here happen to see a lot of colitis. But the condition may turn up anywhere in an emergency, and the patient can't necessarily be transferred to a hospital where surgeons are doing excision of the rectum all the time. Your advice, Mr Hawley, to think hard in an emergency about possibly retaining the rectum is important—though undoubtedly sometimes proctocolectomy (as Peter Bevan has said) is the right operation.

MR BEVAN: When I referred earlier on to the high percentage of emergency proctocolectomies that have been part of my practice during the last 10 or 15 years I would agree that this is not an operation to be done in the middle of the night. When I said emergency I meant within a matter of days; if the patient doesn't settle with conservative treatment the operation should be done by the number one team. It needs the consultant and a first assistant of some experience and a full team working with full supportive facilities during the daytime.

Variations on ileostomy

MR BEVAN: Another important factor we have to bear in mind in deciding between an ileostomy and ileorectal anastomosis is, of course, the ileostomy itself. If ileostomy technique could be improved beyond the Brooke eversion ileostomy this again might be a factor that might persuade us not to attempt so many ileorectals. There have been two recent suggestions for improvement: the reservoir ileostomy patented by Nils Koch in Sweden, and the magnetic ileostomy. Unfortunately, neither seem to me entirely satisfactory.

MR HAWLEY: I think that the Koch ileostomy has been a considerable advance. It's not without its problems; but again patients who have experienced both have no hesitation in saying they prefer to have a reservoir with a continent valve. Now at St Mark's we're not great advocates of this operation; we've done 20 I think. The procedure is technically much more difficult, and the patient may develop many complications. We never press the idea on a patient; if he doesn't know about it

we don't tell him. There have, however, been some young patients who have said "I'm not having my colon out unless this operation is done." At St Mark's we initially had poor results but they are getting better. The results of the last half dozen or so cases have really been successful.

MR BEVAN: How many of your 20 cases are really truly continent?

MR HAWLEY: If the reservoir isn't totally continent the operation is a failure and they're better with a conventional ileostomy. They have to be totally continent. We have had two deaths in this series. One elderly patient, early in this series, perforated his pouch passing a tube seven months post-operatively. And another patient died with renal problems three months postoperatively. But, of the others being followed up, over half have a very good functional result. This means that they empty the pouch two or three times in 24 hours and are totally continent.

The whole problem with reservoir ileostomies is the valve. As has been mentioned, there is a way of overcoming the problem by putting a magnetic device around an ileostomy. I'm not very keen on it, the infection rate is high, and the devices are terribly heavy. One company is making a carbon fibre prosthesis which hardly weighs anything. If this works it may be the answer.

MR JONES: I haven't done an ileal reservoir for the simple reason that I have not been asked for it; and it has always seemed to me that it was sufficiently complicated for it not to be a thing you would wish on somebody who wasn't really very keen to have it. As Peter Bevan was saying earlier on, the present level of ileostomy care is really very high indeed—thanks partly to Professor Bryan Brooke and partly to the Ileostomy Association and all the pressure and hard work they've brought to improving apparatus and stoma care.

MR BEVAN: I would like to say one final thing. I don't think we started at opposite poles of the spectrum, but we have reached a large measure of agreement. I shall certainly continue my own tendency in the last few years—looking for a higher proportion of patients on whom to do an ileorectal anastomosis.

Process and Outcome

Cost of carrying out clinical diagnostic tests

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Summary and conclusions

The total cost of performing diagnostic tests in a hospital laboratory during one year was assessed. The largest single item of expenditure was the cost of the salaries of the technical staff, while the cost of reagents (including

radiopharmaceuticals) was relatively small. The total costs of carrying out diagnostic tests are much higher than is often recognised by those who request them. The use of relatively expensive, commercially available assay kits saves time and gives good value for money. It may be worth taking this into account when planning hospital budgets.

