

Canterbury and Thanet Health Authority

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6 April 1988

Mr Paul Gray
Private Secretary to the Prime Minister
10 Downing Street
London

Dear Paul

As promised, I am enclosing a copy of the student's article regarding clinical budgeting in an Anaesthetic Department. I am sorry I am so late in writing but I had to search far and wide for this article.

I enjoyed the meeting and lunch at Chequers very much and it was very heartening to find such a wide range of opinions and such a very full discussion. I will be grateful if you would convey my thanks to the Prime Minister.

Here in Canterbury we are very proud of what we do and the service we provide, and we have recently raised 1 million pounds for a Cancer Care Unit under the leadership of Mark Rake, one of our Physicians. This will be formally opened at the end of the year by the Countess Mountbatten. In addition, the Regional Health Authority has now agreed to install a CT scanner and mammography unit here which will be opened in the Spring of next year, 1989.

I was hoping to ask the Prime Minister if she would make an unannounced and informal visit to this hospital, just to see what an everyday District General Hospital can do. However on reflection, I suspect there will be security problems and it will probably be more valuable for her politically if she could find time to open our CT scanner next year. Perhaps you would broach this subject with her and let me know if she can find time in what I know is a very busy schedule.

Meanwhile, my thanks again.

Yours sincerely


B E CRAWLEY

Enc

Clinical Costing for a District General Hospital Anaesthetic Department

Stephen Whitfield, 5th Year Medical Student

Introduction

Health care resources, at present, are controlled by the imposition of cash limits, applied locally, by health authorities. Staff compliments and equipment requirements for anaesthetic services are indirectly restricted by these limits, though the cost of drugs and disposable materials is less clearly controlled. The introduction of clinical budgeting is assumed to imply that 'functional' or departmental budgets would be awarded to supporting services such as anaesthesia^{1,2}. Such a budget might cover the cost of drugs, disposables, equipment depreciation and staffing. Clinical costing, however, requires clear guidelines on the range of costs to be included, and firm direction on the detail of costing procedure, so that realistic comparison between similar service units can be made. No such guidelines are available.

In 1960, in Southampton, Shackleton calculated that the average cost of one anaesthetic was £3.69, a price which included an element for staff costs³. In 1980 Astley and Secker Walker updated this to £29.98 per anaesthetic in a London teaching hospital⁴.

Falkirk Royal Infirmary is a district general hospital with 500 acute beds. It serves a population of around 160,000 people. There are nine anaesthetists, including the junior complement, and all anaesthetic services are provided except for cardiothoracic, neurosurgical and neonatal anaesthesia.

In this study, an estimate of the annual cost of drugs, disposable materials, equipment depreciation and staff has been determined, along with the calculated individual cost of a major, an intermediate and a minor procedure, as a proportion of the whole.

Table 1 Procedure Classification (not exclusive)

Majors	General surgical abdominal operations Gynaecological abdominal operations Total hip replacements Major vascular procedures Cataracts and Trabeculectomies Abdominal prostatectomies Pneumonectomies Oesophagectomies Other operations of equivalent scale
Intermediates	Hernia repairs Varicose veins Fractured neck of femur Fractured tibia Trans-urethral prostatectomies Vaginal hysterectomies and repairs Oral surgery and conservative dental All other procedures of equivalent scale
Minors	Cystoscopies Curettag Laparoscopies Minor dental Minor and outpatient orthopaedics Minor and outpatient surgery All other procedures of equivalent scale

Methods

Retrieval of Information

A survey of all anaesthetic procedures, performed by the department, was conducted throughout a three week period in May 1987. Anaesthetists were requested to record the drugs and disposable materials used, along with any wastage. Each procedure was classified and the time spent was recorded. The pharmacy department assisted in the provision of price lists, and each anaesthetic was costed. Classification involved arbitrary allocation to minor, major or intermediate categories. This was done in a manner which reflected anaesthetic rather than surgical complexity. (Table 1)

The entire anaesthetic department workload for 1986 was also reviewed from the operating department registers. The total number of anaesthetics given was established, and these were similarly classified to determine totals for major, intermediate and minor procedures. (Table 2)

Table 2 Workload 1986

	Majors	Intermed.	Minors	Totals
Gen surgery	577	897	1197	2671
Obs & Gyn	507	441	925	1873
Urology	86	265	1181	1552
Orthopaedics	104	249	914	1267
Out patients			368	368
Epidurals and Maternity		207	28	235
ENT	17	26	832	875
Eyes	169	73	113	355
Dental		155	318	473
ECT			299	299
Totals	1460 14.67%	2313 23.25%	6175 62.08%	9948 100%

