
Why does domiciliary oxygen consumption vary from area to area?

B. T. WILLIAMS, MD, FFCM

D. F. MEECHAN, B.SC, M.SC

J. P. NICHOLL, BA, M.SC

SUMMARY. Home oxygen therapy is used mainly for chronic respiratory disease. Differences in the gross quantities of oxygen supplied for home use in eight areas in 1982 reflected differences in the user-proportions of their populations, but not the amounts consumed per user. Similar user-proportions were found among areas with markedly dissimilar levels of respiratory disease. In the majority of cases the decision to use oxygen therapy was taken by the general practitioner.

To ensure that the known benefits of oxygen therapy are more widely obtained, potential recipients need to be more accurately ascertained. More frequent resort to pulmonary function testing at the primary care level is indicated.

Introduction

AMOUNTS of oxygen supplied per unit of population through general practitioners' prescriptions vary widely but consistently from area to area in England.¹ The variations are not caused by differences in levels of chronic respiratory disease. Indeed, some of the highest levels of consumption occur in predominantly rural areas with low death-rates from respiratory disease.

This is the report of a study which sought to discover whether these geographic variations result from differences in the proportions of the population using oxygen, the quantities consumed per patient, the clinical condition for which oxygen is used, or the type of doctor initiating the treatment.

Method

Four Area Health Authority populations were chosen such that two had relatively high crude mortality rates for chronic bronchitis and emphysema and two had low rates. These rates

B. T. Williams, Senior Lecturer in Community Medicine, D. F. Meechan, Statistician/Programmer, and J. P. Nicholl, Statistician, Medical Care Research Unit, Department of Community Medicine, University of Sheffield Medical School.

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were used as proxy measures of the prevalence of chronic respiratory disease. At each level of prevalence one of the two areas chosen had a high level of oxygen consumption per unit of population in 1977-79, the other a low one. The areas were chosen deliberately rather than at random to satisfy two other criteria. First, the areas with high or low levels of oxygen consumption should have similar levels of respiratory disease in each of the age-sex groups of the population; these areas were identified from published sources as those with both similar standardized mortality ratios (SMRs) for respiratory disease and crude death-rates from bronchitis and emphysema. Second, the areas should not have extreme levels of oxygen consumption because the reasons for such consumption levels may be idiosyncratic.

The four areas were replicated once in order to lessen the problem of generalizing from the results. Details of the eight areas are given in Table 1, rows 1-3.

A consumer was defined as someone to whom at least one 1,360-litre cylinder of oxygen was supplied on doctor's prescription by a contracted pharmacist in the three-month period January-March 1982. The Prescription Pricing Authority identified all such consumers in the eight areas, the quantities of oxygen supplied, the prescribing doctors and the date on which oxygen was first supplied. The prescribing doctors were asked to complete and return a short form giving the consumer's age, the clinical condition for which oxygen was used, and whether the decision to initiate oxygen therapy had been taken in hospital, by the general practitioner, or by some other means. Non-responding doctors were sent reminders after two and four weeks. Where the doctors did not give the consumer's age, this information was obtained from the Family Practitioner Committee.

Results

The patterns of high/low oxygen consumption in the eight areas during the first quarter of 1982 reflected those for the same areas in 1977-79, with the exception of one, area C, which, although selected as a low-consumption area, showed the highest number of oxygen cylinders supplied per 1,000 population of all eight areas in the quarter-year (see Table 1, rows 4 and 5).

At each death-rate level, the areas having high consumption levels in 1977-79 were characterized by higher proportions of the population receiving oxygen supplies compared with the low consumption areas, including area C. This difference held for both sexes and all age groups, and is summarized in Table 1 as a user-rate standardized for sex and age (rows 6 and 7).

The amount of oxygen supplied per user in the first quarter of 1982 did not vary consistently between the high/low consuming areas (Table 1, row 8). Area C had an extremely high proportion of heavy users, 14 per cent receiving 40 or more 1,360-litre cylinders during the quarter, a level which implies a rate of use of 5 hours a day or more at a delivery rate of 2 litres per minute. This explains why, in this quarter, there was a high level of consumption in area C, though only a relatively small proportion of the population were supplied. Among the areas with low death-rates the differences in the distributions of the quantities consumed per user were negligible. Area C apart, the same is true for the high death-rate areas, so it appears that within both high and low death-rate classes the differences in levels of oxygen consumption noted in 1977-79 could be explained almost entirely by differences in the proportion of the population receiving oxygen.

General practitioners returned information for high proportions of the patients concerned (Table 1, row 9). In all areas, oxygen therapy was being used mainly for some form of chronic respiratory disease. There was no systematic difference among the areas regarding the

percentage of users with either chronic respiratory disease or heart disease, acute or chronic (rows 10 and 11). The great majority of respiratory patients in each area suffered from chronic non-specific lung disease with or without airways obstruction. Thus the contrasting user-rates are not explained by differences in the range of clinical conditions being treated.

