Acceptability of oxygen concentrators: the patient's view

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SUMMARY. The impact of the installation of an oxygen concentrator on the lifestyle of 30 patients in two health districts has been investigated using a questionnaire. Marked improvements in general well-being (83% of respondents), breathing (82%), mobility (62%) and sleep pattern (52%) were reported. The long term nature of the aims of treatment were understood by 83% of the respondents and the mean period of time the patients used the concentrator was satisfactory. However, 34% of respondents had a concentrator with only one outlet and 70% had the concentrator situated in a commonly used room with the possibility of problems with noise. Thirty one percent of the respondents were still smoking. The recommendations given to patients for the siting of the concentrator and the number of outlets should be improved. However, the oxygen concentrator was found to be generally well tolerated and this refutes criticism that patients may find it restricting.

Introduction

THE oxygen concentrator is a convenient method of delivery for long term oxygen therapy. It has been available free on prescription from general practitioners in England and Wales since December 1985 and the following guidelines for prescribing have been produced by the Department of Health.

Absolute indications: chronic obstructive airways disease with hypoxaemia (pressure of oxygen <55 mmHg), hypercapnia (pressure of carbon dioxide >45 mmHg), oedema, forced expiratory volume in one second <1.5 l, and forced vital capacity <2.0 l in the stable phase more than three weeks from an exacerbation; measures repeated after three weeks should show a variation of <5 mmHg in pressure of oxygen and <20% in spirometric measurements.

Other indications: chronic obstructive airways disease with hypoxaemia but without hypercapnia or oedema; palliative — that is, other respiratory conditions with hypoxaemia (for example, fibrosis); frequent cylinder replacement — more than 21 cylinders a month or more than eight hours use a day.

Long term oxygen therapy in patients with hypoxaemia is known to improve prognosis[1,2] but there is a lower rate of prescription in the UK than in France or the USA where the guidelines for prescription are similar.

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It was our experience that general practitioners were sometimes reluctant to refer patients for an oxygen concentrator because demonstration of a significant increase in survival with long term oxygen therapy requires treatment for six to 15 months.[1,2] In addition, some general practitioners and patients have expressed concern over the possible restriction of lifestyle caused by long term oxygen therapy. Conversely, several recent studies[3-5] have shown that concentrators are often inappropriately prescribed to patients who have been inadequately assessed.

It is of importance that patients' quality of life should not be adversely affected during treatment and that the practicalities and convenience of installation should be optimal. Previous studies of oxygen therapy have demonstrated a variable effect on patient well-being[1,2,6] and no study has assessed the impact of the oxygen concentrator on quality of life since its introduction into clinical practice in the UK.

This study was designed to assess any change in the quality of life and to ascertain any flaws in the current prescribing practice that may reduce patient tolerance and compliance. In addition, patients' perception of the aims of treatment and their adherence to the recommendations of the prescribing doctors have been assessed.

Method

All the patients for whom an oxygen concentrator had been prescribed in the Frenchay (Bristol) and Bath health districts (population 620 000) between 1 December 1985 and 30 April 1988 were identified. Details of age, sex, diagnosis, Department of Health prescribing category and pressure of blood gases at diagnosis were recorded. At the end of July 1988 a questionnaire was sent to all the surviving patients and was collected a week later. The patients were asked to indicate whether the concentrator had improved, worsened or not changed their general feeling of well-being, their mobility, alertness, breathing and their sleep pattern. Separate space was provided for individual comments on the benefits and disadvantages of the concentrator and for suggestions for improvement.

There were further questions about the details of installation, asking specifically about the siting of the concentrator, the number of outlets, noise level, use of mask or cannulae and humidifiers, reliability and availability of other oxygen supplies and of oxygen treatment prior to receiving the concentrator.

The patients' perception of the aims of treatment were assessed by asking if they thought the concentrator was to improve their condition immediately, in the short term or in the long term. The number of hours per day the patients thought the concentrator was used was compared with the metered times in order to assess compliance. The patients' smoking habit was also noted.

Results

In the two health districts 91 patients had concentrators installed over the two and a half year period. Details of both survivors and non-survivors are given in Table 1. The characteristics of both groups were very similar, although a higher proportion of survivors than non-survivors had fulfilled the absolute criteria at prescription. Among the survivors the length of time from installation of equipment to the survey ranged from two to 31 months (mean 14.8 months). Of the 32 survivors one did not

Table 1. Details of all patients prescribed an oxygen concentrator.

