Middle Articles

HOSPITAL TOPICS

Halving the Cost of Anaesthetic Agents

C. E. BRISCOE,* M.B., B.CHIR., F.F.A. R.C.S.

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Summary: A survey in South Wales has been used to estimate the annual cost of individual anaesthetic drugs used in the National Health Service. Halothane, costing £900,000, is the most expensive item, followed by oxygen (£390,000) and nitrous oxide (£350,000). The total cost of drugs used for hospital anaesthetics is estimated to be £2,300,000, and for dental anaesthetics £156,000. The drug cost of the average hospital anaesthetic is £1 3s. and of the average dental anaesthetic 1s. 9d.

The provision of liquid oxygen stores could reduce oxygen costs by up to 90%, and the greater use of closed-circuit anaesthesia, with low gas flows, could save £750,000 annually. The drug cost of an anaesthetic in Cardiff has risen from 8s. 4d. in 1959 to 19s. 10d. in 1968, but costs in Cardiff compare favourably with published figures from other similar centres.

Introduction

The main tools of the anaesthetist are the drugs and gases he uses for everyday anaesthesia. It is therefore of interest to him to have an overall picture of the cost of these drugs, how much of the national drug bill they make up, how their cost has increased over the years, and how the costs in one region compare with those in another.

From these facts come ideas for economies which can be utilized by both anaesthetists and hospital planners, and which may be of interest to drug companies and Government economists.

The information needed for these points is not readily available. The Ministry of Health keeps no record of the cost of individual anaesthetic drugs (except halothane) or of the total expenditure on them. The drug companies do not release their total sales of individual drugs, and even market research workers are comparatively ignorant about the market for hospital drugs.

Survey of Costs

It was therefore decided to carry out a survey in South Wales to ascertain the cost of anaesthetic drugs. Figures were obtained from group pharmacists covering a population of just over 1,000,000 for the year April 1967 to March 1968. It was hoped that this sample would be sufficient to eliminate local variations and make it representative enough to project to the country as a whole.

The main difficulty in an investigation of this nature is to separate the anaesthetic use of drugs from general medical use. Oxygen is a case in point, being used in the wards and in theatres. A separation can be made here by assuming that most

hospital anaesthetic machines are fitted with 24 cu. ft. (0.68 cu. m.) oxygen cylinders, whereas on the wards the larger sizes are nearly always used. In addition some anaesthetic machines are supplied by piped oxygen, but at the time of the survey only four hospitals in South Wales were using this system, so an allowance is made for these.

Another problem is to decide to what extent analgesics, particularly the narcotics, are used for anaesthetics, as distinct from general medical purposes. It seems reasonable to assume that half of these drugs are used in connexion with anaesthesia (before and after operation) and half for general medical purposes.

Certain drugs which are used only occasionally in anaesthesia, such as promethazine, chlorpromazine, isoprenaline, and steroids, were not included. Atropine, which is in any case a very cheap drug, was also omitted. A small return was obtained for chloroform, but this is accounted for by its use as a medicinal flavouring agent. It should also be borne in mind that trichloroethylene and ether have reputations as cleaning agents.

The anaesthetic drugs investigated are listed in Table I. The first column shows the cost of the hospital drugs supplied in

