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Non-pharmacological interventions for breathlessness management in patients with lung cancer: a systematic review

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The aim is to review the published scientific literature for studies evaluating non-pharmacological interventions for breathlessness management in patients with lung cancer. The following selection criteria were used to systematically search the literature: studies were to be published research or systematic reviews; they were to be published in English and from 1990 to 2007; the targeted populations were adult patients with dyspnoea/breathlessness associated with lung cancer; and the study reported on the outcomes from use of non-pharmacological strategies for breathlessness. This review retrieved five studies that met all inclusion criteria. All the studies reported the benefits of non-pharmacological interventions in improving breathlessness regardless of differences in clinical contexts, components of programmes and methods for delivery. Analysis of the available evidence suggests that tailored instructions delivered by nurses with sufficient training and supervision may have some benefits over other delivery approaches. Based on the results, non-pharmacological interventions are recommended as effective adjunctive strategies in managing breathlessness for patients with lung cancer. In order to refine such interventions, future research should seek to explore the core components of such approaches that are critical to achieving optimal outcomes, the contexts in which the interventions are most effective, and to evaluate the relative benefits of different methods for delivering such interventions. *Palliative Medicine* (2008); **22**: 693–701

Key words: breathlessness; dyspnoea; intervention; lung cancer; management; non-pharmacological

Introduction

Dyspnoea is a subjective experience of difficult, laboured and uncomfortable breathing.[1] It can be very distressing and debilitating and severely limit a person's ability to engage in the activities of daily living required to maintain well-being, health and independence, such as personal hygiene, hydration and nutrition.[2] Dyspnoea is one of the most commonly reported symptoms in lung cancer, with 10% to 15% of patients having breathlessness at diagnosis, and 65% having this symptom at some point during their illness.[3]

Management of dyspnoea requires an in-depth understanding of the multidimensional nature of the symptom, the pathophysiologic mechanisms and the indications and limitations of the available therapeutic approaches.[4] Pharmacological interventions and surgical procedures, such as drainage of pleural effusions, can be effective; however, evidence suggests that breathlessness sometimes remains unrelieved despite the use of those strategies.[5] As dyspnoea is a subjective experience, the potential value of non-pharmacological methods as adjuncts to pharmacological management has been proposed. Many of these non-pharmacological interventions draw on a range of pulmonary rehabilitation strategies that have been shown to be effective in chronic obstructive pulmonary disease (COPD); however, in the context of lung cancer, non-pharmacological approaches typically encompass a broader range of psychosocial, behavioural and environmental strategies that can provide a more comprehensive approach to managing this complex symptom.

A previous systematic review has reported on the benefits of non-pharmacological management of breathlessness.[6] However, the review did not provide detailed analysis of the impact of various patient-related factors, such as diagnostic group, or intervention-related factors, such as intervention components and methods of delivery, on outcomes of these management strategies.

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Conclusions can, therefore, not be made about whether specific non-pharmacological techniques or specific delivery methods are more effective in particular clinical contexts. The present systematic review aims to examine the influence of various intervention components, delivery methods and clinical contexts on outcomes of non-pharmacological interventions for managing breathlessness in patients with lung cancer.

Methods

The Cochrane Library (1990–July 2007), EMBASE (1990–July 2007), Pubmed (1990–July 2007), Ovid (1990–July 2007), EBSCO host as a search engine for CINAHL (1990–July 2007), Pre-CINAHL (2007), Health source: Nursing/Academic Edition (1990–July 2007) and MEDLINE (1990–July 2007) were searched to identify all published scientific analytical studies and systematic reviews that included non-pharmacological interventions for managing breathlessness for patients with lung cancer.

The following search strategies were used for EBSCOhost and adapted as appropriate for the other databases:

EBSCOhost (1990–July 2007)

1) breathlessness
2) dyspnoea
3) #1 or #2
4) management
5) interventions
6) treatment
7) #4 or #5 or #6
8) non-pharmacological
9) 'lung cancer'
10) #3 and #7 and 8 and #9

The combined effort of the above searches produced 169 abstracts. On examination of the titles and abstracts of the literature by the two authors (IZ and PY) independently, 15 articles were retrieved. Rejected abstracts did not meet the study selection criteria. The references of these relevant studies were also examined. A 'snowballing' strategy of reference titles was used, and related abstracts and/or full-text articles were accessed.

