

ASPECTS OF THE HOSPITAL SERVICE

The surgical staffing of the future

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Key words: HOSPITAL PERSONNEL; SURGICAL STAFFING; NATIONAL HEALTH SERVICE, BRITISH

Summary

An analysis of the amount of surgical work carried out in the hospitals of the West Midlands Health Region during the year 1975 has been carried out. From this it is calculated that the number of surgeons on permanent contract will have to be increased by between 50 and 100%, that of registrars being reduced by 50% and that of the rest of the junior staff by 15–20%, to enable an equivalent amount of work to be done in the future.

Introduction

The object of this paper is to estimate how many surgeons holding a permanent NHS contract of 10 3½-h sessions a week* would be needed in general surgery to get through the work if the number of registrars (both grades) were to be reduced to that required to fill the vacancies of retirement and premature death. The data have been supplied by, and are therefore confined to, the West Midlands Regional Health Authority. In 1975, the last full year analysed by the computer according to the International Classification of Diseases, there was a total of 98 770 deaths and discharges of general surgical patients, but only 81 918 were coded according to diagnosis. In this smaller number 58 796 operations, classified by diagnosis or procedure (for example, laparotomy, reimplantation of ureter), were presented under 112 headings. Urology was included with general surgery. The work done at the two teaching hospitals attached to the Birmingham Medical School was excluded as unrepresentative of the Region as a whole.

*It is recognised that some surgeons may elect to retain the present contract for 9–9½ sessions a week. This does not affect the calculations below.

Ratio of complex to simple operations

The number of surgeons needed to carry out 58 796 operations in a year depends on the sum of the times each of these operations took to do. In general surgery, as in other branches of surgery, the time taken depends on the complexity of the procedure, the skill and experience of the operator, and whether he is fast or slow at completing it.

To answer this question the Californian Relative Value Weighting System (1) has been consulted. It is based on the assumption that the longer an operation takes to do, the more complex it is and the more skill and experience are called for. It is open to the objection that it will overestimate the skill of the surgeon who is slow and also the complexity of the work he does. However, 30 years of experience and observation provide a shrewd estimate of the 'average' time each operation takes to do. As a protection against these weaknesses the operations were divided into four large groups, A, B, C, and D, designed to allow a difference of 1 h between the time taken by a slow surgeon and that taken by a fast one doing a similar procedure. The result of the subsequent analysis of the 58 796 operations is presented in Table I. It will be noted that 36 377, or 61.9% of the total, are quick to perform and therefore, by definition, simple in nature.

The next step is to calculate how many 3½-h operating sessions the year's work amounts to, because by dividing the total number of sessions by the number of sessions each surgeon supplies gives the total number of surgeons required. Table I, as well as showing that the year's work needs 24 480 notional half-day (NHD) sessions, shows also the number of NHD/sessions contributed to this total by each class of operation, complex, simple,

TABLE I *Distribution of operations according to Californian Relative Value Weighting System and associated numbers of theatre NHD/sessions*

Class	Duration (min)	No of operations	No of sessions
A	210	1844	1844
B	150	9765	8137
C	90	10 810	5405
D	45	36 377	9094
<i>Total</i>		58 796	24 480

and intermediate. In calculating the number of NHD/sessions contributed by classes B, C, and D an interval of 30 min between operations (representing the time taken to prepare the theatre etc) has been allowed for. Thus the number of operations in each class has been multiplied by the duration of the operation in minutes and the product divided by 180 (210-30) min, the actual operating time, to give the corresponding number of sessions.

Number of surgeons

This calculation of the number of surgeons needed in future will be carried out on the assumption that out of his 10 weekly sessions each surgeon will do 4 in the theatre*. Also it will be assumed that he will take his 6 weeks annual leave and work for 46 weeks. Therefore he will contribute 184 operating NHD/sessions in a year. As the total number of NHDs required by the year's work is 24 480, the result of dividing the total by 184 shows that the number of surgeons needed is 133. (If the sum is repeated on the assumption that every surgeon does 5 operating sessions a week, not 4, the number of surgeons needed falls to 106.)

