass index; NA: not available (these statements were included only in the Delphi round 2); NIV: noninvasive ventilation. [#]: As presented in table 5, in Delphi round 1, six items reached consensus for this statement. In Delphi round 2, five new items were added; therefore, the total number of items in this round is one fewer, *i.e.* number of items in Delphi round 1>number of items in Delphi round 2.

three statements regarding patients who were unable to perform ACTs independently, could not follow instructions or were using noninvasive ventilation (NIV) were the only ones that did not include any consensus ACT items. The ACT items that most often reached consensus for use in patients with AECOPD included positive expiratory pressure (PEP) and oscillatory positive expiratory pressure (O-PEP), whereas those that most often reached consensus for nonuse included manual percussion, vibrations and shaking (table 4).

Participants reached consensus on which ACTs to use for six out of the 12 statements and on which ACTs not to use for seven out of the 12 statements. For ACTs to use, PEP reached consensus on six statements, O-PEP on four statements and FET on three statements. These treatments were selected in cases of limited treatment time, in very obese patients or in patients with low motivation for airway clearance. Additionally, PEP and O-PEP were selected for patients with evidence of localised secretions, and PEP for patients with frailty and high resting lung volume. The use of slow expiration with glottis opened in lateral posture (ELTGOL) reached consensus for three statements and active cycle of breathing techniques (ACBTs) for one statement, recommended in patients with evidence of localised, viscous or viscoelastic secretions. No consensus was reached on the use of ACTs in patients with breathlessness at rest, those very physically tired, those unable to perform ACTs independently, patients who cannot easily follow instructions and those on NIV (table 4). On ACTs not to use, manual percussion reached consensus on six statements and vibrations and shaking on five statements. These items reached consensus for patients with resting breathlessness, frailty, obesity and high resting volume. Consensus was also reached not to use manual percussion in cases of limited treatment time (table 4).

Airway clearance management across Europe

The most used ACTs for hospitalised patients with AECOPD were PEP, FETs and ACBTs. All participants from Denmark, Norway, Sweden and Italy reported using PEP. All participants from Denmark, UK and Portugal reported using FETs, and all participants from Norway, UK and Turkey reported using ACBTs. Some ACTs were reported as being used unanimously in certain countries, namely O-PEP in Spain, autogenic drainage in Switzerland and mechanical insufflation–exsufflation in Portugal. Greece, Belgium and France were the only countries whose participants did not have an ACT that was unanimously reported as commonly used by all the respondents of the country (100%). The most used ACTs were, ACBT in Greece (89%), PEP in Belgium (90%) and PEP and ELTGOL in France (64% for both).

In round 1, 78 out of 98 participants (80%) reported using exercise as an ACT. In addition, 83 participants (86%) considered physical activity and/or exercise as an ACT. Of these, 72 participants (87%) used physical activity and/or exercise in combination with other ACTs and only 34 participants (41%) used it as a standalone ACT. Access to ACT equipment is presented in table S1.

Discussion

This study was the first to investigate international consensus on ACTs for hospitalised patients with AECOPD. It also identified which ACTs are used across Europe. Following the invitation of 162 physiotherapists from 12 European countries to establish a Delphi panel and conduct two Delphi survey rounds, participants reached consensus on 26 items relating to the selection of specific ACTs. This consensus of ACTs to use or not to use is intended to support clinical decision-making and prioritisation of future research studies.

It is possible that some of these findings reflect recommendations of the clinical guidelines on airway clearance during clinically stable COPD or less severe exacerbations [17–20]. Specifically, guidelines often report the use of PEP, O-PEP and FETs, which may explain why these ACTs were more often favoured over others by our participants. In addition, these ACTs are accessible, easy to use and include devices of a relatively low cost, if applicable [12]. Consequently, our results might indicate that these ACTs can be preferable or more widely practiced compared to other ACTs because they do not require special training or expensive equipment. Access to equipment and associated costs might have influenced our findings. Use of individual ACTs in specific countries was identified and can be partially related to availability, access and training. Similarly, the use of ELTGOL could be attributed to the influence of studies on COPD that have explored the mechanisms of action of this technique [32, 33]. Still, it is unknown whether physiology, characteristics and practical aspects of ACTs during clinically stable stages of the disease remain equally important and relevant during severe acute exacerbations that require hospitalisation.

Furthermore, ACTs that were considered “traditional” and have a more passive component, such as manual percussions, vibrations and shaking, were often included in the consensus for ACTs not to use. These

TABLE 4 Consensus on airway clearance techniques (ACTs) for Delphi rounds 1 and 2