Overall, 18 full-text articles were retrieved and assessed by two authors (IZ and PY) independently, using the following selection criteria for this study:

1) Studies were to be published research including systematic reviews; descriptive studies were excluded;
2) Studies were to be published in English literature and after year 1990;
3) The targeted populations were adult patients with dyspnoea/breathlessness associated with lung cancer (if studies also included some patients with other thoracic cancers, e.g., malignant pleural mesothelioma, these patients were also included; studies including lung cancer patients with other comorbid conditions, such as COPD, were not excluded);
4) The study reported on the non-pharmacological management (excluding any surgical, non-invasive ventilation or oxygen interventions) of breathlessness.

Thirteen studies were excluded based on the selection criteria, and the results are listed in Table 1 with reasons for exclusion.[1,4,6–16] Five studies met all the inclusion criteria for this review, and they are outlined in Table 2.[17–21] Assessment for the quality of the methodology of these studies was based on a standardised abstraction procedure.[22]

Results

This systematic review identified five studies that fulfilled the inclusion criteria. This review focuses specifically on examining the influence of the following aspects of the

Table 1 Characteristics of excluded studies

Study	Reason for exclusion
Sola, *et al.*[6]	The two studies about breathless management were discussed in detail individually in this systematic review
Jantarakupt and Porock[7]	A descriptive review of the literature
Rabow, *et al.*[8]	Study population did not confine to patients with lung cancer; there was no separate result analysis on patients with lung cancer either
Kvale, *et al.*[1]	A descriptive study
Dudgeon[9]	A descriptive study
Hoyal, *et al.*[10]	A descriptive study
Thomas and von Gunten[11]	A descriptive study
Gallo-Silver and Pollack[12]	A descriptive study
Plant, *et al.*[13]	Outcomes did not meet the inclusion criteria
LeGrand and Declan[14]	A descriptive study
Dudgeon and Rosenthal[4]	A descriptive review of the literature
Grey[15]	A descriptive study
Cowcher and Hanks[16]	A descriptive study

Table 2 Characteristics of included studies

Study	Corner, *et al.*[17]
Methods	Randomised controlled pilot study A nurse-led clinic in a specialist cancer centre (London; UK)
Participants	34 patients randomised (20 analysed, IG = 11, CG = 9) No of withdrawals after randomisation due to deterioration: IG = 8, CG = 6 Median age: IG = 55; CG = 69 No (%) men: IG = 5 (45%); CG = 7 (77%) Inclusion criteria: patients with lung cancers; completed chemotherapy or radiotherapy; experiencing dyspnoea
Interventions	Intervention group Counselling, breathing re-training, relaxation and teaching coping and adaptation strategies Control group Detailed assessments of breathlessness during outcome assessment interviews
Delivery methods	Person in charge of delivery: nurse research practitioners Duration of the intervention programme: 3–6 weeks Frequency of sessions: weekly Length of each session: not specified
Outcome measures	1. VAS - breathlessness over the previous week, symptom distress 2. Functional Capacity Scale - physical functioning 3. Hospital Anxiety and Depression Scale - anxiety and depression 4. Qualitative interviews - patient's experience of breathlessness Measured at baseline, 4 weeks and 3 months
Results	The intervention group showed improvements in breathlessness at worst ($P = 0.02$), distress caused by breathlessness ($P = 0.02$) and functional capacity ($P = 0.03$)
Allocation concealment	Unclear
Study	Bredin, *et al.*[18]
Methods	RCT Multicentre, UK, nursing clinics in six hospitals
Participants	119 patients recruited, 103 analysed (IG = 51, CG = 52) No of withdrawals after randomisation to study: IG = 10, CG = 18 Main reason of withdrawal: condition deterioration Mean (range) age (years): IG = 68 (41–82), CG = 67 (41–83) No (%) men: IG = 41(80%), CG = 35 (67%) Inclusion criteria: patients with lung cancer who had completed treatment and reported breathlessness
Interventions	Intervention group Patients receive a package of care tailored to individual needs. It includes 1) detailed assessment of dyspnoea and factors that ameliorate or exacerbate it 2) advice and support for patients and their families on the management of dyspnoea 3) exploration of the meaning of dyspnoea, their disease and feelings about the future 4) breathing control training, progressive muscle relaxation and distraction exercises 5) setting goals to complement breathing and relaxation techniques, to help in the management of functional and social activities and to support the development and adaptation of coping strategies 6) recognition of problems requiring pharmacological or medical intervention Control group Standard care and best supportive care that were defined as the standard management and treatment for breathlessness available to patients within each centre. This included pharmacological and palliative treatments and treatment of associated problems such as anxiety and depression
Delivery methods	Person in charge of delivery: specialist nurses Duration of the intervention programme: 3–8 weeks Frequency of sessions: weekly Length of each session: not specified
Outcome measures	1. VAS - distress due to breathlessness 2. WHO performance status scale - physical status 3. Hospital anxiety and depression scale - emotional status 4. Rotterdam symptom checklist - physical status Measured at 1, 4 and 8 weeks
Results	At 8 weeks, the intervention group showed significant improvement for breathlessness at best ($P = 0.03$), WHO performance status ($P = 0.02$), levels of depression ($P = 0.02$) and physical symptom distress ($P = 0.04$) A secondary analysis of three specific sub items on the activity level scale (R41: climb stairs; R43: walk outdoors; and R44: go shopping) showed significant improvement in activity levels for the intervention group ($P = 0.05$)
Allocation concealment	Adequate
Study	Connors, *et al.*[19]
Methods	