The Todd vocational training scheme would supply those 133 surgeons with 26-27 registrars (both grades). They are strict career grades and their number is not determined by the amount of work to be done. This is important because a recent 10% survey conducted by the West Midlands RHA found that out of the 58 796 operations here analysed, 48.6% were performed by the two registrar grades.

*It is assumed that each surgeon will do 4 routine 3½-h theatre sessions per week both on the 9-session contract and on the proposed 10-session contract. Therefore the calculations are valid for both contracts.

A demarcation line

If the operative work to an annual total of 58 796 were equally distributed between 133 surgeons, each would do 14 in Class A, 73 in Class B, 81 in Class C, and 274 in Class D to an individual total of 442 operations in a full year.

Statements made by established regional consultants in general surgery and publications by the Hospital Consultants and Specialists Association suggest that the majority of established consultants agree that the cases in Class D, 61.9% of the total, do not call for the degree of skill and experience surgeons in this group had to offer. A local investigation of 7373 operations confirmed this attitude of mind as the Class D work was nearly always delegated to a registrar.

Evidently a demarcation line must be drawn to separate the patients in Class D from those in the other three classes. There are two main ways in which this can be done.

METHOD I

This method simply draws a horizontal line of demarcation between Class C and Class D. The three classes above the line, A, B, and C, add up to an annual total of 22 419 operations, will call for 15 386 NHD/sessions, and will need 84 surgeons, each doing 4 NHDs weekly in the theatre to an annual total of 184 NHDs. Class D, below the line, numbering 36 377 operations, requires 9094 NHD/sessions and 49 surgeons, also doing 4 sessions a week to a total of 184 NHDs in the year. This method is displayed in tabular form in Table II.

In actual practice, of the 58 796 operations in this analysis 30 221 (51.4%) were performed by 86 consultants and the remaining 28 575 (48.6%) by 62 registrars (7 senior) helped by 71 senior house officers (SHOs).

Two contracts would be offered, one

TABLE II *Line of demarcation drawn between Class C and Class D operations, with numbers of surgeons needed above and below that line*

<i>Class</i>	<i>No of operations</i>	<i>No of sessions</i>	<i>No of surgeons</i>
A	1844	1844	10
B	9765	8137	44
C	10 810	5405	30
	<i>Total</i>		
	22 419	15 386	84
D	36 377	9094	49
	<i>Grand total</i>		
	58 796	24 480	133

specifying a detailed restriction to the operations defined as being in Classes A, B, and C, while the other would specify its theatre work as belonging to Class D. These contracts could be of four kinds: (1) both contracts of equal status, of 10 NHD/sessions, and permanent to the retiring age of 65 years; (2) the Class D contract of equal status but limited in tenure until a retirement vacancy occurs in the other contract to admit the holder; (3) the Class D contract to be of subconsultant status but limited in tenure until a retirement from the other contract provides a vacancy for the holder to step into; and (4) the Class D contract to be subconsultant and permanent to the normal retiring age of 65 years.

The total number of contracts would be 133: 84 for Classes A, B, and C; 49 for Class D. Whichever form were to be adopted the number of registrars (both grades) would be 26 or 27 because their number, being determined by the career structure, is proportional to the total number of permanent contracts, 133 in this case, not to the status of those contracts or subdivisions between them.

METHOD 2

This method follows the observed trend that established regional surgeons are tending to

specialise in gastroenterology, urology, and arterial surgery. Table III demonstrates the effect of dividing the 58 796 operations into specialist surgery above the line of demarcation and general surgery below. As the total number of operations is unchanged and as they are the same operations they will require the same number of theatre NHD/sessions and the same numbers of surgeons and registrars.

In this case there would be four contracts and, as with Method 1, there would be the same four alternative ways they could be drawn up except that with Method 2 the line of demarcation would separate specialist surgery from general surgery, not various classes within general surgery.

The calculations for both methods have been based on a contract with 4 theatre NHD/sessions per week. If they were to be repeated for a contract of 5 or 6 theatre NHD/sessions a week the number of surgeons, and therefore the number of registrars, would in each case be reduced.

Whichever way the contracts are arranged they would start at 32 or 33 years of age.