TABLE I.—Cost of Anaesthetic Drugs 1967-8

		Cost in S. Wales sample (£)	Cost to U.K. (£1,000)	Quantity Used in U.K. (1,000s)
Gases	Oxygen 24 cu. ft. (0.68 cu. m.) cylinder	5,050	323	802 cylinders (24 cu. ft. 0.68 cu. m.)
	Piped oxygen (estimated)	1,000	64	43 cu. ft.
	Nitrous oxide	5,538	355	599 cylinders (200 gal.; 909 l.)
	Cyclopropane	496	26	5 cylinders (40 gal.; 182 l.)
	Carbon dioxide	219	12	35 cylinders (2 lb.; 0.9 kg.)
Volatile Anaesthetics	Halothane	17,268	919	150 bottles (250 ml.)
	Trichloroethylene	200	11	31 bottles (500 ml.)
	Ether	94	5	25 bottles (500 ml.)
Intravenous induction agents	Thiopentone	2,452	131	482 bottles (2.5 g.) or 1,616 ampoules (0.5 g.)
	Methohexitone	486	26	83 bottles (500 mg.)
	Propomid	114	6	59 ampoules (0.5 g.)
Relaxants	Tubocurarine chloride	1,819	97	1,038 ampoules (15 mg.)
	Suxamethonium	419	22	1,306 ampoules (100 mg.)
	Gallamine triethiodide	378	20	392 ampoules (80 mg.)
Other drugs	Local anaesthetics	4,515	241	
	Addictive analgesics	882	59	
	Neostigmine	205	11	
Total		41,135	2,328	
Total hospital drugs bill		416,009	22,160	

*Registrar, Department of Anaesthetics, Cardiff. Present address: St. Thomas's Hospital, London, S.E.1.

an area of South Wales covering a population of 1,010,000 (oxygen and nitrous oxide usage applies to 840,000 only). Column 2 shows these figures multiplied by

Population of U.K.† They represent the equivalent Population of Welsh sample

cost of each drug to the United Kingdom in the year 1967-8. The last column shows the quantities of the drugs represented by the costs listed in the previous column. The cost of the drugs depends, of course, on the amount purchased, but these figures are based on the then bulk purchase price.

There are no published national figures to compare with and test the accuracy of those in Table I. The Ministry of Health however, did publish figures for England and Wales for the cost of halothane in 1965-6 and for the total hospital drug bill in 1966-7 (Ministry of Health, 1966, 1967). To obtain similar figures from the sample it is necessary to multiply these figures by

Population of Welsh sample This gives £800,000 for the Population of England and Wales‡

cost of halothane and £19,400,000 for the total hospital drug bill, compared with the Ministry's £800,000 and £19,600,000. The agreement is clearly very good, but it might have been expected that the figures obtained from the sample would be a little higher than those of the Ministry, since they were for a later year.

The above figures include only drugs purchased through N.H.S. hospitals and therefore exclude one major group of anaesthetics—the dental anaesthetics.

It has not proved practicable to obtain details of the purchase of dental anaesthetic agents for a similar sample. Instead an attempt has been made to assess the cost of the agents used in dental anaesthesia. To do this it is necessary to know the quantity and type of these agents and the duration of the average dental anaesthetic.

The agents most commonly used in dental anaesthesia are oxygen, nitrous oxide, halothane, and methohexitone. Oxygen and nitrous oxide are used in virtually all cases, and a local investigation showed that the average consumption of these gases with a "demand flow" anaesthetic apparatus is 12 litres/minute, of which roughly 3 litres are oxygen and 9 litres nitrous oxide. No precise figures are available for the use of halothane and methohexitone, but observations show that in about a third of the total number of anaesthetics 1.5% halothane is added to the mixture, and it is estimated that in about one-tenth of the inductions the patients are given 100 mg. of methohexitone.

Some attempts have been made to estimate the duration of dental anaesthetics. Goldman (1964), in an analysis of 167 cases, found that the average operating-time for extractions is about one and a half minutes. He also estimated that an induction takes one and a half minutes with halothane and somewhat longer without that drug (Goldman, 1968). There are, in addition, rather longer operations for conservative dentistry, and an overall average time of four minutes seems a reasonable assumption.

It is also possible to calculate the probable number of dental anaesthetics given in 1967-8 in the U.K. The Central Health Services Council (1967) report on dental anaesthesia estimated that 1,750,000 dental anaesthetics were given in England and Wales in 1965. If it is assumed that the total number of dental anaesthetics has continued to decline at the same rate as before 1965, and an adjustment is made for the population difference between the U.K. and England and Wales, a figure of 1,800,000 dental anaesthetics for 1967-8 is obtained.