It was found to be impractical to measure use of anaesthetic vapours and gases within the survey. These were costed separately. Annual consumption figures were acquired from the pharmacy, and the British Oxygen Company provided a breakdown of nitrous oxide costs. In addition, a range of costs for materials such as plastic tubing, swabs, spirit and rubber endotracheal tubes, could only be determined by estimating weekly or annual consumption. A range of back-up or supporting drugs is found on anaesthetic room shelves. These are necessarily available for every anaesthetic though many of them are seldom used. An allowance for their availability (and their expiry) was included. Oxygen, as provided centrally in liquid form, could not be costed. It was estimated to be less than one three hundredth of a penny per litre. Its contribution to costs was ignored.

A comprehensive inventory of all general anaesthetic equipment was drawn up. The list included a range from rubber masks to ventilators and monitors. The cost of an

appropriate replacement for each item was established by consulting manufacturers, and referring to recent invoices. Arbitrary life-spans were attributed to groups of these items in order to determine an annual sum to be retained for replacement purchasing. In addition, the cost of maintenance contracts for existing equipment was established.

Finally, the cost of staffing was reviewed. Whole time equivalent complements were determined for both the anaesthetists and the anaesthetic nursing time. Some adjustments were required for the latter, to account for the small proportion of their time which was not spent on anaesthetic duties.

Processing of Results

1986 Register Figures

The department workload for 1986 is presented in Table 2. 1460 major procedures, 2313 intermediates and 6175 minors were performed.

Survey 1987

This comprised 458 anaesthetic procedures given over a 23 day period. This amounted to 4.5% of the 1986 total which is less than would be expected for the proportion of time (6%). There were 65 major, 118 medium and 275 minor procedures performed. Their proportions are representative of the 1986 whole. (Table 3)

Table 3 Number of Anaesthetics

	1987		1986	
	Totals	(3 weeks)	Totals	(12 Mths.)
Major	65	(14.2%)	1460	(14.7%)
Intermed.	118	(25.8%)	2313	(23.25%)
Minor	275	(60.0%)	6175	(62.1%)
Totals	458	(100%)	9948	(100%)

The operating times averaged 77.6 minutes for a major procedure, 43.9 minutes for an intermediate and 13.9 minutes for a minor. In Table 4 these have been extrapolated to the 1986 figures, to estimate the total departmental operating time, and the proportion given to each type of procedure. 38.2% of departmental working time was spent

Table 4 Time Spent

(i) 1987 Survey

	Op Time (mins)	Mean (mins)
Majors (62)	4,815	77.66
Intermediate (108)	4,748	43.96
Minors (268)	3,540	13.21
Total	13,103	

20 cases no time submitted

(ii) 1986 Survey

	Mean times	No of Ops	Time-spent (mins)	Time-spent Proportions
Major	77.66	1460	113,383	(38.2%)
Interm.	43.96	2313	101,679	(34.3)%
Minor	13.21	6175	81,572	(27.5%)
Total	—	9948	296,634	—

providing major anaesthesia, 34.3% providing intermediate anaesthesia and 27.5% on minor anaesthesia. Thus, annually determined costs can be divided on the basis of time-spent. (Time-spent proportions)

The main body of costs from drugs and disposables were derived from the survey. These are presented in Table 5, along with similarly calculated estimations for a twelve month period.

Table 5 Mean costs of drugs and disposables. Survey 1987 (458 Anaesthetics)

	Major (65 cases)	Intermed (118 cases)	Minor (275 cases)
Drugs	£4.73	£2.85	£1.06
Disposables	£3.74	£2.67	£0.87
Total	£8.47	£5.52	£1.93
1986 figures	1460	2313	6175
Extrapolation to 1986 figure total	£11,908	£12,767	£11,917

Total £36,593

Back-Up Drugs

A range of essential drugs, available on the shelves, was recorded and priced. Although their expiry period was on average 3 years, a 2 year lifespan allowed for minimal usage as well as wastage. Any of these drugs appearing in the survey were ignored. The cost is detailed in Table 6.

Table 6 Back-up Drugs and Semi-Disposable Equipment

Back-up Drugs		
Total Cost	£964.46	
Annual Cost	£482.20	£482.20
Semi-Disposable Equipment		
Total Costs	£3,678.00	£3,678.00
		Annual Total £4160.20
Cost per anaesthetic (9948) 0.41p		

Cost per case was determined, without reference to time-spent.