The on-call emergency demand

In the year under examination 98 770 general surgical patients were admitted, of whom

TABLE III *Line of demarcation drawn between specialised operations above and general below, with corresponding numbers of surgeons*

<i>Class</i>	<i>No of operations</i>	<i>No of sessions</i>	<i>No of surgeons</i>
Gastroenterology	12 607	8501	46
Urology	10 749	3248	18
Arterial	3343	3143	17
	<i>Total</i>		
	26 699	14 892	81
General	32 097	9588	52
	<i>Grand total</i>		
	58 796	24 480	133

43 249 (43.8%) came in as emergencies. Of this number less than a quarter were operated on immediately: 5757 for acute appendicitis, 879 for obstructed hernia, 652 for intestinal obstruction, 523 for perianal abscess, 465 for perforated peptic ulcer, 215 for torsion of the testis, and 111 for intussusception and malrotation in young children. There were smaller groups of operations spread over a wide diagnostic field; but the bulk of the emergency admissions were not operated on immediately.

Most of these admissions were managed, and operated on where necessary, by members of the junior hospital staff. There were, as mentioned earlier, 62 registrars (7 senior) and 71 SHOs, a total of 133. Also there were 88 preregistration house officers.

The following paragraphs set out how many extra surgeons would be needed to do this work if the number of registrars was reduced by more than half, to 26 or 27, and the SHO grade replaced by doctors undergoing general professional training in the post-graduate vocational registration scheme.

In the calculations it has been assumed that the majority of the emergency operations would be in Class D (Table I) and most of the others in Class C (up to 90 min); very few would take longer. For the emergency admissions not operated on immediately a modified form of the Californian Weighting System has been used based on the time it would take the surgeon to travel to the hospital and back and to check the provisional diagnosis, having had to wait for X-rays and laboratory tests, in the same way as for an operation.

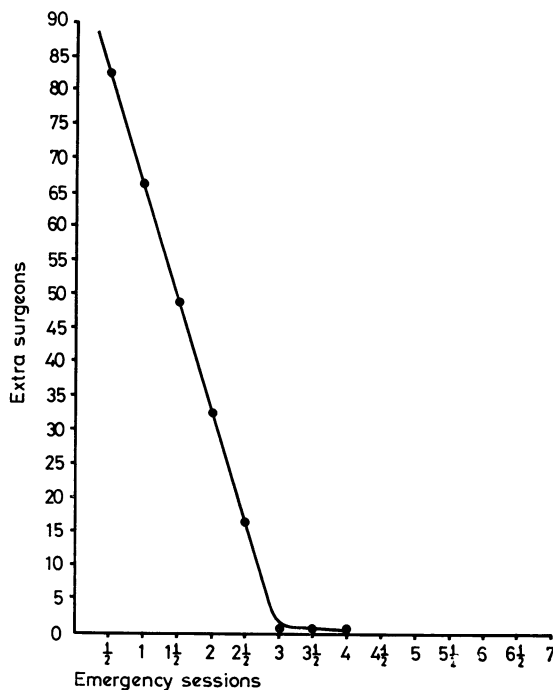
The group managed conservatively included 2350 patients with gallbladder disease, 1627 with acute retention of urine, 5681 sent in as 'abdominal pain', and 6411 admitted because of a mysterious and persistent symptom. The rest covered 112 classified diagnostic headings. There were 14 cases of benign neoplasm of the breast and 8 cases of lipoma.

Personal experience and enquiry have led to the allocation of 2 h per emergency admission, whether operated on or not. Often a laparotomy is the quicker method of management. Calculating on this basis the annual total of 43 249 emergency admissions corresponds to 24 714 NHD/sessions at 3½ h each.

However, the new consultant contract allows 1 NHD weekly for emergency recall. In a year 133 surgeons would supply 6118 emergency NHD/sessions on the basic commitment; therefore the number of extra NHDs they would have to provide is 24 714 minus 6118, which is 18 596. To do this they would all have to add to their contracts another 3 NHDs, so that it would become 10 basic plus 3 emergency NHDs per week, making a total of 13 NHDs.

This extra commitment might be rejected. The accompanying graph shows that if they accepted 2½ extra emergency NHDs 16 additional surgeons would have to be appointed; but that if they would agree to only half an extra NHD 83 more surgeons would be required.