† 53,790,000 in 1966 Census.

‡ 47,136,000 in 1966 Census.

TABLE II.—*Drug Cost of Dental Anaesthesia*

	Average Quantity Used in an Anaesthetic of 4 Minutes	Cost of anaesthetic in 1969			Cost in U.K. of 1,800,000 Anaesthetics 1967-8 £
		O ₂ and N ₂ O s. d.	Halothane Added s. d.	Methohexitone and Halothane Added s. d.	
Oxygen	12 litres	0 3	0 3	0 3	24,670
Nitrous oxide	36 litres	0 8	0 8	0 8	56,980
Halothane (in 1/10 anaesthetics)	3-15 ml.		1 7	1 7	56,500
Methohexitone (in 1/10 anaesthetics)	100 mg.			2 0	18,000
Total		0 11	2 6	4 6	156,150

The present cost of a dental anaesthetic with three different combinations of drugs and the total cost of the anaesthetic agents used in dental anaesthesia in 1967-8 are given in Table II, which is based on the above figures. The drug cost of 1,800,000 dental anaesthetics is therefore estimated to be £156,000. The drug cost of hospital anaesthetics as estimated from the Welsh sample is £2,300,000 and hospital statistics (General Register Office and the Ministry of Health, 1966) show that 2,000,000 hospital anaesthetics are administered annually. The average dental anaesthetic therefore cost 1s. 9d. and the average hospital anaesthetic £1 3s.

The total cost of anaesthetic drugs may be seen in perspective by comparing them with other aspects of health service expenditure (Table III). It is noteworthy that national health contributions only just cover the nation's drug bill.

TABLE III.—*Comparison of Some National Health Costs in England and Wales (Ministry of Health, 1967)*

	£ Million
Anaesthetic drugs (based on Welsh sample)	2
Anaesthetists' salaries	6
Hospital drugs total	20
National drugs total	142
Hospital expenses	765
Cost of Health Service (N.H.S. contributions)	1,358
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Economies

The major items of expense are oxygen, nitrous oxide, halothane, thiopentone, and tubocurarine (Table I). It is of importance to consider if worth-while economies can be made in the use of these.

Oxygen

This is one field in which large savings can be made. The reason for this is the difference in price between liquid oxygen and oxygen supplied in cylinders. The degree of saving depends on the amount of oxygen consumed. Figures from the United Cardiff Hospitals (896 beds) show the economies that can be achieved.

In the United Cardiff Hospitals the wards and recovery rooms are supplied by piped oxygen. The anaesthetic machines in the major operating theatres are fitted with 24 cu. ft. (0.68 cu. m.) cylinders. The general hospital usage of piped oxygen is 2,500,000 cu. ft. (70,000 cu. m.)/year, while the anaesthetic usage is 170,000 cu. ft. (4,000 cu. m.)/year, or only about one-fifteenth of the hospital use. So great is the difference in price, however, that the supplies piped from the liquid oxygen depot cost only 1.7 times more (£3,888) than the anaesthetic cylinder oxygen (£2,238). Replacing the cylinders in the operating-theatres by piped oxygen would reduce the oxygen cost to £246, and an annual saving of £2,200 in these two hospitals would be made. In addition there would be a big saving in portorage and on cylinder rentals. The capital cost of installation would naturally have to be offset against this. The British Oxygen Company states that liquid oxygen stores

are worth installing when a hospital's total weekly consumption of oxygen exceeds 3,000 cu. ft. (85 cu. m.), and there is no doubt that all hospitals should consider the economics of changing to liquid oxygen.

Nitrous Oxide

Nitrous oxide can also be piped from a bulk store of cylinders, but this effects a much smaller saving than liquid oxygen. The saving at the United Cardiff Hospitals would be about £380 in one year or about £1 in every £6 spent, and it would take longer to recoup the capital outlay of a nitrous oxide store and piping than a similar installation for oxygen. Again there are portage costs and cylinder rentals to be saved.