(continued)

Table 2 *(continued)*

	Cohort study
	Patients were referred from 1) the lung cancer clinic as an outpatient, 2) the ward, as an inpatient and 3) the community from the specialist palliative care team; UK
Participants	169 patients were referred; only 14 completed the full programme
	Main reason for withdrawal: patients believed that they only needed some aspects of the programme, but not all of it
	Mean (range) age: 72 (46–86)
	No (men): 6
	All had NSCLC
	Inclusion criteria: patients with intrathoracic malignancy
Interventions	Week 1: assessment, breathing control
	Week 2: review, relaxation, anxiety management
	Week 3: review, energy conservation, goal setting, lifestyle re-adaptation
	Week 4: review, assessment
	Week 8: reassessment and review
Delivery methods	Person in charge of delivery: physiotherapists
	Duration of the intervention programme: 2 months
	Frequency of sessions: individual sessions weekly for 4 weeks and with a review session 1 month later
	Length of each session: 1 h
Outcome measures	1. Chronic Respiratory Disease Questionnaire
	2. Number counting - the ability of reading numbers aloud
	3. VAS of breathlessness at worst, at best and distress caused by breathlessness
Results	Dyspnoea has been improved according to the measurement scores; however, none of the results reaches significance. The changes in mean Chronic Respiratory Disease Questionnaire scores, mean VAS scores (breathlessness at best, breathlessness at worst, distress due to breathlessness) are 0.91 (95% CI: –1.4–3.2); –0.29 (95% CI: –3.5–4.1); –1.79 (95% CI: –2.1–5.7); –1.79 (95% CI: –4.2–7.8)
Study	Hately, *et al.*[20]
Methods	Cohort study
	An outpatient breathlessness clinic at Lewis - Manning House; UK
Participants	45 patients recruited in the study and 30 completed the whole study; the other 15 patients deteriorated or died before completion
	Inclusion criteria: patients with lung cancer whose chest X-ray had excluded pleural effusion and who were experiencing breathlessness not less than 1 month after completion of any active treatment
	Median age: 71 years
	Male: 24; Female: 6
	NSCLC: 16; mesothelioma: 10; unknown histology: 1
Interventions	1. Breathing retraining
	2. Simple relaxation techniques
	3. Activity pacing
	4. Psychosocial support
Delivery methods	Person in charge of delivery: senior physiotherapists
	Duration of the intervention programme: 4–6 weeks
	Frequency of sessions: three sessions during the programme
	Length of each session: 90 min
Outcome measures	Measured by therapist at each visit:
	1. Current Respiratory Symptoms
	2. Functional Capacity Scale
	3. Sputum Production Scale
	Self-assessment by the patient prior to baseline and intervention
	1. Rotterdam symptom checklist
	2. VAS
	3. Things that improve breathlessness
	4. Quality of life questionnaire
Results	1. Dyspnoea was reported less frequently at completion ($P < 0.001$)
	2. There was a highly significant improvement in reported ability between study entry and completion ($P < 0.001$)
	3. Significant improvements were seen in the physical symptom distress ($P = 0.01$) and activity levels ($P < 0.001$)
	4. The median reduction in VAS breathing at worst and distress caused by breathing was 1 ($P = 0.001$; 95% CI: 0–2), 3 ($P < 0.001$, 95% CI: 2–4) and 4 ($P < 0.001$; 95% CI: 2–5)
	5. Both physical and psychological strategies to improve breathlessness were helpful ($P < 0.05$)
	6. Significant improvements were seen in hours per day spent lying down ($P = 0.02$), bodily strength ($P = 0.03$) and things that made patients happy ($P = 0.04$). The greatest improvements were found in patient's ability to do what they wanted to do ($P = 0.001$) and in overall quality of life ($P = 0.004$)

