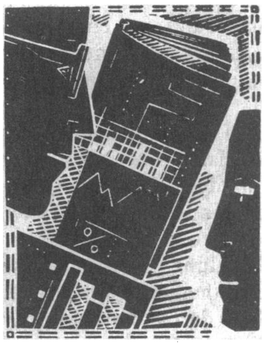
AUDIT IN PRACTICE



Management importance of common treatments: contribution of top 20 procedures to surgical workload and cost

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Abstract

Objective—To assess the contribution of the most frequently performed procedures to surgical workload and to evaluate the financial implications.

Design—Analysis of data held on the department's computerised clinical information system.

Setting—Department of surgery in a district general hospital.

Patients—4845 patients were treated by surgeons in three consultant firms over an 18 month period and 5346 patients by surgeons in a single firm over a five year period.

Main outcome measures—Percentage and cumulative percentage contribution to workload in order of frequency by procedure. Costs of the commonest and costliest treatments.

Results—Half of the workload of the department was encompassed by eight procedures. Twenty procedures accounted for 70% of the work. For a single firm 20 procedures represented over 80% of all the surgical work. Transurethral prostatectomy was the treatment that consumed most resources (£240 900 for 198 patients in 18 months). The costliest patients were those who had undergone complicated large bowel surgery, vascular reconstructions, or amputation.

Conclusions—Clinicians and managers need to appreciate the importance of the most common surgical procedures. It is vital that performance and costing of these procedures are optimum as they contribute disproportionately to overall results and finance.

Introduction

Doctors are wont to exclaim that 90% of their problems are generated by 10% of their patients—that is, a small number of "difficult" patients are responsible for the greatest clinical and economic perturbations. Financial, as distinct from other, costs calculated according to type of patient for a surgical unit could have important lessons for audit, resource management, and the new management task of costing to establish contracts for the internal market between purchasers and providers.[1] I describe here the use of a clinical information system to work out such costs and apply them to resource management.

Three consultant surgical firms whose interests are complementary and represent a wide variety of surgery, including urology, had, since 1989, recorded their episodes of inpatient management in the Micromed (Medical Systems) clinical information system.[2] Recent enhancements to this system have allowed reports on resource utilisation to be produced. One firm had additional information for five years. In the system the treatment received by the patient is entered by selection from a three level menu. In this there are more than 1500 predefined procedures for general surgery, each of which has an Office of Population Censuses and Surveys (OPCS) code linked to it.[3] The menu items are, however, more specific than OPCS codes; thus, under OPCS, all inguinal hernia repairs have one code, but in Micromed different repairs can be specified. For a given set of OPCS codes there are about 50% more Micromed menu items.

Methods

There were two parts to the study.

(1) TOTAL SURGICAL WORKLOAD

To maintain comparability of the data with other sources the total surgical workload was based only on OPCS codes. Data from 18 months of clinical activity between 1 January 1989 to the end of June 1990 for all three firms were exported from the information system to a spreadsheet (Microsoft Excel). A sort was performed on the OPCS code ascribed to the first procedure recorded for each admission episode, so bringing together admission data for similar procedures. When the numbers of each operation performed had been recorded a further sort on that figure produced an ordered list of the frequency for each. A second or subsequent procedure was done in 2% of admissions but was ignored as a much larger computer would have been necessary to do such a multidimensional analysis. The same technique was used to analyse the data on the five years of clinical activity available from one firm.

(2) RESOURCE UTILISATION ANALYSIS

Within the Micromed program is a resource utilisation module that allows four types of ranking analysis: by total number of episodes by procedure, by total days of hospital stay by procedure, by total charge for procedure, and by charge per patient. In each analysis the output consists of information on the number of episodes for each rank; the total and mean days of hospital stay; the treatment, hotel, and total charges; and, finally, the charge per patient. The top 20 ranked procedures were analysed for the pooled data from the three firms over the 18 month period.

To calculate the cost of an inpatient episode the bed charge per day and the cost of any operation must be estimated. In the absence of any scale of severity or complexity of a procedure within the NHS, I used the British United Provident Association (BUPA) grades.[4] The bed charges include all overheads (such as heating, food, pathological tests, etc) and staff expenses except those attributable to the operating theatre; theatre costs are based on a rate per hour and time of the procedure, both of which rise with increasing complexity of surgery. The costs assigned here (table I) are the same as those used in previous work on resource modelling.[5] A total charge is the cost of the episode

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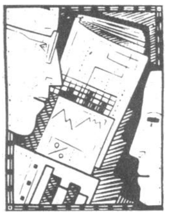

TABLE I—*Costs used to calculate total charge for surgical procedures*

Item	Cost/h (£)	Duration (min)*	Cost (£)
Day case charge			65
Hotel charge/night			110
Treatment†:			
Non-operative			50
Minor	175	30	88
Intermediate	225	45	169
Major	300	75	375
Major plus	400	150	1000
Complex major‡	420	180	1260

*Based on estimates from my operating theatre.
†Categories as described by BUPA (British United Provident Association).
‡Most complex major operations were category C or D (the lowest). Theatre costs were only marginally higher than for major plus operations.

multiplied by the number of admissions. Because the analysis was done within the information system the Micromed codes were used.

