Introduction

Chronic obstructive pulmonary disease (COPD) is characterised by airflow limitation, persistent symptoms and respiratory failure (1). Many patients with severe COPD experience reduced quality of life due to chronic breathlessness, which persists at rest or on minimal exertion despite optimal treatment of the underlying causes (2, 3).

Long-term oxygen therapy is associated with increased survival in COPD patients with severe resting hypoxaemia ($\text{PaO}_2 < 55 \text{ mmHg}$) (4). However, hypoxaemia is only one mechanism for breathlessness generation. “Palliative oxygen therapy” (POT) is defined as oxygen prescribed to patients without significant hypoxaemia, but with persisting breathlessness despite optimal treatment of their underlying end-stage cardiorespiratory disease or cancer (5, 6). Yet there is limited evidence for POT. A randomised, controlled trial (RCT) identified that POT was not superior to medical air (delivered by the same method and with the same flow rate for 15 hours/day) in relieving breathlessness in patients with end-stage cardiorespiratory disease or cancer (7). A Cochrane review, which included only COPD patients, demonstrated that POT reduced breathlessness on exertion during exercise tests, but had limited effect on breathlessness during daily life, or quality of life (QOL) (8). Furthermore the recent long-term oxygen treatment trial, which gave oxygen to COPD patients with only moderate hypoxaemia did not improve survival, hospitalisation rates, exercise tolerance or QOL (9). Most guidelines therefore do not recommend POT routinely for chronic breathlessness (1, 5, 6, 10, 11), albeit some also suggest POT may be recommended on a case-by-case basis if a formal assessment demonstrates reduced breathlessness and improved QOL (5, 11)

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A survey undertaken in 2003 revealed that respiratory and palliative medicine doctors in Australia and New Zealand (ANZ) had mixed views regarding POT (12). Therefore, as part of a wider study exploring the knowledge and attitudes of respiratory and palliative medicine doctors regarding chronic breathlessness in COPD, we aimed to determine current POT beliefs and practices.

Methods

A questionnaire was designed for specialists and advanced trainees working in respiratory medicine in ANZ, and palliative medicine in ANZ and the United Kingdom (UK). After a literature search revealed no appropriate survey, we developed a new questionnaire, which included a case vignette describing an outpatient with severe COPD, receiving maximum disease-modifying therapies and severe chronic breathlessness (Modified Medical Research Council breathlessness score 4 out of 4). The person described was *not* in the last few days of life. Participants were asked to consider the patient in the case vignette or similar COPD patients when answering questions. Questions regarding POT were modelled on a previous oxygen survey from 2003 to facilitate data comparison (12).

After a pilot study, the survey was emailed twice to all members of The Thoracic Society of Australia and New Zealand, the Australian and New Zealand Society of Palliative Medicine, and the Association for Palliative Medicine of Great Britain and Ireland. Ethics approval was granted by the Melbourne Health Research Office (QA2014171).

Statistical analyses were performed using IBM SPSS Statistics Version 24.0. In addition to descriptive statistics, the chi-squared test was used to identify associations between oxygen beliefs and categorical exposures (age, gender, country, specialty, position and places of work); and Student's t

test was used for continuous exposures (mean years worked in specialty and mean number of severe COPD patients seen per month).

Results

The survey was distributed to 1749 potential participants, with 577 (33.0%) responses received. Responses were excluded from participants who: only partially completed the survey (94), worked outside respiratory or palliative medicine (35), or were non-medical (8). Of 440 responses included, 263 were palliative medicine doctors (134 from the UK) and 177 were respiratory doctors from ANZ (Table 1). Gender ($p<0.0001$), mean years in specialty ($p=0.006$), places of work ($p<0.0001$), and mean number of COPD patients seen/month ($p<0.0001$) differed significantly by specialty.

Beliefs regarding whether POT relieves chronic breathlessness in COPD patients varied within each specialty and were significant different between the two specialties ($p=0.001$) (Table 2). Similarly there were significant differences between the two specialties regarding frequency of prescribing (for respiratory doctors) or recommending (for palliative medicine doctors) POT to COPD patients ($p<0.0001$). Within each specialty, participants' demographic characteristics and clinical experience (including age, gender, country, position, places of work, mean years worked in specialty or mean number of patients with severe COPD seen/month) were not associated with either their attitudes regarding the utility of POT or prescription frequency. POT was less frequently prescribed or recommended by both specialties in 2015 as compared with 2003 (Table 3).

Participants' free text comments regarding POT included:

“Regarding prescribing oxygen for very frail patients who perceive symptom benefit from oxygen despite lack of objective evidence of hypoxaemia, it is often very difficult discussing not prescribing oxygen for home for them, as per guidelines, especially in an acute setting when they are currently on oxygen” (Palliative Specialist).