(continued)

Table 2 *(continued)*

Study	Moore, *et al.*[21]
Methods	RCT Specialist cancer hospital and three cancer units in south-eastern England
Participants	203 patients randomised and analysed (IG = 100; CG = 103) No of withdrawal: unclear; reason for withdrawal: death or condition deterioration Mean age: IG = 67; CG = 67 No (%) men: IG = 74 (75%); CG = 66 (64%) Inclusion criteria: patients with lung cancer; completed initial anticancer treatment; expected to survive for at least 3 months
Interventions	Intervention group 1. Open access to nurse specialists through the clinic, telephone and message pager service 2. Telephone assessment or clinic appointment 2 weeks after baseline, then every 4 weeks although patient is stable 3. Rapid and comprehensive communication with general practitioner and primary healthcare team by telephone, fax or letter 4. Regular discussion with and referral to medical team on detection of any new symptom or rapid worsening of condition Control group Routine outpatient appointments (one post-treatment appointment, then appointments at 2 or 3 months intervals) for medical assessment and investigations to monitor disease progression. Patients were also seen on the basis of need
Delivery methods	Person in charge of delivery: clinical nurse specialists Duration of the intervention programme: not specified Frequency of sessions: telephone assessment or clinic appointment 2 weeks after baseline, then every 4 weeks Additional contacts were also available The mean number of contacts with patients was three per month; 14% of the contacts were initiated by patients Length of each session: the mean length of contact was 23 min (2–120)
Outcome measures	1. Quality of life 2. Patient's satisfaction, general practitioners' satisfaction 3. Survival, symptom-free survival, progression - free survival 4. Use of resources 5. Comparison of costs
Results	3 months after nurse-led follow-up began, patients rated their dyspnoea as less severe than did patients randomised to conventional medical follow-up ($P = 0.03$)
Allocation concealment	Adequate

IG, Intervention group; CG, Control group; VAS, Visual Analogue Scales; RCT, randomised controlled trial; WHO, World Health Organisation; NSCLC, non small cell lung cancer.

study on intervention outcomes: the clinical context of the intervention, components of intervention and methods for delivering the intervention.

Clinical context

There were some important differences in sample characteristics between studies and a lack of information about the clinical characteristics of samples in some studies reviewed. For example, besides lung cancers, fourteen patients with mesothelioma were also recruited in Bredin, *et al.*[18] and Moore, *et al.*[21] studies. Only Moore, *et al.* study provided information on patients' comorbid disease, such as COPD, although no specific analysis was conducted on this group of patients. In Hately, *et al.* study, 10 patients had mesothelioma and 1 had unknown histology. Moreover, although the majority of patients in the studies reviewed included patients who had completed anticancer treatments and were experiencing breathlessness, information on stage of diseases and current anticancer and supportive treatments was limited in most of the studies. In Corner, *et al.*[17] study, 13 patients had advanced lung cancer (seven in intervention group and six in control group), whereas the majority of the patients in Moore, *et al.*[21] study were at cancer stage III (about 42%), and 24 patients (about 20%) had metastatic disease in Bredin, *et al.* study.[18] Most of the studies provided information on the participants' performance status/functional capacity at baseline. A review of these data suggest that although the majority of patients in the studies to date had advanced disease, performance status scores indicate few patients who completed the intervention had substantially impaired functional abilities. The significance of this patient profile is underscored by findings from Hately, *et al.* study, which indicated that those patients who were unable to complete the study had lower scores at first assessment. Of the completing patients, 37% could walk more than 100 yards without breathlessness, 33% could walk less than 100 yards, 30% were breathless on mild exertion and none of the patients were breathlessness at rest. This was compared with 17%,

17%, 42% and 25%, respectively, in the patients unable to complete the programme.