Nitrous oxide is about nine times as expensive as oxygen (depending on quantity consumed) when both come from bulk stores. The economy to be obtained by closed-circuit anaesthesia, as discussed under halothane, therefore becomes more important for nitrous oxide than for oxygen.

Halothane

This is the largest single item in the country's anaesthetic drug bill. It is therefore worth considering what economies can be made by using closed circuits with carbon dioxide absorption. With reasonably accurate vaporizers and leak-proof circuits the maintenance of anaesthesia ought not to require gas flows of more than 1.2 l./minute, in contrast to 5.8 litres needed without a CO₂ absorber.

There are two situations to consider when comparing the costs of closed-circuit with semi-open-circuit anaesthesia. The first is with the patient breathing spontaneously and the second with the patient being artificially ventilated. The cost of one hour's anaesthesia with the patient breathing spontaneously, firstly with a Magill attachment and a flow of 7 l./min. and, secondly, with a closed circuit and a flow of 2 l./min., is shown in Table IV. The average inspired concentration of halothane is taken as 1.5% (Bodman, Gerson, and Smith, 1967). To obtain an inspired concentration of 1.5% with a gas flow of 7 l./min. and the vaporizer in the "outside of circuit" position, a vaporizer setting of 1.5% is required, but with a flow of 2 l./min. a setting of 1.8% is necessary to maintain the inspired concentration of 1.5% (Mapleson, 1960; Mushin and Galloon, 1960).

The costs of cylinder gases and piped gases in Tables IV and V are based on current prices at the United Cardiff Hospitals. The saving resulting from use of the closed circuit is over 60% with either cylinder or piped gas supplies.

TABLE IV.—*Cost of One Hour's Anaesthesia During Spontaneous Respiration*

<i>Magill Attachment</i>									
		1.5% Halothane	+	2 l./min. Oxygen	+	5 l./min. Nitrous Oxide	+	Total	
		s.	d.			s.	d.	s.	d.
Cylinder gases	..	10	0		1	7		3	11
Piped gases	..	10	0		0	2		3	4

<i>Closed Circuit</i>											
		1.8% Halothane	+	1 l./min. Oxygen	+	1 l./min. Nitrous Oxide	+	½ lb. (226g.) Soda Lime	+	Total	
		s.	d.			s.	d.			s.	d.
Cylinder gases	..	3	5		0	10		0	11	6	0
Piped gases	..	3	5		0	1		0	11	5	1

The cost of one hour's anaesthesia when the patient is artificially ventilated is given in Table V. In this case a muscle relaxant is used and only a small supplement of 0.5% ha-

lothane is added. This requires a vaporizer setting of 0.5% with a fresh gas flow of 7 l./min. but 0.6% with a gas flow of 2 l./min. (Mapleson, 1960; Mushin and Galloon, 1960). Again the vaporizer is in the outside-of-circuit position. In this case the saving produced by using the closed circuit is just under 40% with either cylinders or piped gas supplies.

TABLE V.—*Cost of One Hour's Anaesthesia During Intermittent Positive Pressure Ventilation*

<i>Magill Circuit</i>									
	0.5% Halothane	+	2 l./min. Oxygen	+	5 l./min. Nitrous Oxide	+	30 mg. Curare		Total
	s. d.		s. d.		s. d.		s. d.		s. d.
Cylinder gases ..	3 4		1 7		3 11		3 9		12 7
Pipes gases ..	3 4		0 2		3 4		3 9		10 7

<i>Closed Circuit</i>											
	0.6% Halothane	+	1 l./min. Oxygen	+	1 l./min. Nitrous Oxide	+	30 mg. Curare	+	½ lb. Soda Lime		Total
	s. d.		s. d.		s. d.		s. d.		s. d.		s. d.
Cylinder gases ..	1 2		0 10		0 10		3 9		0 11		7 6
Piped gases ..	1 2		0 1		0 8		3 9		0 11		6 7

These examples show the economy of the closed-circuit technique. It is of particular value in the patient breathing spontaneously, but is also useful in the ventilated patient. It is interesting (Table V) that the economy in nitrous oxide is greater than in halothane.