Statement	Agreement (%)	Missing or "I do not know" (%)	Likert response (median, IQR)	Consensus decision	Delphi round when/if consensus was achieved
1) If I have limited time, I would use the following ACT:					
FET	**75.8**	**3.1**	**4 (4–5)**	**Agree**	**Round 1**
ACBT	61.9	3.1	4 (3–5)	Agree	No consensus
Manual percussions	**77.8**	**8.2**	**1.5 (1–2)**	**Strongly disagree**	**Round 1**
Manual vibrations or shaking	69.4	4.6	1 (1–2)	Strongly disagree	No consensus
GAD	*73.8*	*6.2*	*1 (1–3)*	*Strongly disagree*	*No consensus*
HFCWO	56.7	31.6	2 (1–3)	Disagree	No consensus
IPV	36.7	24.6	3 (2–4)	Neutral	No consensus
AD	42.6	6.2	3 (2–4)	Neutral	No consensus
ELTGOL	58.3	7.7	4 (3–4.5)	Agree	No consensus
PEP	**86.3**	**3.1**	**5 (4–5)**	**Strongly agree**	**Round 1**
O-PEP	**78.3**	**7.7**	**4 (4–5)**	**Agree**	**Round 2**
Simeox	40.5	43.1	3 (2–4)	Neutral	No consensus
SCT	60.4	10.8	4 (3–5)	Agree	No consensus
MI/E	40.3	15.4	3 (2–4)	Neutral	No consensus
MetaNeb	54.3	46.2	3 (2–3)	Neutral	No consensus
IPPB	33.3	35.4	3 (2–4)	Neutral	No consensus
2) If I treat a patient with breathlessness at rest, I would use the following ACT:					
FET	54,0	3.1	2 (1–4)	Disagree	No consensus
ACBT	62.9	4.6	4 (3–4)	Agree	No consensus
Manual percussions	**78.7**	**6.2**	**2 (1–2)**	**Strongly disagree**	**Round 2**
Manual vibrations or shaking	**77.1**	**6.2**	**2 (1–2)**	**Strongly disagree**	**Round 2**
GAD	*72.1*	*12.2*	*1 (1–2)*	*Strongly disagree*	*No consensus*
HFCWO	68.8	34.7	2 (1–3)	Strongly disagree	No consensus
IPV	42.9	24.6	3 (2–4)	Neutral	No consensus
AD	43.3	4.6	3 (2–4)	Neutral	No consensus
ELTGOL	40.7	9.2	3 (2–4)	Neutral	No consensus
PEP	67.7	4.6	4 (3–4)	Agree	No consensus
O-PEP	53.5	10.8	4 (3–4)	Agree	No consensus
Simeox	36.11	44.6	3 (2–4)	Neutral	No consensus
SCT	49.12	12.3	3 (3–4)	Neutral	No consensus
MI/E	58.2	15.4	2 (1–3)	Disagree	No consensus
MetaNeb	44.12	47.7	3 (2–3)	Neutral	No consensus
IPPB	40.91	32.3	3 (2–3)	Neutral	No consensus
3) If I treat a patient who is physically very tired, I would use the following ACT:					
FET	58.1	4.6	4 (3–4)	Agree	No consensus
ACBT	57.4	6.2	4 (3–4)	Agree	No consensus
Manual percussions	*72.6*	*4.6*	*2 (1–3)*	*Strongly disagree*	*No consensus*
Manual vibrations or shaking	66.1	4.6	2 (1–2)	Disagree	No consensus
GAD	57.4	6.2	2 (1–4)	Disagree	No consensus
HFCWO	52.2	30.0	2 (1–4)	Strongly disagree	No consensus
IPV	49.0	21.5	3 (2–4)	Neutral	No consensus
AD	32.8	6.2	3 (2–4)	Neutral	No consensus
ELTGOL	50.0	10.8	3.5 (3–4)	Agree	No consensus
PEP	66.1	4.6	4 (3–4)	Agree	No consensus
O-PEP	55.2	10.8	4 (3–4)	Agree	No consensus
Simeox	40.5	43.1	3 (2–4)	Neutral	No consensus
SCT	45.5	15.4	3 (2–4)	Neutral	No consensus
MI/E	37.5	13.8	3 (2–4)	Neutral	No consensus
MetaNeb	40.0	46.2	3 (2–4)	Neutral	No consensus
IPPB	35.0	38.5	3 (2.5–4)	Neutral	No consensus
4) If I treat a patient who is frail, I would use the following ACT:					
FET	69.8	3.1	4 (3–4)	Agree	No consensus
ACBT	*71.0*	*4.6*	*4 (3–4)*	*Agree*	*No consensus*
Manual percussions	**83.9**	**11.2**	**1 (1–2)**	**Strongly disagree**	**Round 1**
Manual vibrations or shaking	**80.2**	**12.2**	**1 (1–2)**	**Strongly disagree**	**Round 1**
GAD	58.1	4.6	2 (1–4)	Disagree	No consensus
HFCWO	64.1	34.7	2 (1–3)	Strongly disagree	No consensus