Introduction

We decided to investigate the importance of certain biochemical tests in clinical diagnosis and to assess the costs and value of these tests. We report our analysis of the costs to the National Health Service of biochemical tests performed in the department of Nuclear medicine, the District Hospital, York. Radiopharmaceuticals were used in all tests. The analysis was carried out

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during the year from 1 April 1975 to 31 March 1976, when the department was situated at the City Hospital, York (now closed).

The total cost of each test included the cost of reagents, the cost of the time spent by technical staff in performing the tests, a fraction of the capital and running costs of the department, and the cost of collecting and redistributing the blood samples for testing. These costs vary with conditions in different hospitals, but we believe that our analysis draws attention to the scale and type of resources used in diagnosing certain conditions. We hope that this will make a useful contribution to the debate about the best use of the resources available to the National Health Service.

Methods

We adopted the general principle that (with the exception of the cost of radiopharmaceuticals) the cost of carrying out a diagnostic test is proportional to the time spent on it. We therefore calculated the total time spent during the year on each of the diagnostic tests carried out in the department. When possible this was calculated from the Leeds regional hospital board's estimate of the average time taken to obtain a result from a single sample. For tests which were not assessed by them we made our own estimate of the time, using the same principles. This time (unit time) included the time spent at the bench and in making necessary calculations, and also allowed for time spent in general laboratory administration. We calculated the total time spent on a test by multiplying the unit time by the number of results for that test recorded in the laboratory records.

The five different costs constituting the total cost of performing the tests were: (a) reagents (including disposable equipment); (b) collection and distribution of blood samples; (c) staff time; (d) maintenance of building and equipment together with a fraction of the capital cost of the building and equipment; and (e) a fraction of the costs of central administration. This classification omits many minor contributory costs, but we calculated that none of these contributed as much as 1% of the total of the five costs listed above. The methods for obtaining the five contributory costs are detailed below.

(a) *Reagents (including disposable equipment)*—The materials used during the year included reagents obtained directly from chemical suppliers and other items purchased in bulk and held in the hospital stores or pharmacy. The quantity and costs of all these materials were obtained from hospital records and invoices. The costs of radiopharmaceuticals and other reagents were considered separately because radiopharmaceuticals cost over twice as much as all other reagents, and because there was no doubt about the tests to which this cost was attributable.

(b) *Collection, distribution, and processing of blood samples*—Examination of hospital records showed that the hospital received a total of 89 000 blood samples of which 1.92% were eventually received by the department of nuclear medicine. Details of salaries of staff engaged in blood sampling and the cost of consumables used by them were obtained from hospital records. The average cost of taking a single sample was calculated from these accumulated costs and the number of samples taken. The total cost to the department of nuclear medicine came to £526. About 75% of the samples were separated or partially prepared for analysis by either the departments of biochemistry or haematology. The cost of preparation was assessed from the average time taken to process the samples and an average salary of the staff concerned. It came to £650. The final cost in this category was the cost of distributing samples. Many samples were taken in hospitals at some distance from the laboratory and some were taken to the

regional physics unit at Hull for measurement. Most of these samples were carried in a special hospital van. The costs of running this van (including depreciation and the driver's salary) were obtained from the appropriate hospital authority as were the travelling expenses and staff time of other staff concerned. The fraction of costs attributable to the department of nuclear medicine was £1014. The total cost under this head was therefore £2190.

(c) *Staff*—The staff of the laboratory consisted of two full-time and one part-time technicians and a part-time copy typist. A medical laboratory technologist with general administrative duties also contributed to running the laboratory. Details of staff salaries and pension and National Insurance contributions (or an appropriate fraction of them) were obtained from the salaries office. The total was £12 475.