The question arises whether anaesthetists do, in fact, use the closed-circuit techniques as often as possible. A calculation was made in the Cardiff Royal Infirmary in 1964 based on the number of hours of anaesthesia utilizing halothane and the number of bottles of halothane used daily. Some of these anaesthetics were given with intermittent positive-pressure ventilation and some breathing spontaneously, and it was assumed that 1.4% was the average concentration of halothane used. These figures gave an average fresh gas flow rate of 5.6 l./min. It is clear that the carbon dioxide absorbers were being used but that there was room for still further use.

The cost comparisons given below indicate that similar or higher flow rates would be found at other hospitals. The average flow rate of gases used during anaesthesia might therefore well be reduced by at least a half. If this were done the overall cost of halothane, nitrous oxide, and anaesthetic oxygen in the U.K. would be reduced by half, with a saving of about £750,000 per annum, or over a third of the total bill for anaesthetic agents.

Perhaps anaesthetists might use this technique more often if hospitals installed halothane vaporizers that are accurate at low flows and also provided leak-proof closed-circuit apparatus and the technicians to maintain it.

Finally, it is worth while to point out the difference in cost between halothane and trichloroethylene. In Fig. 1 the cost of one hour's halothane anaesthesia is compared with that of one hour's trichloroethylene anaesthesia in a patient breathing spontaneously, both being related to the fresh gas flow. Halothane anaesthesia with flows of 2 l./min. or less is cheaper than trichloroethylene anaesthesia. The latter cannot be used with soda lime and thus always requires higher gas flows to eliminate carbon dioxide.

A comparison of halothane and trichloroethylene costs in the artificially ventilated patient given 30 mg. of curare as a muscle relaxant and a small supplement only of halothane or trichloroethylene is made in Fig. 2. In this case halothane anaesthesia becomes cheaper with gas flows below about 4 l./min.

The proportions of oxygen and nitrous oxide used do not

FIG. 1.—Comparison of cost of halothane and trichloroethylene anaesthesia in patients breathing spontaneously. FIG. 2.—Comparison of cost of halothane and trichloroethylene anaesthesia in patients ventilated artificially.

alter the prices shown in Figs. 1 and 2 as they are based on the cost per litre of gases obtained from the cylinders commonly used on the Boyle machine, and this is the same for the two gases.

Thiopentone

The only point worth emphasizing in regard to thiopentone is that a 2.5-g. bottle costs 5s. 5d., while five 0.5-g. ampoules cost 8s. 1d.—that is, 50% more. Solutions prepared in bottles will keep for a few days if necessary (Robinson, 1947), and they could thus provide a reasonable economy. Both methohexitone and propanidid are more expensive. Equipotent doses (Clarke, Dundee, Barron, and McArdle, 1968) of thiopentone (330 mg. from a bottle), methohexitone (100 mg. from a bottle), and propanidid (360 mg. from an ampoule) cost 8½d., 1s. 3d., and 1s. 5d. respectively.

Tubocurarine

This is another big item, and it is worth pointing out how its price compares with some of the other competitive muscle relaxants. Gallamine (80 mg.) costs 1s. 0½d., pancuronium (4 mg.) costs 1s. 7d., and tubocurarine (15 mg.) costs 1s. 10½d. Replacing tubocurarine by gallamine would save over £40,000 per year.

All the above prices are those currently paid at the United Cardiff Hospitals.

Cost Increases

The bulk prices of the major items in 1959 and 1969 are given in Table VI. Some of these prices have not changed, while the price of halothane has halved in the 10-year period. Only cylinder oxygen shows a pronounced rise in price.