Continued

TABLE 4 Continued

Statement	Agreement (%)	Missing or "I do not know" (%)	Likert response (median, IQR)	Consensus decision	Delphi round when/if consensus was achieved
IPV	47.1	21.5	3 (2–4)	Neutral	No consensus
AD	42.6	6.2	3 (2–4)	Neutral	No consensus
ELTGOL	56.9	10.8	4 (3–4)	Agree	No consensus
PEP	**79.8**	**4.1**	**4 (4–5)**	**Agree**	**Round 1**
O-PEP	62.7	9.2	4 (3–4)	Agree	No consensus
Simeox	41.7	44.6	3 (2–4)	Neutral	No consensus
SCT	50.0	16.9	3.5 (3–4)	Agree	No consensus
MI/E	29.6	16.9	3 (2–4)	Neutral	No consensus
MetaNeb	50.0	50.8	3 (2–3)	Neutral	No consensus
IPPB	41.0	40.0	3 (2–4)	Agree	No consensus
5) If I treat a patient who is very obese (BMI >40 kg·m^{-2}), I would use the following ACT:					
FET	**82.1**	**3.1**	**4 (4–5)**	**Agree**	**Round 1**
ACBT	**78.9**	**8.2**	**4 (4–5)**	**Agree**	**Round 1**
Manual percussions	**80.2**	**12.2**	**1 (1–2)**	**Strongly disagree**	**Round 1**
Manual vibrations or shaking	**77.9**	**12.2**	**1 (1–2)**	**Strongly disagree**	**Round 1**
GAD	67.2	6.2	2 (1–3)	Disagree	No consensus
HFCWO	64.2	18.5	2 (2–3)	Disagree	No consensus
IPV	59.6	20.0	2 (1–4)	Disagree	No consensus
AD	50.8	9.2	4 (3–4)	Agree	No consensus
ELTGOL	49.2	9.2	3 (2–4)	Neutral	No consensus
PEP	**93.6**	**4.1**	**5 (5–5)**	**Strongly agree**	**Round 1**
O-PEP	**82.2**	**14.3**	**4 (4–5)**	**Agree**	**Round 1**
Simeox	43.2	43.1	3 (3–4)	Neutral	No consensus
SCT	69.8	18.5	4 (3–4)	Aree	No consensus
MI/E	45.5	15.4	3 (2–4)	Neutral	No consensus
MetaNeb	38.2	47.7	3 (3–4)	Neutral	No consensus
IPPB	47.5	38.5	3 (3–4)	Agree	No consensus
6) If I treat a patient with low motivation for airway clearance, I would use the following ACT:					
FET	**79.0**	**4.6**	**4 (4–4)**	**Agree**	**Round 2**
ACBT	40.3	4.6	3 (2–4)	Neutral	No consensus
Manual percussions	*72.1*	*6.2*	*2 (1–3)*	*Disagree*	*No consensus*
Manual vibrations or shaking	69.4	4.6	2 (1–3)	Disagree	No consensus
GAD	*70.0*	*9.2*	*2 (1–3)*	*Disagree*	*No consensus*
HFCWO	42.3	21.5	3 (2–4)	Neutral	No consensus
IPV	40.0	23.1	3 (2–4)	Neutral	No consensus
AD	56.7	7.7	2 (2–3)	Disagree	No consensus
ELTGOL	40.4	12.3	3 (2–4)	Neutral	No consensus
PEP	**80.6**	**5.1**	**4 (4–5)**	**Agree**	**Round 1**
O-PEP	**81.0**	**10.8**	**4 (4–4)**	**Agree**	**Round 1**
Simeox	44.7	41.5	3 (2–4)	Neutral	No consensus
SCT	58.2	15.4	4 (3–4)	Agree	No consensus
MI/E	42.6	16.9	3 (2–4)	Neutral	No consensus
MetaNeb	38.2	47.7	3 (2–4)	Neutral	No consensus
IPPB	43.9	36.9	3 (2–4)	Agree	No consensus
7) If my patient is not able to perform ACT independently, I would use the following ACT:					
FET	45.9	6.2	3 (2–4)	Neutral	No consensus
ACBT	63.4	6.2	2 (2–3)	Disagree	No consensus
Manual percussions	65.0	7.7	2 (1–3.5)	Disagree	No consensus
Manual vibrations or shaking	59.7	4.6	2 (1–4)	Disagree	No consensus
GAD	54.1	6.2	2 (1–4)	Disagree	No consensus
HFCWO	43.1	6.2	3 (2–4)	Neutral	No consensus
IPV	53.1	9.2	4 (2–4)	Agree	No consensus
AD	67.8	9.2	2 (2–3)	Disagree	No consensus
ELTGOL	51.7	10.8	2 (2–3)	Disagree	No consensus
PEP	59.0	6.2	4 (3–4)	Agree	No consensus
O-PEP	48.2	13.8	3 (3–4)	Neutral	No consensus
Simeox	36.1	44.6	3 (2–4)	Neutral	No consensus
SCT	48.1	4.6	3 (2–3)	Neutral	No consensus