The median number of months for which patients had been receiving oxygen did not show any consistent pattern between high/low user areas, suggesting that oxygen therapy is not started earlier in the course of the disease in the high-user areas (row 12).

In seven out of the eight areas the majority of users had their oxygen therapy started by their general practitioners (Table 1, row 13). The glaring exception was again area C, where in only 27 per cent of cases did the general practitioner decide to start oxygen therapy, and in 71 per cent of the cases this decision was taken in hospital. (Cases initiated in hospital had a higher consumption per consumer than cases initiated by general practitioners in all areas. This fact may explain the exceptional consumption in area C.) However, there were no systematic differences between high and low

Table 1. Distribution of oxygen usage and characteristics of users in areas A-H.

	High death rate				Low death rate			
	High O ₂ consumption		Low O ₂ consumption		High O ₂ consumption		Low O ₂ consumption	
	A	B	C	D	E	F	G	H
1. Estimated population mid 1981 (thousands)	247	214	219	310	965	504	858	429
2. Mean annual crude death-rate per 100,000, 1977-79 bronchitis and emphysema	54	54	57	58	37	32	36	38
3. SMR (persons) respiratory diseases	125	112	124	109	97	90	93	93
4. Mean number of cylinders per 1,000, per year, 1977-79	17.3	19.3	7.4	3.3	13.7	17.3	3.6	7.0
5. Number of cylinders per 1,000, January-March 1982	3.4	5.9	6.5	1.2	3.4	5.4	1.7	2.3
6. Number of users January-March 1982	133	100	77	78	394	248	179	157
7. Users per 100,000 January-March 1982, standardized for age/sex	52	46	35	25	45	47	22	32
8. Percentage of users receiving cylinders								
1-3	67	58	55	67	60	52	69	64
40+	5	5	14	1	5	4	4	3
9. Percentage of users whose general practitioners gave information	95	83	86	88	89	99	92	100
10. Percentage of users with chronic respiratory disease (CRD)	83	84	85	81	78	78	82	73
11. Percentage of users with heart disease but no CRD	7	5	6	13	9	11	7	9
12. Median duration patient receiving O ₂ (months)	10	18	11	15	12	13	9	16
13. Percentage of users initiated by general practitioners	59	71	27	72	53	65	68	64

SMR = standardized mortality ratio.

user areas in the proportions of users whose oxygen therapy was initiated by their general practitioners, so differences in the rates of consumption cannot be explained on this basis.

Discussion

This study has shown that it is a difference in the proportion of the population receiving oxygen (the user-rate) which explains variations in the levels of oxygen consumption, and that whatever the user-rate, some form of chronic respiratory disease is the condition for which oxygen is most commonly employed. Furthermore, there is no suggestion that oxygen therapy is started earlier in the high-user areas. Nevertheless, for a particular level of respiratory disease prevalence the user-rate can vary between areas by a factor of 2, and similar user-rates are found in areas with markedly dissimilar levels of respiratory disease. What factors might explain the variations in the user-rate? One possibility is that in some areas there is ignorance about the benefits of oxygen therapy. Moreover, even in the higher user-rate areas, intensive use of oxygen is exceptional, and this finding is all the more significant because the benefits of intensive oxygen therapy for sufferers from hypoxaemic chronic obstructive pulmonary disease (COPD) complicated by cor pulmonale had been well publicized before this study was conducted.^{2,3} The important issue that remains to be settled therefore is whether or not general practitioners are giving domiciliary oxygen to the right patients in the right doses.

What proportion of the population can we reasonably expect to require oxygen therapy? Without a measure of the prevalence of hypoxaemic COPD it is difficult to estimate. Petty⁴ has suggested that out of an estimated 9 to 10 million sufferers from COPD in USA many or all of the 500,000 who receive social security benefit would be candidates for home oxygen therapy. This represents, for a population of approximately 200 million, a user-rate of 250 per 100,000, a level five to 10 times the current levels in the United Kingdom. This shortfall, and the low intensity of use, would imply the need for considerable investment in oxygen therapy in order to avoid premature mortality from COPD. Value judge-

ments would no doubt be made as to whether such investment in this client group, many of whom had impaired their respiratory functions through smoking, should be given precedence over that for other types of sufferer.

Low though these British oxygen user-rates are, one other finding calls for comment. In nearly every area the decision to use oxygen treatment was taken in the majority of cases by the general practitioners. In these circumstances, it is likely that oxygen therapy was sometimes initiated without prior testing of respiratory function and blood oxygenation, so that there may be patients receiving oxygen for whom it is not indicated. At the same time there must be many more patients in the community, not currently receiving oxygen, whose respiratory function and blood oxygen levels, if measured, would indicate the need for oxygen therapy. This implies the need for the wider availability at primary care level of the means of testing these body systems, or more frequent resort to specialist services for the same purpose.

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Address for correspondence

Dr B. T. Williams, Medical Care Research Unit, Department of Community Medicine, University of Sheffield Medical School, Beech Hill Road, Sheffield S10 2RX.



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