TABLE VI.—Price Changes in Anaesthetic Agents

	Oxygen		N ₂ O 200 gal. (909 l.)	Halothane 250 ml.	Thiopentone Ampoule	Curare Ampoule
	24 cu. ft. (0.68 cu. m.) Cylinder s. d.	240 cu. ft. (6.8 cu. m.) Cylinder s. d.	s. d.	£ s. d.	s. d.	s. d.
1959	4 10	13 3	11 2	10 5 0	1 7½	1 10½
1969	8 3	19 10	11 10	4 11 6	1 7½	1 10½

It might therefore be thought that on balance any rise in the cost of anaesthetic drugs would be comparatively small. Figures from the United Cardiff Hospitals, however, show that the cost of anaesthetic drugs and gases has advanced from an estimated £3,941 in 1959 to £13,398 in 1968 (Table VII).

TABLE VII.—Cost of Anaesthetic Drugs in Cardiff (1959-68)

	Financial Year ending March 1959 £	Financial Year ending March 1964 £	Financial Year ending March 1968 £
Halothane		3,488	5,069
Other anaesthetics		1,083	1,648
Muscle relaxants		724	1,429
Addictive analgesics		250	602
Anaesthetic gases	2,000 (estimated)	3,224	4,650
Total	3,941	8,769	13,398
No. of operations	9,480	11,600	13,533
Cost per operation	8s. 4d.	15s. 1d.	19s. 10d.

The anaesthetic drug cost per operation has risen from 8s. 4d. to 19s. 10d., or over 100% in nine years. The three major reasons for this rise appear to be the introduction of halothane, the higher price of gases, and the increasing length and complexity of operations. It is interesting to compare these costs with those published from Southampton in 1959 (Shackleton, 1960) and from Sheffield in 1964 (Murray Wilson, 1966).

	1959	1964
Cardiff	8s. 4d.	15s. 1d.
Southampton	13s. 8d.	£1 2s. 9d.

The difference in costs between the centres is very striking, and it is possible to compare the 1964 figures in more detail, as shown in Table VIII.

TABLE VIII.—Comparison of Anaesthetic Drug Costs in Sheffield and Cardiff, 1964

	Sheffield (550 beds) £	Cardiff (896 beds) £
Halothane	3,531	3,488
Other anaesthetics	1,013	1,083
Muscle relaxants	504	724
Addictive analgesics	225	250
(Medical gases)	(4,258)	(7,309)
Anaesthetic gases	4,200	3,224
Anaesthetics total cost	9,473	8,769
No. of operations	8,250	11,600
Cost per operation	£1 2s. 9d.	15s. 1d.

Both Cardiff and Sheffield undertake most forms of surgery, including neurosurgery. Part of the difference lies in assessment of the oxygen used for anaesthesia. In the United Cardiff Hospitals, as already explained, it is possible to be confident regarding the cost of oxygen and nitrous oxide being used for anaesthetics. In 1964 this was £1,141 for oxygen and £1,960 for nitrous oxide. These figures, together with small amounts for cyclopropane and carbon dioxide, make up only half the total bill for medical gases. In Sheffield a much smaller allowance was made for the use of oxygen outside anaesthetics.

Another pronounced difference between the two hospitals lies in the cost of halothane per operation, and here the only probable explanation is that a greater proportion of the anaesthetics in the United Cardiff Hospitals were with closed circuits. This emphasizes the point of the saving to be obtained from closed-circuit anaesthesia. Even in Cardiff it would have been possible to lower these costs still further if the closed-circuit technique had been used more often.

It is against this background of rising costs that the recommendations for economic methods must be considered. If all the economies outlined in this paper were practised the cost of anaesthetic agents would be reduced by one-half, with a saving of a millions pounds annually. If such worth-while

savings can be achieved in this one branch of medicine it is interesting to speculate how many other points there are in the health service where similar savings could be made.