Continued

TABLE 4 Continued

Statement	Agreement (%)	Missing or "I do not know" (%)	Likert response (median, IQR)	Consensus decision	Delphi round when/if consensus was achieved
MI/E	52.7	15.4	4 (2–4)	Agree	No consensus
MetaNeb	42.4	49.2	3 (2–4)	Neutral	No consensus
IPPB	34.1	36.9	3 (3–4)	Neutral	No consensus
8) If my patient cannot easily follow instructions, I would use the following ACT:					
FET	40.9	4.6	3 (2–4)	Neutral	No consensus
ACBT	62.3	6.2	2 (2–3)	Disagree	No consensus
Manual percussions	66.7	7.7	2 (1–3.5)	Disagree	No consensus
Manual vibrations or shaking	60.7	6.1	2 (1–4)	Disagree	No consensus
GAD	52.5	6.2	2 (1–4)	Disagree	No consensus
HFCWO	40.0	23.1	3 (2–4)	Neutral	No consensus
IPV	47.1	21.5	3 (2–4)	Neutral	No consensus
AD	60.0	7.7	2 (1–3)	Disagree	No consensus
ELTGOL	63.8	10.8	2 (2–3)	Disagree	No consensus
PEP	59.7	4.6	4 (3–4)	Agree	No consensus
O-PEP	48.3	10.8	3 (3–4)	Neutral	No consensus
Simeox	34.2	41.5	3 (2–4)	Neutral	No consensus
SCT	55.8	20.0	2 (2–3)	Disagree	No consensus
MI/E	41.5	18.5	3 (2–4)	Disagree	No consensus
MetaNeb	36.4	49.2	3 (2–4)	Neutral	No consensus
IPPB	33.3	40.0	3 (2–4)	Neutral	No consensus
9) If my patient is currently on NIV, I would use the following ACT:					
FET	60.0	7.7	4 (2–4)	Agree	No consensus
ACBT	55.0	7.7	4 (2–4)	Agree	No consensus
Manual percussions	*70.0*	*7.7*	*2 (1–3)*	*Disagree*	*No consensus*
Manual vibrations or shaking	65.0	7.7	2 (1–4)	Disagree	No consensus
GAD	56.7	7.7	2 (1–4)	Disagree	No consensus
HFCWO	59.7	31.6	2 (1–3)	Strongly disagree	No consensus
AD	47.5	9.2	3 (2–4)	Neutral	No consensus
ELTGOL	43.1	10.8	3 (2–4)	Neutral	No consensus
Simeox	47.2	44.6	3 (1–3)	Neutral	No consensus
SCT	45.3	18.5	3 (2–4)	Neutral	No consensus
MI/E	47.2	18.5	3 (2–4)	Neutral	No consensus
MetaNeb	31.3	50.8	3 (2–4)	Neutral	No consensus
IPPB	32.5	38.5	3 (1.5–4)	Agree	No consensus
10) If I treat a patient showing evidence of localised secretions (X-ray, computed tomography scan, auscultation) during AECOPD, I would use the following ACT:					
FET	*71.4*	*3.1*	*4 (3–5)*	*Agree*	*No consensus*
ACBT	*71.7*	*7.7*	*4 (3–5)*	*Agree*	*No consensus*
Manual percussions	*70.5*	*6.2*	*2 (1–3)*	*Disagree*	*No consensus*
Manual vibrations or shaking	66.1	4.6	2 (1–3)	Disagree	No consensus
GAD	53.2	4.6	2 (1–4)	Disagree	No consensus
HFCWO	48.0	23.1	3 (2–4)	Neutral	No consensus
IPV	47.1	21.5	3 (2–5)	Neutral	No consensus
AD	50.0	7.7	3.5 (3–4)	Agree	No consensus
ELTGOL	**79.31**	**10.8**	**4 (4–5)**	**Agree**	**Round 2**
PEP	**90.3**	**4.6**	**4 (3–4)**	**Strongly agree**	**Round 2**
O-PEP	**84.5**	**10.8**	**4 (4–5)**	**Agree**	**Round 2**
Simeox	44.4	44.6	3 (2.5–4)	Neutral	No consensus
SCT	51.9	16.9	4 (3–4)	Agree	No consensus
MI/E	39.6	18.5	3 (2–4)	Neutral	No consensus
MetaNeb	38.2	47.7	3 (2–4)	Neutral	No consensus
IPPB	45.5	38.5	3 (3–4)	Agree	No consensus
11) If I treat a patient with having highly viscous or viscoelastic secretion during AECOPD, I would use the following ACT:					
FET	69.9	3.1	4 (3–5)	Agree	No consensus
ACBT	63.3	7.7	4 (3–4)	Agree	No consensus
Manual percussions	*71.7*	*7.7*	*2 (1–3)*	*Disagree*	*No consensus*
Manual vibrations or shaking	65.6	6.2	2 (1–3)	Disagree	No consensus
GAD	59.0	6.2	2 (1–3)	Disagree	No consensus
HFCWO	43.1	21.5	3 (2–4)	Neutral	No consensus