Information on the anticancer treatments provided to the participants before or during their trial period was also limited. In Bredin, *et al.* study, 35, 15 and 5 patients in the intervention group had completed radiotherapy, chemotherapy and surgery, respectively, whereas in the control group, 39, 15 and 11 patients had completed radiotherapy, chemotherapy and surgery, respectively. Among the patients who had completed the programme in Connors, *et al.*[19] study, eight patients had previous resection, two had previous radical radiotherapy, three had previous chemotherapy and one had no previous treatment. Among the 30 patients who completed the study period in Hately, *et al.*[20] study, 22 had received previous radiotherapy, 8 had previous surgery, 3 had previous chemotherapy and 3 had no previous active treatment. Those patients were also on a variety of medications, including steroids, analgesics, bronchodilator and psychotropic drugs; however, such information was not available in the other studies (Cornor, *et al.* study and Moore, *et al.* study).

There were also some key differences in the demographic characteristics of the participants. For example, the median age of the participants in Connors, *et al.*, Hately, *et al.* and Moore, *et al.* studies was 72, 71 and 67, respectively. The mean ages of the subjects in Bredin, *et al.* intervention and control groups were similar, which were 68 years and 67 years, respectively. However, the median age of the subjects in Corner's intervention group was much younger (55-year-old) than that in the control group (69 years). The authors reported that the age difference was unlikely to have confounded the treatment effect; however, no detailed explanation was given. In terms of gender differences, there was a higher percentage of male participants in most of the studies. The majority of the subjects in the studies of Corner, *et al.*, Bredin, *et al.*, Hately, *et al.* and Moore, *et al.* were males (for more details, see Table 2).

Components of interventions

The intervention strategies were quite similar in four studies (Corner, *et al.*, Bredin, *et al.*, Connors, *et al.* and Hately, *et al.*), although some important differences can be noted. The intervention group in Corner, *et al.*[17] study was counselled and taught breathing retraining, relaxation techniques and coping and adaptation strategies. Similarly, patients in Hately, *et al.*[20] study were taught breathing retraining and simple relaxation techniques and were given psychological support. Patients in Connors, *et al.*[19] study were assessed and taught breathing control at baseline. Subsequently, they were reviewed and instructed in more strategies, such as relaxation techniques, anxiety management, energy conservation and goal setting and lifestyle re-adaptation. Once the participants learned all the techniques, they were reviewed and reassessed during follow-up sessions. In Hately, *et al.* study, activity pacing was a new component compared with previous studies; and energy conversation was a unique feature in Connors, *et al.* study. Patients in Connors, *et al.* study were seen individually for 1 hour on four consecutive weeks and followed with a review session 1 month later. In Hately, *et al.* study, the participants were only seen at three sessions, each lasting up to 90 min, over a period of 4–6 weeks. Hately, *et al.* showed significant improvements in dyspnoea measurements after the programme. Patients' breathlessness was also reported to be improved in Connors, *et al.* study; nevertheless, these results should be interpreted with caution due to small sample size and high dropout rate.

One key feature of Bredin, *et al.*[18] study is that the intervention package was tailored to individual patients, which recognised the differences of service needs in different individuals. This included detailed assessment of dyspnoea and factors that ameliorate or exacerbate it; advice and support for patients and their families on the management of dyspnoea; exploration of the meaning of dyspnoea, their disease and feelings about the future; breathing control training, progressive muscle relaxation and distraction exercises; setting goals to complement breathing and relaxation techniques, to help in the management of functional and social activities and to support the development and adaptation of coping strategies; and recognition of problems requiring pharmacological or medical intervention. This package of care also incorporated supportive measures for patients' family members, as well as recognition of problems requiring pharmacological or medical intervention.

In Moore, *et al.*[21] study, patients in the intervention group were assessed by nurse specialists monthly by protocol over the telephone or in a nurse-led clinic to identify signs of disease progression, symptoms warranting intervention or serious complications. Additional contacts could also be made as necessary without an appointment. This intervention programme emphasized prompt identification of signs and symptoms warranting intervention by the clinical nurse specialist and communication with the general practitioner and primary healthcare team as appropriate. The study results also showed significant improvements in dyspnoea ratings by patients.