	Non-survivors ($n = 59$)	Survivors ($n = 32$)
Age (years)		
Mean (range)	67.5 (43–85)	66.6 (48–86)
Sex (no. (%) of patients)		
Male	38 (*64*)	23 (*72*)
Female	21 (*36*)	9 (*28*)
Diagnosis (no. (%) of patients)		
COAD + cor pulmonale	29 (*49*)	23 (*72*)
COAD	19 (*32*)	7 (*22*)
Fibrosis	8 (*14*)	1 (*3*)
Other	3 (*5*)	1 (*3*)
Department of Health category (no. (%) of patients)		
Absolute indication	13 (*22*)	14 (*44*)
Other indications		
COAD	7 (*12*)	2 (*6*)
Palliative	7 (*12*)	1 (*3*)
Inadequately assessed	32 (*54*)	15 (*47*)
Mean pressure of blood gases at diagnosis (mmHg)		
$P(CO_2)$ (range)	43.4 (31.6–61.3)	52.5 (33.0–66.0)
$P(O_2$ (range)	44.7 (35.7–60.8)	46.1 (36.0–54.8)

COAD = chronic obstructive airways disease.

reply to the questionnaire and one was too unwell to respond. Thirty questionnaires were thus completed; three patients did not answer all of the questions.

Changes to the patients' quality of life are displayed in Table 2. A maximum of two respondents recorded a deterioration in any of these indicators: over 80% of respondents described an improvement in general well-being and in breathing, 62% thought their mobility had improved and 52% that their sleep pattern was better. Alertness was improved in 32% of the respondents and unchanged in 61%. The length of time the patients had been prescribed a concentrator did not affect their responses.

Twelve patients commented that their breathing was improved by the concentrator, seven patients found it more convenient than their previous system, two patients mentioned 'increased confidence' and two were able to 'sleep longer' and had less nocturnal breathlessness. Few patients volunteered any disadvantages, although when asked directly in a separate question if the concentrator was too noisy 10 patients said yes and 20 said no. A few patients suggested improvements such as a portable version, suggesting that they felt at least some degree of restriction.

Fifteen patients had had oxygen by cylinder before prescription of the concentrator but there was no difference in the responses from patients who had cylinders prior to the concentrator and those who had not and these two groups of patients were comparable with regard to their medical condition. Twenty one patients had an alternative source of oxygen available. Eight of these patients had never used it and six only when the concentrator broke down. Five patients used an additional source intermittently and two commonly. Four patients also had portable oxygen for use in their car.

Further details of installation are given in Table 3. Nasal

Table 2. Changes in the patients' quality of life after the installation of a concentrator.

	Number (%) of respondents[a]		
	Improved	Not changed	Worsened
General well-being	24 (*83*)	4 (*14*)	1 (*3*)
Mobility	18 (*62*)	10 (*34*)	1 (*3*)
Alertness	9 (*32*)	17 (*61*)	2 (*7*)
Breathing	23 (*82*)	4 (*14*)	1 (*4*)
Sleep pattern	15 (*52*)	12 (*41*)	2 (*7*)

[a] Percentages are based on total number of respondents to each question.

Table 3. Further details of installation.

	Number (%) of respondents[a]
Site	
Lounge	14 (*52*)
Main bedroom	5 (*19*)
Other	8 (*30*)
Number of outlets	
1	10 (*34*)
2	19 (*66*)
Delivery system	
Cannulae	26 (*87*)
Face mask	2 (*7*)
Both	2 (*7*)
Humidifier	
Yes	22 (*73*)
No	8 (*27*)
Number of breakdowns	
None	24 (*80*)
One	5 (*17*)
Two	1 (*3*)

[a] Percentages are based on total number of respondents to each question.

cannulae were used by 93% of respondents and 73% had a humidifier, usually supplied by the nurse to reduce nasal drying. The concentrator was situated in a commonly used room for 19 respondents (70%). For 10 respondents (34%) the concentrator had only one outlet; this was the patient's original preference but where specific enquiry was made the patient was found to regret this initial choice. The concentrator had broken down for 20% of the respondents. There was no difference between those patients fully assessed according to Department of Health guidelines and those inadequately assessed with regard to these indices of installation.

Four patients thought the aim of treatment was an immediate improvement in their condition, one a short term improvement and 24 a long term improvement. Twenty four patients were using 15 hours or more hours of oxygen each day and four between eight and 14 hours; none were using less than eight hours per day. The patients estimated their mean concentrator use as 16.7 hours but the actual mean time the concentrator was running taken from meter readings was 18.1 hours. The mean duration of use recommended by doctors was 17.1 hours. All the patients used their oxygen at night. Twenty respondents denied currently smoking but nine (31%) admitted that they still smoked.