Continued

TABLE 4 Continued

Statement	Agreement (%)	Missing or "I do not know" (%)	Likert response (median, IQR)	Consensus decision	Delphi round when/if consensus was achieved
IPV	58.8	21.5	4 (3–4)	Agree	No consensus
AD	44.1	9.2	3 (3–4)	Neutral	No consensus
ELTGOL	54.2	10.8	4 (3–4)	Agree	No consensus
PEP	**80.6**	**4.6**	**4 (4–4)**	**Agree**	**Round 2**
O-PEP	**87.9**	**10.7**	**4 (4–5)**	**Strongly agree**	**Round 2**
Simeox	51.4	43.1	4 (3–4)	Agree	No consensus
SCT	52.8	18.5	4 (3–4)	Agree	No consensus
MI/E	40.7	16.9	3 (2–4)	Neutral	No consensus
MetaNeb	34.3	46.2	3 (3–4)	Neutral	No consensus
IPPB	48.7	40.0	3 (3–4)	Agree	No consensus
12) If I treat a patient with high resting lung volume (*i.e.* hyperinflation, evidenced either *via* lung function test or clinically) during AECOPD, I would use the following ACT:					
FET	59.0	6.2	4 (3–4)	Agree	No consensus
ACBT	51.7	7.7	4 (2–4)	Agree	No consensus
Manual percussions	**82.0**	**6.2**	**2 (1–2)**	**Strongly disagree**	**Round 2**
Manual vibrations or shaking	**78.3**	**9.2**	**2 (1–2)**	**Strongly disagree**	**Round 2**
GAD	*70.0*	*7.7*	*2 (1–3)*	*Disagree*	*No consensus*
HFCWO	55.8	20.0	2 (2–3)	Disagree	No consensus
IPV	39.2	21.5	3 (2–4)	Neutral	No consensus
AD	39.0	9.2	3 (2–4)	Neutral	No consensus
ELTGOL	58.6	10.8	4 (3–4)	Agree	No consensus
PEP	**79.4**	**3.1**	**4 (4–5)**	**Agree**	**Round 2**
O-PEP	*73.7*	*12.3*	*4 (3–5)*	*Agree*	*No consensus*
Simeox	41.7	44.6	3 (2.5–4)	Neutral	No consensus
SCT	41.5	18.5	3 (3–4)	Neutral	No consensus
MI/E	63.5	20.0	2 (1–3)	Disagree	No consensus
MetaNeb	45.5	49.2	3 (2–3)	Neutral	No consensus

The total number of responses was 98 for statements that achieved consensus or were removed in round 1. The total number of responses was 65 for the remaining statements. When consensus (75% agreement) was achieved, the columns are bolded. Items approaching consensus (between 70 and 75% agreement) are italicised. The scores on the Likert scale ranges from 1 to 5. The corresponding qualitative descriptor to each median score is given in the column "strength of consensus". The percentage of agreement is calculated from the number of patients who answered on the Likert scale. Q1 is the 25th percentile, Q3 is the 75th percentile. ACBT: active cycle of breathing techniques; AD: autogenic drainage; AECOPD: acute exacerbation of COPD; BMI: body mass index; ELTGOL: slow expiration with glottis opened in lateral posture; FET: forced expiratory technique; GAD: gravity-assisted drainage; HFCWO: high-frequency chest wall oscillation; IPPB: intermittent positive pressure breathing; IPV: intrapulmonary percussive ventilation; IQR: interquartile range; MI/E: mechanical insufflation–exsufflation; NIV: noninvasive ventilation; O-PEP: oscillating positive expiratory pressure; PEP: positive expiratory pressure; SCT: specific cough technique.

ACTs might have been perceived as less favourable by the Delphi panel as they can be time consuming or physically demanding for frail patients or those with fatigue, which were clinical statements included in the surveys. These techniques have also shown lower patient preference, as they usually require assistance. The variation observed when patients are unable to perform ACTs independently likely reflects the necessity of applying clinical judgment and adapting approaches on a case-by-case basis.

Physical activity and exercise were included in our survey as ACT options due to the ongoing debate regarding their effectiveness in airway clearance management and because some geographical areas, such as Australia, utilise exercise as the most commonly used ACT for managing COPD [8]. Herrero-Cortina *et al*. [34] concluded that there is insufficient evidence to recommend the use of exercise as an exclusive ACT in bronchiectasis. Current studies are investigating this research question in different patient populations, such as people with cystic fibrosis, where it is considered highly relevant and a high research priority [35].

Investigations into chronic respiratory conditions and their management during severe acute exacerbations are very limited. Recent large studies have reported the international use of ACTs in other respiratory conditions during clinically stable stages [36]. Data from the European Multicentre Bronchiectasis Audit and Research Collaboration, including 16 723 people with bronchiectasis from 28 countries, reported similar results to ours, demonstrating variability in the use of individual ACTs across Europe and identifying frequently used ACTs, such as the ACBT [36]. These international audit data indicated that ACTs were used mainly in patients with higher disease severity. Similarly, national surveys on

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TABLE 5 Use of airway clearance techniques (ACTs) per country