“Patients benefit from the flow of oxygen and not necessarily the oxygen itself. There are harms that are experienced sometimes by patients tied to an oxygen cylinder who might have had as much benefit from a fan if normoxaemic” (Palliative Specialist).

“Some patients find oxygen helpful but I think this is not because of increasing the SpO₂, I think it is psychological and one can argue the pros and cons of this, although I consider it inappropriate to give oxygen therapy in these circumstances” (Respiratory Physician).

Discussion

Over the past decade and concordant with guidelines, fewer respiratory and palliative medicine doctors report prescribing POT, with less believing it reduces chronic breathlessness. However, the majority of palliative medicine doctors and just over half of respiratory physicians still believe that POT relieves breathlessness, with this proportion increasing slightly over time. The continued use of POT highlights the challenge of managing distressing, chronic breathlessness.

The differing approaches between specialties are perhaps unsurprising given the contexts in which each sees COPD patients. Many palliative medicine doctors see few COPD patients, however, those which are referred have end-stage disease and often are referred with the specific aim of palliating symptoms (1, 11). Therefore, palliative medicine doctors are more willing to consider a “palliative” therapy despite the limited evidence of benefit. By contrast respiratory physicians see numerous

COPD patients, including those with early and end-stage disease, thus may take a more disease-directed management approach. Nonetheless, physicians in both specialities may benefit from further education regarding evidence-based, breathlessness management strategies such as pulmonary rehabilitation, breathing exercises, the handheld fan, and opioids (10, 11). Once those strategies fail then POT may be trialled and continued if there is objective evidence of improved symptoms or QOL (5).

The lack of consensus in specialists' current views regarding POT, particularly for respiratory medicine, is notable and was independent of participants' demographics or experience. This may relate to lack of awareness of evidence, as a recent survey of Australian basic physician trainees also identified that 52% believed POT was useful for chronic breathlessness (13). Alternatively POT may simply be a grey area. Specialists recognise that POT is not helpful for most COPD patients with chronic breathlessness, however appreciate that some patients do perceive a benefit. As identified, this concept can be challenging to discuss with patients and their families when they request domiciliary oxygen therapy. This distinction that POT is useful for only some patients (which was not included in the Abernethy *et al* survey in 2003 (12)), together with changes accessing POT, may explain why self-reported POT prescription has fallen, despite more participants in 2015 indicating it relieves breathlessness.

The burden, both physical and psychological, of oxygen therapy to patients and their carers must be also considered. Risks related to fire, falls from tripping on oxygen tubing or respiratory depression should be balanced against any actual benefit to symptoms or QOL. Similarly regular support and

follow-up (which may be provided in the community) are required to ensure POT is used safely. Thus even once prescribed, POT is not a straightforward management strategy.

The current limited evidence base is conflicting with data suggesting POT does not improve QOL or breathlessness, but may improve exercise during laboratory testing (8). Similarly current guidelines state POT should not be recommended for managing chronic breathlessness, yet suggest individualised POT prescription if other treatment modalities have failed and breathlessness objectively improves with oxygen (5, 11). The “greyness” in the evidence, guidelines and physicians’ attitudes highlight that POT prescription remains challenging and further research is required, particularly to understand which patients may benefit. Additionally the ongoing dependence of physicians on management strategies with limited efficacy underscore the urgent need for better treatments for chronic breathlessness.

This study has some limitations. We had intended to also survey British respiratory physicians, however, the British Thoracic Society has a policy of not disseminating research surveys to its members. The response rate reflects the current industry standard for online surveys of 33% (14, 15). Though this may suggest caution in generalising findings, the respondents’ gender and age were similar to the respiratory and palliative medicine workforce demographics in all three countries (16-20). Furthermore the respondents numbered more than 400 representing a large sample of clinicians’ views. There were differences in wording for the POT questions in this survey compared with the 2003 survey. The latter asked regarding POT benefit to “normoxaemic” patients, with response options limited to yes, no or don’t know (7). As “normoxaemic” lacks clarity, our study described a case with moderate hypoxaemia (PaO_2 62mmHg), ineligible for long-term oxygen

therapy. Positive response options in this survey were split into some or many patients find POT beneficial for breathlessness to obtain more detailed responses from participants.

Conclusions

Recent evidence suggesting that POT is of only limited benefit to some patients has translated appropriately into reduced POT prescription by both respiratory and palliative medicine doctors. However, many doctors particularly within palliative medicine still support and recommend POT, albeit their approach is more individualised. Education regarding the limited benefits of POT and the burden and well-documented risks from oxygen therapy generally, together with training regarding evidence-based management strategies for chronic breathlessness are required. Additionally, further research is needed regarding any role for POT and more importantly to identify new effective management strategies for distressing, chronic breathlessness.