Semi-Disposable Equipment

Rubber endotracheal tubes were estimated to have a twelve month lifespan. To permit all lists to function and sterilisation to be carried out, some 370 of these are required. This was costed along with annual consumption of swabs, spirit, tape and other incidental materials. A proportion of the total of £3678 was allocated to each case without reference to time-spent. (Table 6)

Nitrous Oxide

The total cylinder rental and delivery costs for all theatres amounted to £1394.75. Filling costs varied from 0.22p per litre to 0.5p per litre for the largest cylinders. An average cost of 1.5p per minute was assumed. The total operating time, derived from the survey and the 1986 figures, permitted calculation of annual 'filling costs'. This

was added to rental and delivery, to provide an annual figure, and the cost per case was determined by reference to time-spent. (Table 7)

Table 7 Nitrous Oxide

(i) Annual Cost

Cost of rent for 67 cylinders (assorted size) plus weekly deliveries (inc VAT)	£1,394.75
Cost per litre (from filling costs)	Cost per min. at 5 litres per minute
D size - 0.5p	2.5p
G size - 0.22p	1.0p
Assume 1.5p per min running cost per anaesthetic	
COST = 296,634 (mins of anaesthesia) x 1.5 (p/min)	£4449.50
TOTAL	£5,844.25

(ii) Cost per Anaesthetic

	Time-spent Proportion	Cost	Cost per Anaesthetic
Major	38.3%	£2,238.3	£1.53
Interm.	34.3%	£2,004.6	£0.86
Minor	27.4%	£1,601.3	£0.26
Total	100%	£5,844.25	

Halothane, Enflurane, Isoflurane

Annual consumption for all theatres was obtained from pharmacy. This is presented in Table 8. Time-spent proportions for majors and minors were adjusted to reflect

Table 8 Anaesthetic Vapours

(i) Annual Cost

	Total bottles	Cost
Halothane	372	£2,689.00
Enflurane	54	£2,070.00
Isoflurane	24	£874.00

(ii) Cost per Anaesthetic

	Time-spent Proportions	Adjusted for varied Concentration	Cost	Cost per Anaesthetic
Major	38.3%	17.6%	£ 991.24	£0.68
Interm.	34.3%	31.6%	£1785.60	£0.77
Minor	27.4%	50.8%	£2,875.00	£0.46
Total			£5,633.00	

higher inspired concentrations in the latter. It was assumed intermediate procedures averaged twice the working inspired concentrations of majors and minor procedures averaged four times the working inspired concentrations of majors.

Equipment and Maintenance

The equipment inventory was in four sections, grouped according to arbitrary life-spans of 2 years, 5 years, 10 years and 15 years. The total capital value was around £161,000 including VAT. The annual figure to be retained for future purchasing was £14,577 (Table 9). Annual contracts for

service and maintenance amounted to £6,550, the bulk of which was an estimate of the anaesthetic department's share of the British Oxygen Company invoice. Most servicing and maintenance is provided by the regional physics department. No account has been made for their services. The total annual costs were allocated to individual anaesthetics on a time-spent proportional basis.

Table 9 Equipment and Maintenance

(i) Annual Cost

	Capital Cost (+ VAT)	Cost Per Year
Equipment		
15 year life span	£ 97,914.00	£ 6,527
10 year life span	£ 51,935.00	£ 5,193
5 year life span	£ 9,181.00	£ 1,836
2 year life span	£ 2,042.00	£ 1,021
Totals	£161,072.00	£14,577.00
Maintenance Contracts		£ 6,550.00
Total		£21,127.00

(ii) Cost per Anaesthetic

	Time-spent Proportion	Cost	Cost per Anaesthetic
Major	38.3%	£ 8,092	£5.54
Intermediate	34.3%	£ 7,246	£3.13
Minor	27.4%	£ 5,789	£0.93
		£21,127	

Staffing

Medical staff comprises 5.5 wholtime equivalent consultant anaesthetists, 0.5 WTE associate specialist, 2 second year registrars and one SHO. The juniors have 13 UMPT's each. Annual salaries are calculated to be £241,146. The anaesthetic nursing team includes one sister, one staff nurse, 3.75 WTE enrolled nurses, three anaesthetic orderlies and one auxiliary nurse. The junior members of this team are not infrequently required to provide some non-anaesthetic duties. This is reflected in a total salary cost of £63,204. Total anaesthetic salary costs of £304,350

Table 10 Staffing

(i) Annual Costs

Medical Staff	£241,146
Nursing Staff	£ 63,204
Total	£304,350

(ii) Staffing Per Anaesthetic

	Time-spent Proportion	Cost	Cost per Anaesthetic
Major	38.3%	£116,566	£79.84
Interm.	34.3%	£104,392	£45.13
Minor	27.4%	83,392	£13.50
Total		£304,350	

have been allocated to individual anaesthetics on a time-spent proportional basis (Table 10).