Results

(1) TOTAL SURGICAL WORKLOAD

In the first part of the study 3975 of 4845 episodes (82%) were suitable for analysis by OPCS code. The top five procedures in order of frequency were upper gastrointestinal endoscopy, inguinal hernia repair, cystoscopy, transurethral resection of the prostate, and surgery for long saphenous varicosities. Among the next 15 were appendicectomy, circumcision, breast biopsy, transurethral resection of bladder tumour, and thyroidectomy. Also in this group were two non-operative procedures: intravesical chemotherapy and "observation and symptomatic treatment."

Table II shows the cumulative percentage contribution of the top 20 procedures to the overall workload.

TABLE II—*Data sets for three firms and one firm in surgery department of district general hospital for 20 most frequently performed procedures, comprising actual number of procedures performed, cumulative sum of procedures, and cumulative percentage of all admissions*

	Three firms (n=3975)			One firm (n=5346)		
Rank	No	Cumulative	Cumulative %	No	Cumulative	Cumulative %
1	401	401	10·1	708	708	13·2
2	307	708	17·8	612	1320	24·7
3	293	1001	25·2	541	1861	34·8
4	256	1257	31·6	281	2142	40·1
5	215	1472	37·0	274	2416	45·2
6	177	1649	41·5	243	2659	49·7
7	176	1825	45·0	243	2902	54·3
8	165	1990	50·1	223	3125	58·5
9	150	2140	53·8	157	3282	61·4
10	85	2225	56·0	153	3435	64·3
11	85	2310	58·1	138	3573	66·8
12	81	2391	60·2	120	3693	69·1
13	74	2475	62·0	98	3791	70·9
14	66	2531	63·7	86	3877	72·5
15	63	2594	65·3	83	3960	74·1
16	54	2648	66·6	80	4040	75·6
17	51	2699	67·9	74	4114	77·0
18	48	2747	69·1	62	4176	78·1
19	45	2792	70·2	55	4231	79·1
20	45	2837	71·4	54	4285	80·1

For example, the five most common procedures accounted for 37% of the workload. In my department eight operations (by OPCS code) represent over half the total surgical activity and 20 procedures account for over 70%. The first 100 classifications account for 97%, the remaining 3% being made up of about 160 rarer and usually one off operations.

For my own firm, which has a considerable commitment to urology (which accounts for 61% of discharges), the analysis was of 5346 episodes over a five year period. Table II indicates that the frequency distribution of procedures was, in general, comparable with that for the three firms combined for the top 20 procedures, though this hides the fact that the order differed in detail. Transurethral resection of the prostate was the most commonly performed procedure, followed by cystoscopy. The first 10 also included circumcision, inguinal hernia repair, and appendicectomy. Twenty procedures accounted for more than 80% of the workload.

(2) RESOURCE UTILISATION ANALYSIS

Frequency of procedures—In all, 395 different treatments (as specified by Micromed) were recorded and corresponded to about 260 different OPCS codes. Twenty procedures (5·1%) accounted for 49% of the total inpatient episodes. Inguinal hernia repair (by different techniques) accounted for three of the top 20 ranked procedures. These 20 accounted for 6030 (31%) of 19 546 total inpatient stay days, £386 835 (45%) of the £851 071 treatment cost, and £1 116 045 (36%) of the £3 112 411 total cost. The mean length of inpatient stay for these episodes was 4·4 days and for the remainder of the admissions was 7·8 days. When these data were ranked by total days of stay transurethral resection of the prostate alone accounted for 1515 (7·8%) of all days. Ranked second as a percentage of total days was bedrest and symptomatic treatment, which consumed 891 (4·6%) days.

Costs—Ranked by total charge transurethral resection of the prostate was again top. I estimate that this treatment for 198 patients cost about £240 900. Upper gastrointestinal endoscopy in 420 patients (352 as day cases) cost £149 630, and cholecystectomy in 106 patients was estimated at £126 210. The ranking by patient charge highlights the greatest individual episode costs. The 20 patients (rather than treatments) with the highest patient charge represented 0·4% of admissions but consumed 1105 (5·6%) of the stay days and £129 766 (4·2%) of the total cost. Their mean stay length was 55 days. These patients had undergone amputation for limb ischaemia (eight patients, cost £58 107); vascular reconstruction (three patients, cost £16 640); complex large bowel surgery for carcinoma or diverticular disease (12 patients, cost £38 529); or were delayed in hospital pending the resolution of social problems (two patients, cost £18 020).

Discussion

Accuracy of coded discharge data on inpatient care has always been a problem. The main reason why 18% of records were excluded from further analysis in the first part of the study was that clinical input data on procedure had been imprecise, ambiguous, or not present at all. Lyons and Gumpert recently reported a similar shortfall (17%) of coded discharges compared with their district's patient administration system.[6] Perusal of the excluded records in the present study suggested that almost none were of patients who had undergone one of the top 20 procedures. Although this exclusion rate is high, it represents the first 18 months of clinical computing for two of the three firms. However, if the relatively sophisticated method of collecting management information developed in my department still has this degree of deficiency close financial control will remain difficult.