Country	Round 1 (n=98)											Round 2 (n=65)				
	FET	ABCT	Manual percussions	Manual vibrations or shaking	GAD	HFCWO	IPV	Autogenic drainage	ELTGOL	PEP	O-PEP	Simeox	SCT	MI/E	MetaNeb	IPPB
Denmark n=10	10 (100)	4 (40)	1 (10)	1 (10)	4 (40)	0 (0)	0 (0)	2 (20)	5 (50)	10 (100)	2 (20)	0 (0)	4 (57)	1 (14)	0 (0)	1 (14)
Norway n=11	10 (91)	11 (100)	0 (0)	0 (0)	1 (9)	0 (0)	0 (0)	2 (18)	4 (36)	11 (100)	6 (50)	0 (0)	9 (90)	0 (0)	0 (0)	0 (0)
Sweden n=5	4 (80)	2 (40)	0 (0)	0 (0)	2 (40)	0 (0)	0 (0)	0 (0)	1 (20)	5 (100)	1 (20)	0 (0)	3 (75)	0 (0)	2 (50)	0 (0)
UK n=6	6 (100)	6 (100)	3 (50)	3 (50)	1 (17)	0 (0)	0 (0)	3 (50)	0 (0)	3 (50)	4 (67)	0 (0)	3 (75)	3 (75)	0 (0)	4 (100)
Spain n=4	2 (50)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (25)	2 (50)	3 (75)	2 (50)	4 (100)	0 (0)	2 (67)	1 (33)	0 (0)	0 (0)
Portugal n=6	6 (100)	5 (83)	0 (0)	0 (0)	0 (0)	1 (17)	1 (17)	2 (33)	4 (67)	3 (50)	5 (83)	0 (0)	1 (33)	3 (100)	0 (0)	1 (33)
Italy n=14	12 (86)	9 (64)	0 (0)	0 (0)	1 (7)	2 (17)	6 (43)	7 (50)	13 (93)	14 (100)	6 (43)	6 (50)	8 (67)	1 (8)	4 (33)	4 (33)
Greece n=9	7 (78)	8 (89)	6 (67)	7 (78)	6 (67)	0 (0)	0 (0)	5 (56)	2 (22)	3 (33)	0 (0)	0 (0)	3 (75)	1 (25)	0 (0)	0 (0)
Switzerland n=7	5 (71)	3 (43)	1 (14)	0 (0)	1 (14)	0 (0)	5 (71)	7 (100)	6 (86)	4 (57)	4 (57)	1 (50)	1 (50)	1 (50)	0 (0)	0 (0)
Belgium n=10	6 (60)	3 (30)	0 (0)	0 (0)	0 (0)	0 (0)	4 (40)	6 (60)	7 (70)	9 (90)	8 (80)	0 (0)	4 (67)	1 (17)	0 (0)	2 (20)
France n=11	6 (55)	6 (55)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	4 (36)	7 (64)	7 (64)	5 (45)	1 (14)	1 (14)	2 (29)	0 (0)	2 (29)
Turkey n=5	4 (80)	5 (100)	4 (80)	3 (60)	1 (20)	3 (60)	0 (0)	2 (40)	2 (40)	4 (80)	2 (40)	0 (0)	2 (67)	1 (33)	0 (0)	0 (0)
Total n=98	78 (80)	62 (63)	15 (15)	14 (14)	17 (17)	6 (6)	17 (17)	42 (43)	54 (55)	75 (77)	47 (48)	8 (12)	41 (63)	15 (23)	6 (9)	14 (22)

Data presented as frequency (percentage) of participants from number of total participants from each country. Note: "Country" refers to the location where each Delphi participant is currently employed. ACBT: active cycle of breathing technique; ELTGOL: slow expiration with glottis opened in lateral posture; FET: forced expiratory technique; GAD: gravity-assisted drainage; HFCWO: high-frequency chest wall oscillation; IPPB: intermittent positive pressure breathing; IPV: intrapulmonary percussive ventilation; MI/E: mechanical insufflation–exsufflation; O-PEP: oscillating positive expiratory pressure; PEP: positive expiratory pressure; SCT: specific cough technique.

bronchiectasis that investigated ACTs during clinically stable stages also indicated that ACTs are used reactively rather than proactively [37]. Furthermore, bronchiectasis guidelines recommend that a change in ACT may be necessary during an acute exacerbation due to changes in symptoms and sputum characteristics [38]. This is also likely to apply to individuals living with COPD, so results from individuals in a stable clinical state may not be applicable during an AECOPD. Thus, it is paramount to further assess airway clearance management during AECOPD, including its effectiveness and role in milder disease severities.

In support of this, the items that did not reach consensus highlight the considerable variability in clinical opinion and practice. Unsurprisingly, the statements that did not reach consensus for ACTs in AECOPD are in areas where the evidence base is limited, suggesting important uncertainties. This variability may contribute to differences in patient care and highlights the need for high-quality studies to clarify the efficacy and effectiveness of patient selection and support for more standardised and optimal practice.

Regarding the Delphi process, we planned two survey rounds *a priori* to mitigate respondent fatigue bias, as the surveys were lengthy and included repetitive answer options [39]. While the number of rounds in Delphi surveys typically ranges from two to four, there is limited evidence on the optimal number of rounds [40]. Furthermore, the threshold for consensus was defined as 75% *a priori*, although we also reported on "nearly consensus" items (70%). There is no agreement on the most appropriate threshold for a Delphi study, but our selection was based on a previous systematic review in Delphi studies, which identified consensus thresholds between 50% and 97%, with a median threshold of 75% [27].

