MEDICAL PRACTICE

Occasional Review

Geographical variations in the supply of domiciliary oxygen

B T WILLIAMS

Abstract

The amounts of oxygen prescribed by general practitioners in each of 90 family practitioner committee areas of England in 1977-9 were compared using data supplied by the Prescription Pricing Authority and were matched with published mortality statistics for these areas. The annual number of 1360-litre cylinders supplied per thousand population ranged among family practitioner committees from 3·3 to 32·5, with a mean for all family practitioner committees of 10·6. Levels of supply were not associated with the degree of urbanisation of the areas and did not correlate with standardised mortality ratios for respiratory diseases. Levels were significantly greater in teaching areas than in non-teaching areas. The rationale for prescribing domiciliary oxygen is ill defined.

Introduction

The National Health Service spent £3·5m in 1979 on supplying oxygen for patients' use at home—0·47% of the total cost of general practitioners' prescriptions for all classes of drugs and appliances. Most patients who use oxygen think that they are helped by it, but there are wide variations in the amounts of oxygen that they consume.[1] We do not know whether, in aggregate, the amount of oxygen consumed varies widely from area to area, nor whether consumption depends on such factors as the prevalence of chronic respiratory disease. Is current usage rationally determined? To help decide this we compared the amount of oxygen supplied over a three-year period through general practitioner prescriptions in each family practitioner committee area in England and looked at any associations with levels of respiratory disease and other characteristics.

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Method

The Prescription Pricing Authority at Newcastle upon Tyne supplied information on the number of cylinders of oxygen of various sizes supplied by each of the 90 family practitioner committees in England for the years 1977, 1978, and 1979. Most oxygen is supplied in 1360-litre cylinders; the small numbers of other sized cylinders were converted into 1360-litre equivalents in our analysis.

Two series of mortality statistics were used as proxy measures of the prevalence of respiratory disease: standardised mortality ratios (SMRs), men and women, for chronic bronchitis and emphysema (obtained from the Office of Population Censuses and Surveys' publication *Mortality Statistics by Area* (Series DH5) for 1977 and 1978) and SMRs (persons) for all respiratory diseases for the populations of area health authority areas, which are coterminous with family practitioner committee areas (obtained from the statistics division of the DHSS for the period 1977-9), used for allocating funds to area health authorities.[2]

Estimates of the 1978 populations of area health authority areas corresponding territorially with those of the family practitioner committees were obtained from the Office of Population Censuses and Surveys' MONITOR Series PP1, 79/6.

Correlations of levels of oxygen supply and measures of respiratory disease and other characteristics of the areas were obtained by using Spearman's rank order correlation coefficient.

Results

There was a ten-fold difference among family practitioner committees in the number of 1360-litre cylinders of oxygen supplied per thousand population per year in the period 1977-9, ranging from 3·3 to 32·5 (mean 10·6) (see fig 1). For individual family practitioner committees the levels of supply were similar from year to year, being consistently high, intermediate, or low.

No obvious explanation emerged for these differences. The level of uptake was not associated with the degree of urbanisation of the corresponding area. The mean numbers of cylinders per thousand population in 36 family practitioner committees based on the former shire counties, which include large tracts of rural area, ranged from 3·6 to 31·2 (mean 10·9, SD 5·7); those in the 54 family practitioner committees based on the former county boroughs, hence mainly urban in character, ranged from 3·3 to 32·5 (mean 10·5, SD 5·1).

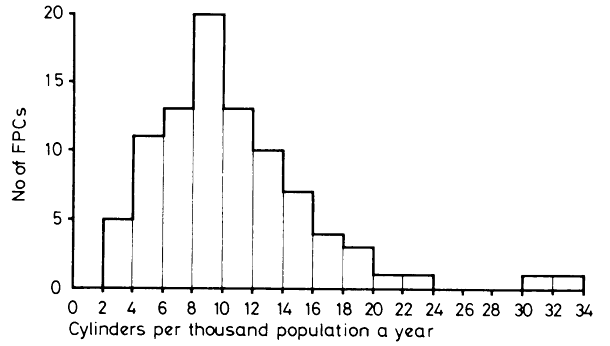

FIG 1—Mean annual numbers of 1360-litre oxygen cylinders supplied by family practitioner committees.

Family practitioner committees within the same health region did not conform to any particular pattern of supply, and among the 14 health regions there was a two-fold difference in the range of average number of cylinders supplied (7·9 to 15·3), but again, no clear pattern was recognisable.