All studies, thus, included multiple behavioural, psychological support and educational components within the intervention. In most cases, all components were provided to patients in a structured format. However, in Bredin, *et al.* study, the intervention strategy was tailored to individual patient's needs. As well, in Moore, *et al.* study, patients could continue to contact the nurse according to needs. Despite these differences, all studies were reported to be beneficial for lung cancer patients with breathlessness.

Delivery methods

Every study adopted different delivery methods for the intervention, in terms of who was in charge of delivering the programme, timing of interventions and how the programme was delivered. Nurse research practitioners or nurse specialists delivered the intervention programmes in Corner, *et al*., Bredin, *et al*. and Moore, *et al*. studies; whereas physiotherapists and senior physiotherapists delivered the programmes in Connors, *et al*. and Hately, *et al*. studies, respectively. Connors, *et al*. reported that the physiotherapist running the programme had attended a 3-day education programme on the Corner model in 1997 and had practiced in the area of lung cancer breathlessness management ever since. In Bredin, *et al*. study, regular telephone contact and visits to each centre and meetings of all the participating centres at 6 month intervals were carried out in order to audit the intervention method. All nurses taking part were taught the intervention in the same way using a practice guideline, and they all completed a checklist at the end of each intervention session indicating the strategies they had used with patients. In Moore, *et al*. study, medical consultants and nurse academics gave regular clinical supervision sessions for the clinical nurse specialists.

Patients were consulted individually for a few consecutive weeks in Corner, *et al*., Bredin, *et al*. and Connors, *et al*. studies. Corner's programme[17] was carried out over 3–6 weeks, whereas Bredin's programme[18] lasted for between 3 weeks and 8 weeks. Participants in Connors, *et al*.[19] study were seen individually for about 1 hour on four consecutive weeks and followed with a review session 1 month later. Similarly, physiotherapists in Hately, *et al*.[20] study only needed to see the patients for three sessions, each lasting about 90 min over 4–6 weeks. However, the authors did not specify whether the programme was delivered to a group of patients or individuals only. These studies, thus, all involved the instructors having one-to-one contact with the participants for a few consecutive weeks to deliver the programme.

Moore, *et al*.[21] adopted a very different approach to deliver the intervention programme as the participants had open access to nurse specialists through the clinic, telephone and message pager service. The participants could consult the nurse specialists anytime for any concerns; and the nurse specialists were required to provide thorough instructions or make a prompt decision to refer the patients accordingly. At 3 months, the mean number of contacts with patients was three; 14% of these contacts were initiated by patients. The mean length of contact was 23 min (range, 2–120).

Regardless of differences in delivery methods and length of intervention, all the study outcomes were positive.

Power of the intervention

In some cases, the sample size was too small, limiting the power of the study and the ability to generalise the results to other populations. There were only 20 and 45 patients selected in Corner, *et al*.[17] and Hately, *et al*.[20] studies, respectively. Moreover, even though there were 160 patients recruited in Connors, *et al*.[19] study at baseline, only 14 completed the programme. The investigators acknowledged that patient selection could be the reason for the high dropout rate. That is, the patients were selected from the totality of patients with lung cancer presenting to a cancer unit, and included the frail, receiving oncological interventions, whereas both Corner, *et al*. and Bredin, *et al*. selected patients from cancer centres where patients had completed active oncological interventions.

Some writers have argued that the clinical meaningfulness of an intervention could be shown by a mean Visual Analogue Scales (VAS) score change of two points according to previous studies.[23] Where change scores were reported, researchers reported mean change scores on a VAS, but none reported SD of these changes. In Corner, *et al*. study, the changes in mean VAS of breathlessness at worst and distress due to breathlessness were +3.2 and +2.3, respectively. In Hately, *et al*. study, the changes in median VAS breathing at best, VAS breathing at worst and VAS distress caused by breathing were −2, −3.5 and −4, respectively. Using the above criterion for determining a clinically significant change, these results support the clinical meaningfulness of their interventions.