The modified Delphi process followed a standardised methodology and was led by a multinational research team and the active participation of many clinicians and researchers, through a series of international workshops. The selection of relevant ACTs was additionally informed by a scoping review that used systematic methodology [41]. Still, it should be noted that our study is not without limitations. We aimed to establish international consensus but only participants from 12 European countries were included. Moreover, the number of participants from each country of employment was not equal, ranging from three to 14 per country, and in some instances, the sample size was small due to low response rates. Consequently, a few countries may have been under-represented. Low response rate is a common issue in surveys and we tried to address this through the engagement techniques reported in the methods section. As most participants reported an ORCID ID, the sample may have been weighted towards academic physiotherapists, which represents a potential limitation that could have influenced the perspectives captured in this study. Additionally, this was a study investigating expert consensus, so the views of patients and families were not considered. Finally, our strict consensus threshold could have precluded some additional agreement; therefore, a lower threshold has also been reported.

Conclusion and implications

This study identified some European consensus on the selection of ACTs for patients hospitalised with AECOPD and provided the first overview on the use of ACTs across Europe in this population. PEP and O-PEP were the most likely to reach a consensus on the ACT to use, while manual percussion, vibrations and shaking were the most likely to reach a consensus on the ACT not to use. It is important to highlight that this consensus represents the collective opinions of experienced physiotherapists and that future clinical studies are required to validate and expand on our results. Importantly, further investigations of countries outside Europe and further work on the use of individual ACTs for patients with AECOPD are required. Future research should also consider evaluating pragmatic and combined approaches to ACTs in AECOPD.

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References

1 Agustí A, Vogelmeier C, Faner R. COPD 2020: changes and challenges. *Am J Physiol Lung Cell Mol Physiol* 2020; 319: L879–L883.
2 Adeloye D, Chua S, Lee C, *et al.* Global and regional estimates of COPD prevalence: systematic review and meta-analysis. *J Glob Health* 2015; 5: 020415.
3 Ritchie AI, Wedzicha JA. Definition, causes, pathogenesis, and consequences of chronic obstructive pulmonary disease exacerbations. *Clin Chest Med* 2020; 41: 421–438.
4 Hogea SP, Tudorache E, Fildan AP, *et al.* Risk factors of chronic obstructive pulmonary disease exacerbations. *Clin Respir J* 2020; 14: 183–197.
5 Whittaker H, Rubino A, Müllerová H, *et al.* Frequency and severity of exacerbations of COPD associated with future risk of exacerbations and mortality: a UK routine health care data study. *Int J Chron Obstruct Pulmon Dis* 2022; 17: 427–437.

6 Montagnani A, Mathieu G, Pomero F, *et al.* Hospitalization and mortality for acute exacerbation of chronic obstructive pulmonary disease (COPD): an Italian population-based study. *Eur Rev Med Pharmacol Sci* 2020; 24: 6899–6907.
7 Perera PN, Armstrong EP, Sherrill DL, *et al.* Acute exacerbations of COPD in the United States: inpatient burden and predictors of costs and mortality. *COPD* 2012; 9: 131–141.
8 Osadnik CR, McDonald CF, Holland AE. Airway clearance techniques in acute exacerbations of COPD: a survey of Australian physiotherapy practice. *Physiotherapy* 2013; 99: 101–106.
9 Hanrahan C, Pedlow K, Osadnik C. Airway clearance techniques for patients experiencing acute exacerbations of chronic obstructive pulmonary disease in the Republic of Ireland. *Physiother Pract Res* 2021; 42: 165–172.
10 Westerdahl E, Osadnik C, Emtner M. Airway clearance techniques for patients with acute exacerbations of chronic obstructive pulmonary disease: physical therapy practice in Sweden. *Chron Respir Dis* 2019; 16: 1479973119855868.
11 Diaz AA, Orejas JL, Grumley S, *et al.* Airway-occluding mucus plugs and mortality in patients with chronic obstructive pulmonary disease. *JAMA* 2023; 329: 1832–1839.
12 Herrero-Cortina B, Lee AL, Oliveira A, *et al.* European Respiratory Society statement on airway clearance techniques in adults with bronchiectasis. *Eur Respir J* 2023; 62: 2202053.
13 Pakpahan R, Tarigan AP, Sitohang NS. The effect of the combination of chest physiotherapy and active cycle breathing technique on respiratory rate and ability to expend sputum in chronic exacerbation obstructive lung disease patients at Haji Adam Malik Hospital Medam. *Eur J Mol Clin Med* 2021; 8: 616–623.
14 Shen M, Li Y, Ding X, *et al.* Effect of active cycle of breathing techniques in patients with chronic obstructive pulmonary disease: a systematic review of intervention. *Eur J Phys Rehabil Med* 2020; 56: 625–632.
15 Saeed MA, Barker RE, Alsulayyim ASS, *et al.* Use of oscillatory positive expiratory pressure (OPEP) devices to augment sputum clearance in COPD: a systematic review and meta-analysis. *Thorax* 2020; 75: 855–863.
16 Open Science Framework. Airways clearance techniques for people with chronic obstructive pulmonary disease: a scoping review protocol. Date last accessed: 4 June 2023. Date last updated: 21 June 2023. https://osf.io/64nvw
17 National Institute for Health and Care Excellence. Chronic obstructive pulmonary disease in over 16s: diagnosis and management (NICE guideline, No. 115). Date last accessed: 12 June 2024. Date last updated: July 2019. www.ncbi.nlm.nih.gov/books/NBK542426/
18 Yang IA, George J, McDonald CF, *et al.* The COPD-X Plan: Australian and New Zealand guidelines for the management of chronic obstructive pulmonary disease 2023. Version 2.73. Date last accessed: 1 October 2025. Date last updated: December 2023. https://copdx.org.au/wp-content/uploads/2024/03/COPD-X-V2.73_version-3.0_FINAL.pdf
19 Koninklijk Nederlands Genootschap voor Fysiotherapie. COPD. Date last accessed: 1 October 2025. Date last updated: 24 July 2020. www.kennisplatformfysiotherapie.nl/richtlijnen/copd/samenvatting/
20 Wedzicha JA, Miravitlles M, Hurst JR, *et al.* Management of COPD exacerbations: a European Respiratory Society/American Thoracic Society guideline. *Eur Respir J* 2017; 49: 1600791.
21 Nasa P, Jain R, Juneja D. Delphi methodology in healthcare research: how to decide its appropriateness. *World J Methodol* 2021; 11: 116–129.
22 Boulkedid R, Abdoul H, Loustau M, *et al.* Using and reporting the Delphi method for selecting healthcare quality indicators: a systematic review. *PLoS One* 2011; 6: e20476-e20476.
23 Schrøder CK, Spinou A, Oliveira A, *et al.* Airways clearance techniques for people with chronic obstructive pulmonary disease: A scoping review protocol. Date last updated: 21 June 2023. https://doi.org/10.17605/OSF.IO/64NVW
24 Trevelyan EG, Robinson PN. Delphi methodology in health research: how to do it? *Eur J Integr Med* 2015; 7: 423–428.
25 Joshi A, Kale S, Chandel S, *et al.* Likert scale: explored and explained. *British J Appl Sci Technol* 2015; 7: 396–403.
26 Chyung SY, Roberts K, Swanson I, *et al.* Evidence-based survey design: the use of a midpoint on the Likert scale. *Performance Improvement* 2017; 56: 15–23.
27 Diamond IR, Grant RC, Feldman BM, *et al.* Defining consensus: a systematic review recommends methodologic criteria for reporting of Delphi studies. *J Clin Epidemiol* 2014; 67: 401–409.
28 Shearsmith L, Kennedy F, Lindner OC, *et al.* Delphi survey to inform patient-reported symptom monitoring after ovarian cancer treatment. *J Patient Rep Outcomes* 2020; 4: 71.
29 Vogel C, Zwolinsky S, Griffiths C, *et al.* A Delphi study to build consensus on the definition and use of big data in obesity research. *Int J Obes (Lond)* 2019; 43: 2573–2586.
30 Cascella M, Miceli L, Cutugno F, *et al.* A Delphi consensus approach for the management of chronic pain during and after the COVID-19 era. *Int J Environ Res Public Health* 2021; 18: 13372.
31 Audag N, Cnockaert P, Reychler G, *et al.* Consensus on nasal irrigation in infants: a Delphi study. *Ann Otol Rhinol Laryngol* 2023; 132: 674–683.