The level of oxygen prescription could conceivably be related to the number of consultant physicians available, especially chest physicians, on the basis that it is these consultants who initiate oxygen treatment, whereas the general practitioners largely provide repeat prescriptions. Indeed, as in the case of amount of oxygen supplied, there was in 1978 a two-fold difference in the number of whole-time equivalent consultants in general medicine and in chest diseases per 100 000 population between the Trent Region, with the lowest level (1·69), and the North-west Thames Region, with the highest level (3·67). The level of correlation between the number of cylinders and the number of these consultants was, however, not statistically significant ($r=0·34$, $df=12$, $p>0·05$).

No statistically significant correlation was found between the average number of cylinders supplied per thousand total population in each health region and the respective SMRs for bronchitis and emphysema in those regions (table). Nor was there any correlation between the SMRs for the equivalent area health authority populations and the average annual number of cylinders supplied by the respective family practitioner committees ($r=-0·15$, $df=88$, $p>0·05$) (fig 2).

One characteristic of the area that *was* associated with oxygen consumption was the teaching status of the corresponding area health authority. The levels of supply for the 19 teaching area health authorities (mean 13·6, SD 6·3) were, on average, significantly greater than for the 71 non-teaching area health authorities (mean 9·9, SD 4·8) ($t=2·8$, $df=88$, $p<0·01$).

Oxygen supply and mortality from bronchitis, emphysema. Regional health authorities, England

Health region (and No of FPCs)	Cylinders/1000 population/year, 1977-9 Mean	Range among FPCs	Standardised mortality ratios (bronchitis, emphysema) 1977 M	1977 F	1978 M	1978 F
Northern (9)	12·0	3·4-19·3	132	112	125	124
Yorkshire (7)	10·6	4·8-15·9	116	119	107	112
Trent (8)	9·8	3·6-23·3	111	103	110	106
East Anglia (3)	15·3	7·1-31·2	65	60	77	75
North-west Thames (7)	11·9	5·0-14·6	87	105	81	102
North-east Thames (6)	11·8	7·8-17·6	102	96	101	103
South-east Thames (5)	11·2	7·6-16·4	85	93	92	102
South-west Thames (5)	9·6	4·5-18·1	77	81	87	83
Wessex (4)	8·8	5·3-11·6	73	64	67	71
Oxford (4)	10·5	6·4-20·2	87	83	82	74
South Western (5)	11·8	7·0-17·3	74	72	71	61
West Midlands (11)	7·9	3·3-12·2	116	106	113	97
Mersey (5)	8·9	6·5-12·0	120	147	120	115
North Western (11)	11·1	4·8-32·5	119	137	124	136

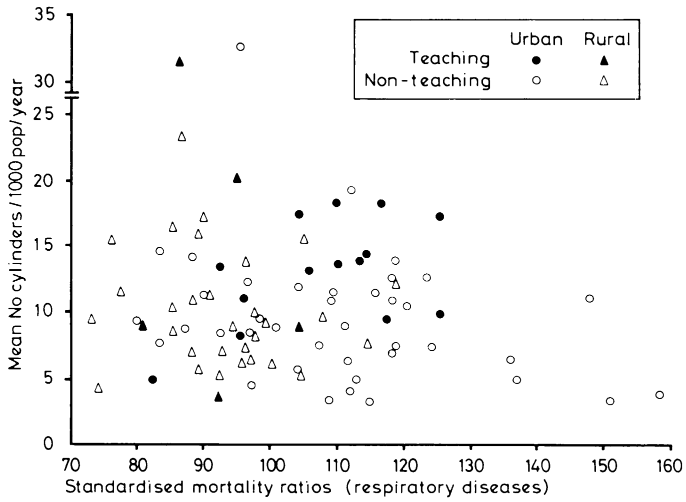

FIG 2—Oxygen consumption and respiratory disease mortality. Area health authorities 1977-9.

Discussion

Patterns of clinical practice may vary considerably in Britain. This sometimes gives rise to wide variations in the amounts of resources used to accomplish similar tasks.[3 4] So very broad is the range of domiciliary oxygen consumption in the different areas of England that differences in clinical opinion about the indications for oxygen treatment must seem to be a contributory factor.