Discussion

The patients studied were similar to all the patients prescribed oxygen concentrators after these were introduced in the two

health districts in December 1985. Half of the patients were not fully assessed prior to prescription of the concentrator and we are not, therefore, able to comment on whether their prescription was appropriate. The problem of non-adherence to Department of Health guidelines for the prescribing of long term oxygen therapy has been reported previously.[4] A relatively high mortality was seen in this study compared with the Medical Research Council treated group,[2] perhaps as a result of prescribing to patients who were inappropriate for a concentrator.[4,5] Those patients who had not been fully assessed responded to the questionnaire with similar replies to those who had been fully assessed.

Most patients noted an improvement in their general well-being and breathing. Of particular interest is that a majority found their mobility was improved despite the potential restriction of long term oxygen usage. Half the patients noted an improvement in their sleep pattern; some patients commented that they had less nocturnal breathlessness. The improvement in these indicators was equally apparent in those who had had the concentrator either for a few months or for two years. Among the patients who had oxygen by cylinders prior to the concentrator and those who did not there was an equally positive response to all indices.

It is of concern that 10 patients thought the concentrator was unacceptably noisy and this indicates that patients should be advised to have the concentrator situated in an infrequently used room. Ten patients had a concentrator with only one outlet and while this was the patient's original preference, it was clearly regretted by patients later. The humidifier was usually supplied by the nurse to reduce nasal drying but this problem could have been discussed earlier. This study clearly shows a need for improved counselling of patients on the practicalities of the treatment before the concentrator is installed.

On the whole, patients were adequately educated in the aims of treatment, although five respondents (17%) considered that the main objective was immediate or short term benefit. Compliance was good with 86% of respondents using the oxygen for 15 hours a day or more and accurately assessing the length of time spent using the concentrator. This is at variance with results obtained in a recent survey of patients in Liverpool[3] where only 45% were using oxygen for 15 hours a day or more and where they tended to overestimate their usage. The time the concentrator was in use does not necessarily equate with the length of time the patient was receiving oxygen and this may explain some variation in results.

It is disturbing that nearly a third of the respondents admitted to continued smoking. This is a similar proportion to that found in the Liverpool group.[3] While it was the policy of prescribing physicians to defer oxygen therapy until the patient stopped smoking, concentrators were not removed if there was subsequent evidence of tobacco usage.

Generally there was a very positive response among patients to oxygen treatment with the concentrator. This positive response was supported by specific comments on the benefits of the treatment. Although these benefits cannot be quantified the reports were striking and at the least indicated that patients were not made to feel worse by this treatment. It is possible that it is not only the oxygen that produces this improved feeling of well-being; there may also be a strong placebo effect both because of the feeling of security the concentrator may engender and because of the increased attention the patient receives. The presence of a placebo effect is also suggested by the improvement that the patients previously receiving oxygen by cylinders felt and by the speed with which this improved well-being occurred. This is not, however, relevant to the primary aim of the study as the efficacy of long term oxygen therapy in improving prognosis has been previously shown.[1,2]

General practitioners should not be dissuaded from referral for long term oxygen therapy by oxygen concentrator on the basis that it may be an unpleasant and restricting treatment. There is, however, the need for improved counselling of patients, particularly with regard to smoking and an explanation of the aims of treatment, and clear advice needs to be given about the practicalities of the installation of the concentrator by the prescribing physician. Thus we conclude that long term oxygen therapy by concentrator produces a considerable improvement in quality of life in addition to the previously demonstrated improvement in survival.

References

1. Nocturnal oxygen therapy trial group. Continuous or nocturnal oxygen therapy in hypoxaemic chronic obstructive airways disease; a clinical trial. *Ann Intern Med* 1980; **93:** 391.
2. Medical Research Council working party. Long term domiciliary oxygen therapy in chronic hypoxaemic cor pulmonale complicating chronic bronchitis and emphysema. *Lancet* 1981; **1:** 681.
3. Walshaw MJ, Lin R, Evans CC, Hind CRK. Prescription of oxygen concentrators for long term oxygen treatment: reassessment in one district. *Br Med J* 1988; **297:** 1030.
4. Dilworth JP, Higgs CMB, Jones PA, White RJ. Prescription of oxygen concentrators: adherence to published guidelines. *Thorax* 1989; **44:** 576.
5. Baudouin SV, Waterhouse JC, Tahtamouni T, *et al.* Long term domiciliary oxygen treatment for chronic respiratory failure reviewed. *Thorax* 1990; **45:** 195.
6. Heaton RK. Grant I, McSweeny AJ, *et al.* Psychologic effects of continuous and nocturnal oxygen therapy in hypoxaemic chronic obstructive pulmonary disease. *Arch Intern Med* 1983; **143:** 1941.

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