32 Martins JA, Dornelas de Andrade A, Britto RR, *et al.* Effect of slow expiration with glottis opened in lateral posture (ELTGOL) on mucus clearance in stable patients with chronic bronchitis. *Respir Care* 2012; 57: 420–426.

33 Lanza FC, Alves CS, dos Santos RL, *et al.* Expiratory reserve volume during slow expiration with glottis opened in infralateral decubitus position (ELTGOL) in chronic pulmonary disease: technique description and reproducibility. *Respir Care* 2015; 60: 406–411.

34 Herrero-Cortina B, Spinou A, Oliveira A, *et al.* Airway clearance techniques and exercise in people with bronchiectasis: two different coins. *Eur Respir J* 2023; 62: 2300741.

35 Saynor ZL, Cunningham S, Morrison L, *et al.* Exercise as airway clearance therapy (ExACT) in cystic fibrosis: a UK-based e-Delphi survey of patients, caregivers and health professionals. *Thorax* 2023; 78: 88–91.

36 Spinou A, Hererro-Cortina B, Aliberti S, *et al.* Airway clearance management in people with bronchiectasis: data from the European Bronchiectasis Registry (EMBARC). *Eur Respir J* 2024; 63: 2301689.

37 McLeese RH, O'Neill K, O'Neill B, *et al.* Airway clearance treatments in bronchiectasis: feasibility of linking survey results to registry data and a survey of patients' and physiotherapists' practices. *ERJ Open Res* 2023; 9: 00540-2022.

38 Hill AT, Sullivan AL, Chalmers JD, *et al.* British Thoracic Society guideline for bronchiectasis in adults. *Thorax* 2019; 74: Suppl. 1, 1–69.

39 Walker MA, Selfe MJ. The Delphi method: a useful tool for the allied health researcher. *Brit J Ther Rehabil* 1996; 3: 677–681.

40 Keeney S, Hasson F, McKenna H. Consulting the oracle: ten lessons from using the Delphi technique in nursing research. *J Adv Nurs* 2006; 53: 205–212.

41 Poncin W, SchrøderC OliveiraA, *et al.* Airway clearance techniques for people with acute exacerbation of COPD: a scoping review. *Eur Respir Rev* 2025; 34: 240191.