The amount of oxygen supplied to a population does not, as we have seen, correlate with indirect measures of the volume of respiratory disease in the community. If differences of opinion do exist about the range of conditions causing breathlessness that require treatment with oxygen, and about the amounts needed to provide relief, the question is, whose opinion? General practitioners in each area are unlikely to show spontaneous uniformity about the type of patient who should have oxygen and yet differ appreciably from the opinion of general practitioners in the next area. A factor peculiar to each particular area is more likely; and one such factor is the group of consultants who deal with most of the thoracic medicine. At the regional level there is poor correlation between the level of oxygen supply and the size of the body of consultant physicians. Teaching area hospitals tend to be more generously staffed, however, and the considerably higher levels of supply in teaching areas may, in part, reflect the relatively larger numbers of doctors who initiate oxygen treatment available. Even so, levels of oxygen supply vary enormously in both teaching and non-teaching areas. Differences of consultant opinion about the clinical usefulness of oxygen treatment is probably the key factor.

Intensive use of oxygen by patients with hypoxaemic chronic obstructive lung diseases prolongs their lives (see leading article p 1909). If all such patients are now encouraged to use oxygen to the maximum the amount to be supplied will increase and the demand for oxygen-concentrating machines will rise. Area health authorities whose populations already consume large volumes of oxygen stand to face the biggest initial demand for such capital investment, but demand in what are at present low-use areas may also increase as the therapeutic effectiveness of oxygen is identified and on account of the convenience of the concentrator as a mode of delivery. The rationale for domiciliary oxygen treatment is ill defined enough at present. The danger is that the availability of an easy-delivery system will promote indiscriminate prescribing and use for conditions in which the effectiveness of oxygen treatment has not been properly assessed.

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For Debate . . .

The changing face of the laboratory

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Medicine as a science has a rapidly changing scenario as ideas and methods of approach to the treatment of disease wax and wane. Divisions of medicine grow or decline in stature, their popularity reflected in their ability to influence investment in the specialty. Pathology laboratories had their heyday in the 'sixties, as much owing to the impressive contribution to medical care made by pathologists during the previous decade as to advances in technology. Laboratory diagnosis was based on an expert appraisal of mostly qualitative results by a knowledgeable specialist—who, perhaps, had time to delve into each patient's case history and to discuss the laboratory results with clinical colleagues. As a result of these deliberations, the pathologist offered a subjective judgment about the diagnosis. With advancing technology and objective methods of analysis his role is diminishing, and the many vacant posts, which may never be filled,[1] coupled with an aging population point to an impending crisis.

Why use a laboratory?

Worse is to come. Many acute general hospitals now have intensive care units, coronary care units, and operating theatres where continuous monitoring facilities are provided—for example, for cardiac and lung function. Why, the clinicians ask, do we have to send samples to the laboratory, when we could have machines to monitor blood gases, electrolytes, blood glucose, and urea? Paediatricians ask similar questions, knowing that the cost to the State of one brain-damaged infant could be as much as £250 000.

Reliable and easily operated diagnostic kits are now available for determining some biochemical values; they can be installed in wards for more effective control of patients' treatment. Might there soon be no need to rely on a pathology service?

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Specialist surgeons wish to examine their biopsy specimens during the operation—say, in a convenient side room. Why should they have to send them to someone else? They could reduce operating time, become more expert in assessing where and how much to remove, and aid the training of their juniors.

Laboratory test results are now precise and scientific and are largely generated by automated testing systems. Analysis can be objective, though it is rarely undertaken by a pathologist—perhaps in no more than 5% of all requests. The rapid expansion in knowledge, the rise in demand for laboratory investigations, and the complexity of equipment and technique are patently too much for any single pathologist to cope with. The modern training curricula of medical students in a high-technology medical school environment enables them to assess laboratory information and draw conclusions without help. In most laboratories the numbers of pathologists have not changed appreciably in 20 years, and increasing reliance has to be placed on other grades of staff, mainly medical laboratory scientists. Some of the latter are expert in very narrow specialties, in which they may be the only people who can advise clinicians. This has led to understandable concern among laboratory medical staff.

Total rethink needed

A total rethinking of the provision of laboratory services is long overdue. Laboratories have become too large and cumbersome. Specimens may have to be processed in one hospital laboratory and then rerouted to a centralised specialist unit, such as a chromatography laboratory sited at another hospital, for actual testing. Centralisation means transport, and transport systems are extremely vulnerable. Some large hospital laboratories have set up satellites on site to handle emergencies. If the demands of acute medicine and surgery cannot be met as they are in the private sector then hospital pathologists will have only themselves to blame for their inadequacy. Clinicians could and should have the results of most investigations the day they request them.

To add to these problems, some pathologists are actively undermining the structural chain of command of medical laboratory scientists instead of reinforcing their own clinical