The non-operative categories in the top 20 procedures should serve to remind surgeons that any consideration of the allocation of resources or study of efficiency must take into account surgical patients who do not have an operation. My department's audit shows that between 15% and 20% of our patients do not visit the operating theatre, and I believe that other surgeons will have similar experiences.

In the first part of the study no aggregation beyond the OPCS code was performed. Thus right, transverse, left, and sigmoid colectomies were regarded as distinct procedures, and, therefore, colectomy failed to reach the top 20 (right hemicolectomy on its own was ranked 25). Had further aggregation been undertaken in this and other topics the top 20 procedures would probably

have easily encompassed 80% of the total workload of the department.

It is not yet clear at what level of aggregation costing should take place. On the one hand diagnostic and operation codes need to be of sufficient specificity to be clinically useful (hence the greater specificity of Micromed codes compared with OPCS4), while, on the other hand, for costing and management purposes it makes more sense to undertake a degree of aggregation. This can be achieved either by taking a step back up the hierarchical structure of the coding system in question or by translating codes into diagnostic related groups. However, as these data show, useful information can be produced even at the highest level of specificity.

The range of procedures undertaken by a single firm in a hospital where firms are organised to be complementary is inevitably going to be smaller than that of the sum of the firms. In addition, single firms often have a personal leaning towards certain topics of interest or perceived need. Study of the single firm shows that the proportion accounted for by 20 procedures reached 80%. Some surgical specialties, such as gynaecology, cardiothoracic surgery, and ophthalmic surgery, might have an even higher proportion of their work embraced by 20 procedures.

The resource utilisation analysis shows that although the top 20 treatments (by Micromed menu) account for 49% of turnover, they consume only 36% of total cost. This is because the common treatments tend to have a shorter stay length (4·4 days compared with an overall mean of 6·3 days) and be less complex (and therefore cheaper) theatre episodes.

The analysis of the total cost of a procedure should identify areas which consultants and managers can examine for possible changes that might create a financial saving—for example, a small change in the way a procedure is organised or in hotel costs multiplied many times over will have a considerable effect on total cost. In my department we are investigating the feasibility of undertaking transurethral resection of the prostate in a five day ward. Similar studies should be undertaken which focus on any of a surgeon's top 20 procedures.

The ranking by cost of an episode emphasises the additional expenditure incurred if patients stay in hospital for excessive lengths of time and underpins the axiom related to "difficult" patients, with which this paper began. Part of this problem arises from the difficulty of placing patients who have no need of acute surgical care for most of their admission but who could not cope at home. In my health district the possibility for long term placement is less now than it has been for many years. These patients' bed consumption reduces the availability of beds for other patients, and, given restraints on the number of beds, the only variable that can be manipulated is the turnover of short stay elective patients.[5] Clearly, the long stay problem must be solved to enable elective patients to gain health care and so to prevent further increases in the length of waiting lists.

Every surgeon should take steps to discover what are his or her most common procedures. It is then possible to focus on them in an endeavour to refine the process of care to produce an optimum service for the patient. The surgeon should keep a close watch on the results from the top 20 procedures for they will have a profound effect on overall performance. While junior surgical staff need guidance and training in a wide range of procedures, it is vital that they are instructed and assessed from the outset in executing the common operations undertaken by the firm in which they work.

Our findings clearly show that in the process of clinical audit and closing the feedback loop[7,8] it is worth ascertaining and then focusing on procedures that are most common in a surgical firm or department. When quality is assured in those subjects it is likely to follow elsewhere. Because of the costs incurred, however, it is vital that audit—as distinct from any dismissive approach based on costs alone—looks at the plight of long stay patients.

Costs estimated in this way will be as accurate as is possible with present techniques because pricing is being undertaken with a knowledge of the precise nature of the procedure in question and with a sound base of historical data. Accuracy is limited only by the precision of the costing of a bed or day charge and theatre charges used for the calculations in the resource utilisation reports. Given valid input, the clinician or manager may be confident that he or she can account accurately for the greater part of surgical expenditure. The rest can be estimated from the severity mix of the remaining patient episodes. This process has, in our hands, proved to be both simple and meaningful.

In many integrated hospital computer systems details of every cost (for example, pathology tests) is built up against each patient episode—hence the need for very large systems. If individual itemised patient accounts ever become necessary then such systems will be vital. This costing technique will not, however, be any more precise than that described above for estimating costs by procedure—all that is required at present for debate with a purchasing authority.

Some clinicians may have difficulty coming to terms with the philosophy that we should start taking a business approach in the analysis of our top "lines" or "products." However, the structure of the health service from April 1991 is such that those who ignore these principles may well come off second best.

I thank the many registrars and senior house officers who have been involved in the entry of data into the Micromed system. I also thank Mr W N W Baker and Mr J Horner for permission to report results derived from their surgical activity and Mr R Rivett of Medical Systems, without whose vision and enthusiasm this idea would not have arisen. Finally, I thank Professor Hugh Dudley for help and advice. British United Provident Association (BUPA) kindly consented to the use of their operation severity classification for the purposes of this study.

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