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Table 1. Participants' demographics

	Respiratory Medicine (n=177)	Palliative medicine (n=263)
Female	61 (34.4%)	192 (73.0%)
Age		
25-35	40 (22.6%)	56 (21.3%)
36-45	57 (32.2%)	77 (29.3%)
46-55	39 (22.0%)	67 (25.5%)
56-65	27 (15.3%)	44 (16.7%)
>65	8 (4.5%)	11 (4.2%)
Missing	6 (3.4%)	8 (3.0%)
Position		
Consultant	145 (81.9%)	196 (74.5%)
Specialist trainee	32 (18.1%)	67 (25.5%)
Mean years in specialty *	15.0 (10.8)	12.4 (8.2)
Places of work		
Acute hospital inpatients	158 (89.3%)	53 (20.2%)
Acute hospital consultation service	95 (53.7%)	130 (49.4%)
Community	10 (5.6%)	120 (45.6%)
Outpatient clinics	145 (81.9%)	89 (33.8%)
Hospice / Palliative care unit	2 (1.1%)	166 (63.1%)
Private practice	81 (45.8%)	8 (3.0%)
Mean no. of severe COPD patients seen/month *	14.1 (12.0)	2.8 (3.3)

Data are represented as either frequencies or means (denoted by *), with either proportions or standard deviations in parentheses.

Table 2. Palliative oxygen therapy for chronic breathlessness in COPD

	Respiratory Medicine	Palliative Medicine			Specialties compared
	ANZ (n=177)	ANZ (n=129)	UK (n=134)	All (n=263)	
Does palliative oxygen relieve breathlessness? *					
Yes, many patients find it helpful	15 (8.5%)	9 (7.0%)	4 (3.0%)	13 (4.9%)	p=0.001
Yes, some patients find it helpful	86 (48.6%)	85 (65.9%)	92 (68.7%)	177 (67.3%)	
No	73 (41.2%)	35 (27.1%)	34 (25.4%)	69 (26.2%)	
Don't know	3 (1.7%)	0	4 (3.0%)	4 (1.5%)	
Recommendation/prescription of palliative oxygen frequency **					
Regularly	0	9 (7.0%)	6 (4.5%)	15 (5.7%)	p<0.0001
Occasionally	71 (40.1%)	83 (63.3%)	78 (58.2%)	161 (61.2%)	
Never	106 (59.9%)	37 (28.7%)	50 (37.3%)	87 (33.1%)	

Data are shown as frequencies with proportions in parentheses.

* Survey question: Do you think that breathless COPD patients without severe hypoxaemia (i.e. who have PaO₂>55mmHg) derive any symptomatic benefit from oxygen?

** Survey question: Do you recommend/prescribe oxygen to your COPD patients who do not meet the criteria for provision of LTOT or ambulatory oxygen therapy?

Table 3. ANZ Specialists' palliative oxygen therapy recommendations over 12 years

	Respiratory Medicine		Palliative Medicine	
	2003 (n=121)	2015 (n=177)	2003 (n=93)	2015 (n=129)
Does palliative oxygen relieve breathlessness?				
Yes	58 (48%)	101 (57.1%)	64 (69%)	94 (72.9%)
No	41 (34%)	73 (41.2%)	16 (17%)	35 (27.1%)
Don't know	22 (18%)	3 (1.7%)	13 (14%)	0
Recommendation or prescription of palliative oxygen frequency				
Regularly *	10 (8%)	0	27 (29%)	9 (7.0%)
Occasionally	90 (74%)	71 (40.1%)	61 (66%)	83 (63.3%)
Never	21 (17%)	106 (59.9%)	5 (5%)	37 (28.7%)

Data are represented as frequencies with proportions in parentheses.

Separate responses in the 2015 survey regarding "yes many" or "yes some patients find POT helpful" were combined into one response for comparison with the 2003 study.

* In the 2003 survey the term "Frequently" was used, whereas in the 2015 survey the term "Regularly" was used.

Abstract

As palliative oxygen therapy (POT) is only beneficial to a minority of patients with chronic breathlessness, it is no longer routinely recommended. This multi-national, online survey of respiratory and palliative medicine specialists, with 440 participants, identified that prescription of POT has decreased over the past decade, however a sizable proportion of doctors, particularly within palliative care, still support and recommend POT. Further education and research regarding the optimal management of chronic breathlessness are required.

Approaches to palliative oxygen therapy in COPD: a multi-national survey of specialists

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COPD – Chronic obstructive pulmonary disease

ANZ – Australia and New Zealand

POT – Palliative oxygen therapy

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