(d) *Maintenance and capital costs*—The laboratory nucleonic equipment was maintained by the staff of the regional physics unit at Hull. Materials used in maintenance were included in the costs of consumables used in the laboratory. Extra maintenance costs were therefore the time (including travelling time) and travelling expenses of the maintenance staff. These costs were estimated from the number and duration of the visits and the salaries of the staff concerned. The total was £297. The capital value of the laboratory equipment was calculated by the method of Bathurst¹ from its initial cost and replacement cost. The initial cost was obtained from hospital records and replacement cost was obtained from suppliers' catalogues. The total value of the equipment was estimated at £14 154. A seven-year life for this equipment was assumed² so that £2022 (one-seventh of the total value) was attributed to the year in question. The cost of building maintenance and capital was calculated from the floor area of the laboratory, which was 72.1 m². The cost of rebuilding the laboratory was calculated at £155 per m².³ The yearly cost was obtained by discounting this replacement value over 60 years.⁴ This gave a cost for the year of £1120. This method may be applied generally to calculating the cost of any building, new or old. Maintenance and running costs have been estimated to vary from 36% to 54% of the total annual costs.^{5,6} A cost of £880 was chosen, since it was roughly halfway between these different estimates. Thus the total running costs of the laboratory, including a share of the capital costs, came to £4320.

(e) *Cost of central administration*—The central administrative services of the National Health Service account for 3.4% of the total costs of the service.⁷ This percentage of the sum of the other costs was added to the total cost.

Results

Table I shows details of the diagnostic tests carried out in the department during the year, including the cost of radiopharmaceuticals. We calculated the possible number of results which could have been obtained from the amount of radiopharmaceutical purchased. The actual number of samples for which results were obtained was less than the theoretical number partly because of the need to test standard samples, partly because of natural wastage due to the relatively short shelf-life of most radiochemicals, and partly because of the occasional need to repeat an analysis on a sample. The total time for performing the tests was close to the amount of time available from the technical staff working in the department. This confirmed that the notional time allocated to each test was reasonably accurate.

Table II summarises the costs of carrying out the tests listed in table I and the percentage of the total cost contributed by each component. Table III shows five different components contributing to the total cost of carrying out each diagnostic test on a particular

TABLE I—Details of diagnostic tests carried out by department of nuclear medicine, 1975-6

Test	Cost of radiopharmaceuticals (£)	Possible No of test results	No of samples tested	Time for one test (min)	Total time (min)
Thyroid-stimulating hormone concentration*	324	1200	876	40	35 040
Triiodothyronine*	180	429	395	30	11 840
IgE concentration*	422	1465	337	40	13 480
Radio Allergo Sorbent test*	460	1840	323	40	12 920
Serum folate	138	2450	1639	40	65 560
Serum vitamin B ₁₂	120	8000	1318	40	52 720
Thyroid-hormone binding index	168	8320	3513	10	35 130
Various in-vivo tests	1720		599	NA†	39 060
Miscellaneous in-vitro tests	78		714	NA†	10 500

*Tests for which radiopharmaceuticals were purchased as commercially available kits.

†NA = Not available. Times for single tests not included because figures were obtained by summing small numbers of different tests.

TABLE II—Costs contributing to total cost of performing clinical diagnostic tests

Contributory cost:	Consumables		Collection and distribution	Staff	Capital, maintenance, and running costs	Central administration	Total
	Radio-pharmaceuticals	Other					
Cost in £ ('% of total cost)	3611 (14.4)	1602 (6.4)	2190 (8.8)	12 475 (49.8)	4320 (17.3)	831 (3.3)	25 029 (100)

TABLE III—Total cost of each diagnostic test and components contributing to total cost. All costs given in pence