Although the results on breathlessness at best in Bredin, *et al*. study were statistically significant, the median change scores for the VAS measuring distress caused by breathlessness, breathlessness at worst and breathlessness at best were much smaller than in other studies, being 0, +1 and +1.3, respectively. Similarly, Connors, *et al*.[19] reported that the changes in mean Chronic Respiratory Disease Questionnaire, mean VAS of breathlessness at worst, at best and distress caused by breathlessness after intervention were 0.91 (95% CI: −1.4–3.2); −0.29 (95% CI: −3.5–4.1); −1.79 (95% CI: −2.1–5.7); −1.79 and (95% CI: −4.2–7.8), respectively. These differences were thus arguably neither clinically nor statistically significant. No mean change scores post-intervention was available in Moore, *et al*. study. Based on the analysis above, no definite conclusion could be made on which interventions could produce more powerful results.

Discussion

This systematic review identified five analytical research studies on non-pharmacological interventions for breathlessness in patients with lung cancer.

On the basis of mean change scores alone, Corner, *et al*. and Hately, *et al*. approaches involving a mean

VAS change greater than two points might be considered as being most effective. However, a number of issues should be highlighted when drawing any conclusion from these scores alone. First, both studies had relatively small sample sizes, which limited the power of the study and the ability to generalise the results to other populations. Second, although the dropout rate in Corner, *et al.* study appeared relatively low (41%), the median age of Corner's intervention group was significantly younger (55 years) than that of controls (69 years). Connors, *et al.* study results were also reported to be effective; however, based on the small change score of less than one and arguably statistically insignificant results, the clinical meaningfulness and statistical significance of the results may be questionable. Moreover, the high attrition rate might be a concern when considering the feasibility of implementing the intervention strategies. The authors acknowledged that the high dropout rate could be attributed to the selection of patients from the totality of patients with lung cancer presenting to a cancer unit. Nevertheless, information on performance status at entry or stage of disease of those dropouts was not available for further comparison.

On the basis of the information reviewed, there is some evidence to suggest that the intervention described in Bredin, *et al.* and Moore, *et al.* studies may have some advantages that are worth further consideration. The attrition rate in Bredin, *et al.* study was relatively low. Although this may in part be due to a higher functional ability of patients in Bredin, *et al.* study, it may also be attributed to the tailored approach of implementing individualised intervention strategies. However, in order to offer such a tailored package of care to the patients, staff must have adequate training and skills to conduct thorough assessments and provide tailored instructions based on individual needs. A practice guideline, for instance, suggested by Bredin, *et al.* would be useful to standardise such practice.

In Moore, *et al.* study, patients randomised to nurse-led follow-up had open access to nurse specialists. The clinical nurse specialists were responsible for the entire care of patients in the nurse-led follow-up group; and they also had regular discussion with and referral to medical team on detection of any new symptom or rapid worsening of condition. The notion of the intervention was rapid and comprehensive communication with general practitioner and primary healthcare team. Regular clinical supervision sessions were provided to the clinical nurse specialists. The study results also showed that patients benefited from the clinical nurse specialists led follow-up programme. Such results emphasise the complexity of the non-pharmacological interventions for dyspnoea and suggest that there is a need for those delivering the interventions to have some advanced knowledge and skills in psychosocial care, and breathing re-training is emphasised by these studies.

Conclusion

This systematic review identified a limited number of studies on non-pharmacological interventions for breathlessness in patients with lung cancer. Based on the limited evidence, some suggestions could be made to inform future studies. First, although non-pharmacological approaches appear to be beneficial to the majority of patients with lung cancer experiencing breathlessness, such interventions may be less suitable for patients as functional status becomes progressively worse. Second, all studies offered patients multicomponent interventions, which were reported to be effective. Although the multicomponent approach appears to be effective, it is difficult to confirm from the evidence available whether all components are required or whether some components are more or less effective than others. Third, a package of care tailored to individual needs may be more preferable, as such tailoring may help to enable patients' participation and reduce attrition. However, in order to provide patients with tailored instruction, staffs with adequate knowledge and skills are essential. The complex and intensive nature of these interventions do raise issues about the feasibility of implementing them in routine clinical practice. Further investigation is required into alternative methods of delivering such interventions, without comprising their effectiveness. For example, supplementary resources well prepared for patients and their carers for ongoing reinforcement may assist patients to gain more control and incorporate the strategies into their daily lives.

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