Grateful acknowledgement is made to Professor W. W. Mushin for his constant encouragement and criticism, to members of the anaesthetic department at Cardiff for all their help, to the finance and pharmaceutical departments of the United Cardiff Hospitals (especially Mr. A. G. Williams), to the chief pharmacists of Glantawe, Mid-Glamorgan, S.W. Wales, and Cardiff Hospital Management Committee, and to Mr. Jeffreys, of the Welsh Hospital Board, for taking part in this survey. Thanks are also due to Dr. Gareth Jones, of the Welsh Board of Health, Mr. C. Postle, of Imperial Chemical Industries (Pharmaceuticals Division), the British Oxygen Company, May and Baker, Burroughs Wellcome, and Eii Lilly for their helpful information. Finally, a tribute must

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UNHEARD VOICES

The Pathologist

[FROM A SPECIAL CORRESPONDENT]

Dr. Alde, the pathologist, is a contented man. Now in his middle forties, he came to his consultant job five years ago after spending fifteen years in junior appointments in medicine and pathology. He works in a district general hospital in a large Northern town, and is also responsible for pathology services in another five hospitals nearby. The work is shared with a senior colleague, who in addition does the administrative work for this group. There are no junior staff to help the consultants; the routine emergency work is done by laboratory technicians, one of the consultants being available on the telephone for giving advice. The main laboratory is about 30 years old, and, though hemmed in by books and equipment, Dr. Alde has his own room. Moreover, he should have a lot more space when the central laboratory, which is to be built as part of the new district hospital, is ready in about five or six years' time.

Starting work at 9.00, Dr. Alde takes at the most half an hour for lunch, and finishes at about 5.30; he works on most Saturday mornings. He does all the surgical histology for the group—about 3,000 specimens a year—and half the necropsies, about one a day. Roughly one evening a week he spends working on a research project as part of a team for the nearby medical school, reading in the library, or preparing a clinicopathological conference for his own hospital. About once a month or more he attends a meeting of one of the local medical societies. Vocational and continuing education have come comparatively late to his hospital group—which has acquired a postgraduate medical centre only recently—but for some time Dr. Alde has organized a fortnightly clinicopathological conference, and time spent in teaching seems likely to increase considerably fairly soon.

Better Service to Patients ?

"Could the service to the patient be made any better?" I asked. Certainly, as far as surgical pathology was concerned, he thought not. He had the most modern equipment available, first-rate technical help, and good liaison with the other

consultants and junior staff; nor did the distance between the central laboratory and the other hospitals create many problems. By using the excellent messenger system, a surgeon operating in a hospital three miles away could still have a report on a frozen section twenty minutes after removing the tissue specimen. On the other hand, they desperately needed a chemical pathologist to expand and develop this side of the work. "Was anything wrong?" He would have liked more work, both to ensure that he saw enough of the unusual and so that he could employ and train two registrars. Only the prospect of more work would make him move—and that hospital would have to be nearby, for he valued his personal contacts and research links too highly to go very far. "What about committees?" He didn't always go to these, and anyway was eligible to attend only two—the group medical staff committee and the regional pathologists' committee. "I'm not convinced," Alde said, "that any resolution I've ever heard passed at the medical staff committee has ever been acted on by the regional hospital board. In this way, there is a lack of contact between the centre and the periphery, and this is why I've decided not to waste my time on this committee, unless I'm particularly concerned. But, to be fair, I must say that I've got almost everything I personally want—a good microscope and a cryostat (each costing £1,000), all the important books and journals, and opportunities for research and study leave. Nobody interferes with the way I work, and fortunately my colleague likes travelling round to the other hospitals and doing the administrative chores."

Why is he Happy ?

I tried to analyse the reasons for his contentment. Materially they were not hard to seek—a detached house set in archetypal dale landscape; warmth, books, pictures, and a good table; two cars; and an annual family holiday. Medically, he was able to do things exactly as he wanted to without interference. Intellectually, there was the stimulus of postgraduate teaching, of keeping up first-class standards in his own field,