Test	Theoretical cost per test of radiochemicals	Actual cost of radiochemicals for one result	Cost of reagents plus sample collection	Cost of time	Maintenance, capital, and central administration	Total cost
Thyroid-stimulating hormone concentration ..	27	37	55	181	75	348
Triiodothyronine	42	38	41	135	56	270
IgE concentration	29	125	55	181	75	436
Radio Allergo Sorbent test	25	142	55	181	75	453
Serum folate	6	8	55	181	75	319
Serum vitamin B ₁₂	2	9	55	181	75	320
Thyroid-hormone binding index	2	5	14	45	19	83
Various in-vivo tests		287	90	294	120	791
Miscellaneous in-vitro tests		23	20	66	23	132

sample. The theoretical cost of radiopharmaceuticals needed to test a single sample was obtained by dividing the cost of the radiopharmaceutical by the theoretical number of results obtainable from the amount purchased (see table I). The actual cost of radiopharmaceuticals needed to obtain a single useful result was obtained by dividing the cost by the number of samples actually tested (table I). The contribution to the cost of testing one sample made by the other components of the total cost was obtained by dividing the cost of each component (table II) by the total time used (276 240 min) (table I) and multiplying by the time taken to test that sample.

Discussion

Our analysis shows that the cost of performing certain diagnostic tests (and probably most others) is measured in pounds rather than in pence. General recognition of this cost might lead to fewer requests for certain tests. Such a reduction would release important assets of labour and space to provide a broader range of medical diagnostic tests. At present most laboratories do not provide a full range of diagnostic tests, and one of the factors limiting the introduction of new tests is the level of staffing of the laboratories.

We found that the cost of labour was the largest single contributory cost in every case; radiopharmaceuticals contributed no more than 30% of the total cost, even when the radioisotope was purchased as a prepacked kit and wastage of materials was great. Indeed, the cost of the radiopharmaceuticals only reached this level in the radioimmunological tests for total IgE and in the Radio Allergo Sorbent test, and in both these tests wastage of the radiopharmaceutical is considerable due to its short shelf-life relative to the number of samples being tested.

Much time may be saved by using prepacked assay kits. We have recently adopted a prepacked kit for measuring serum vitamin B₁₂ and folate. Using the new kit to measure B₁₂ and folate together takes one-quarter of the time taken to make both measurements independently by the old methods. The cost of the kits needed to carry out 850 measurements during the first five months after introducing this method was 104p per test, which is a six-fold increase in the cost estimated (table III) for the old methods. Nevertheless, the saving in the cost of labour more than compensates for the increase.

We conclude that the National Health Service might get better value for money by spending more on prepacked kits for use in hospital laboratories. We suggest that this should be taken into account when allocating budgets for such departments.

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Pollen B has been advocated for staying young.¹ Have all the ingredients in it been isolated, and could any of them have an adverse effect on health?

Pollen consists of microspores formed in flowering plants and conifers. The average diameter of a pollen grain is 0.5 mm, but a single catkin produces several million. Between four and seven million tons of pollen are shed throughout the world each year.² In addition to a considerable amount of protein, pollen contains all the water-soluble vitamins and some vitamin A, vitamin D, and vitamin K. Small amounts of minerals—including calcium, phosphorus, iron, copper, potassium, magnesium, manganese and silicone, and sulphur—are all present; so are several enzymes and coenzymes.³

Pollen is mentioned in the ancient texts of Persia, China, and Egypt. In the Koran, the Talmud, and the Bible reference is made to pollen and honey as ambrosia or heavenly food. Virgil, Hippocrates,

and Pliny considered that pollen was a specific against old age. An investigation into the longevity of Russians suggested that bee-keepers lived longer than others because they ate pollen.¹ From a nutritional point of view pollen has been thoroughly analysed, and there are no ingredients that could have an adverse effect on health. Even the pollen from poisonous plants is safe.

Pollen has a bitter taste and to improve its palatability it must be combined with other ingredients, such as honey. In the past few years pollen tablets have been on the market. The DHSS regards them as a food and not a drug. Harmful effects from pollen occur only in sufferers from hay fever—a nasal allergy to inhaled grass pollens.

¹ Lyall, N, and Chapman, R, *The Secret of Staying Young*. Pan Books Ltd, London.

² Hillemann, H H, *Modern Nutrition*, 1963, 16, 21.

³ Viveno, A E, and Palmer, L S, *Archives of Biochemistry and Biophysics*, 1944, 4, 129.