Accounts

All these factors can be brought together to produce 2 sets of accounts. The first shows the cost of running the service for the year. The second derives the cost of an anaesthetic in each class.

Accounts 1: Annual Costs

<i>Drugs and Disposables</i>			
General	(Table 5)	£36,593.00	
Back-up & Semi-disp	(Table 6)	£4,160.20	
Nitrous Oxide	(Table 7)	£5,844.50	
Vapours	(Table 8)	£5,633.00	
		£52,233.70	£52,230.70
Equipment Replacement and Maintenance	(Table 9)	£21,127.00 (5.6%)	
Staff	(Table 10)	£304,350.00 (80.6%)	
			TOTAL £377,707.70

Accounts 2: Cost Per Anaesthetic

	Major	Intermediate	Minor
Drugs & disposables general	£ 8.47	£ 5.52	£ 1.93
Back-up & semi-disposables	£ 0.41	£ 0.41	£ 0.41
Nitrous Oxide	£ 1.53	£ 0.86	£ 0.26
Anaesthetic vapours	£ 0.68	£ 0.77	£ 0.46
Total drugs & disposables	£11.09	£ 7.56	£ 3.05
Equipment & maintenance	£ 5.54	£ 3.13	£ 0.93
Staff	£79.84	£45.13	£13.50
Total Costs	£96.47	£55.82	£17.49
<i>Average cost of all anaesthetics: £37.99</i>			

Discussion

Griffiths advised, in 1983, that clinical budgets should be introduced more widely as a means of maintaining tighter financial control and responsibility within hospital and departmental budgets⁵. In this clinical costing of an anaesthetic service, however, many legitimate components have been excluded; costs of heating, lighting, facilities and fixtures have not been determined and might not be divisible; costs of x-ray, pharmacy and physics services are unknown. In this sense the study is deficient. In addition, estimates have necessarily replaced strict accounting in many aspects of the work. Arbitrary assumptions about equipment lifespans or varying staff contributions can be explained, but scarcely defended. Some form of standardisation is required; budgets will be inaccurate and comparisons between similar service units will be impossible.

Costs of drugs and disposables in previous studies have been calculated from source, on an annual basis^{6,7,8,9}. This may well overestimate the cost by failing to allow for use of the materials by other disciplines. The survey technique, used in this study, may admittedly underestimate, by failing to record every item in every anaesthetic. Some form of sample, we feel, is essential, if only to determine the amount of time spent on each procedure. Only with this

knowledge, can the proportion of costs be divided, to price different groups of anaesthetic realistically.

The anaesthetic service unit of costing must be the price of a single anaesthetic. If accurate and adjusted for different types of procedure, it could be used to 'charge' other clinical budget holders for services given. More generally applied, it could be used, in reverse, to determine the size of budget to be awarded. Previous studies have provided, only, a single average unit cost^{3,4}. This is interesting but unhelpful.

Our average cost of a single procedure was £38, which represents a 26% increase from Secker Walker's estimate in 1980⁴. However, our figures of £96 for a major anaesthetic, £56 for an intermediate and £18 for a minor, are a more practical expression of the costing result.

It would appear that a nine-strong anaesthetic team providing normal anaesthetic services for a population of 160,000 can manage on a budget of £377,000. 80% of this figure represents staff costs. There is, therefore, little room to manoeuvre within the budget, without changes in the staff complement. This problem was also noted by Secker Walker¹⁰. Equally, small differences in staff/workload ratio would lead to very significant differences between the budgets of different anaesthetic departments, irrespective of their tastes in expensive drugs or equipment.

Summary

A clinical costing exercise for a district general hospital anaesthetic department is presented. Annual costs included drugs, disposable materials, semi-disposable equipment, depreciation on major equipment and staffing. The average cost of a single major anaesthetic was £96.00. That of a minor anaesthetic was £18.00. The practical problems of costing and the need for standardisation are discussed.

Acknowledgements

I would like to thank everybody in the anaesthetic department of Falkirk and District Royal Infirmary for their help and cooperation, without which, this project would not have been possible.

Special thanks to Dr D. S. Simpson for all his help in organising and writing up this project.

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