Therefore with a registrar establishment of 26 or 27, although the management of the 43 249 emergency admissions could be accomplished by the 133 surgeons needed to do the list work, 216 (133 + 83) would be needed if those 133 surgeons only agreed to do half an extra emergency NHD per week.



Graph of relationship between number of paid emergency sessions surgeons will do and extra number of surgeons needed.

Clinical supervision of the surgical patient: preoperative and postoperative

This function depends primarily on the junior hospital doctor. It is the junior doctor upon whom the nursing staff rely to reach the patient's bedside within 10 minutes 24 hours a day and 7 days a week all the year round.

The junior hospital staff have negotiated a contract with the Department of Health and Social Security to work a basic 40-h week (10 units of medical time (UMTs) of 4 h each) and up to another 40 h, 10 extra UMTs, for emergencies. It is insisted that 'the duties of hospital junior doctors are formally rostered and that the rosters are based on units of time integrated into a 24-hour grid system'. The Californian Relative Value Weighting System is not a suitable method by which to calculate the number of junior hospital doctors, on this contract, required by 98 770 admissions. A useful estimate can, however, be made.

Out of the 10 basic UMTs, 8 will be absorbed by the 8 clinical consultant sessions in the new 10-session contract. Therefore each week 4 UMTs will be spent assisting the surgeon operating on list and ward cases, 2 UMTs will be spent accompanying the surgeon on routine ward rounds, and 2 UMTs will be spent helping in the outpatient department. This leaves the junior doctor 1 UMT for admitting list cases, writing discharge letters, and sending for patients off the list to come in the following week and 1 UMT for independent ward work. As a UMT is 4 h in length compared with the surgeon's NHD, which is only $3\frac{1}{2}$ h, this difference provides the junior doctor with another 4 h for helping in the ward.

In the present sample the surgeons, in the year, used 24 480 NHDs operating on 58 796 patients, which corresponds to 21 420 UMTs. If the establishment is 133 surgeons, then ward rounds in a 46-week working year add up to 12 236 NHDs and 10 707 UMTs. The outpatients also use 12 236 surgical NHDs per annum and 10 707 UMTs. Therefore the planned work, if there are 133 surgeons, needs 48 952 NHDs and 42 833 UMTs in the year. The surgeon's administrative NHD is balanced by 5353 UMTs the junior doctor spends in the unit's office and on the ward.

To this is added 12 236 UMTs in the year available to the ward because the junior doctor has 1 free UMT and each UMT is $\frac{1}{2}$ h longer than a surgical NHD. Each junior doctor works a 48-week year, supplying 480 basic UMTs. The work so far examined could be done by 126 junior doctors and the career structure would add about 26–27 registrars. A grand total of 152–153 junior hospital doctors would assist 133 surgeons.

Out of the total of 98 770 admissions in this sample, 43 249 came in as emergencies—that is, between 7.00 p.m. and 8.30 a.m. the following morning or on a Saturday or Sunday. It has been calculated above that the management of these emergencies would demand an extra 18 596 NHDs from an establishment of 133 surgeons and 26–27 registrars. Observation and experience lead to the opinion that from the time the junior doctor accepts the emergency on the telephone to the departure of the surgeon and giving a final check to the patient in the ward is 3 h, whether an operation has been done or not. These duties will amount to 32 437 UMTs in the full year. However, each of the 126 junior doctors employed on a basic contract of 10 UMTs per week can provide up to 10 extra UMTs for emergencies. At 20 UMT a week 126 juniors, each taking 4 weeks' holiday a year, could supply a grand total of 120 960 UMTs in the year. The care and management of 98 770 admissions (43 249 as emergencies) requires 92 868 UMTs in the full year. Therefore no extra junior doctors are needed on account of the emergency admissions, even though they amount to 43.8% of the total, because the 126 juniors provide a surplus of 5655 UMTs by working the extra 10 UMTs a week provided by their contract.

The on-call grid

The smallest number of junior doctors it takes to make the most simple 'grid' in conformity with the terms and conditions of their contract is 4 (Table IV). Joined to the vocational training scheme the number of UK graduates flowing from the expanded medical schools will give a ratio between junior doctors and surgeons of about 1:1. Therefore 3 surgeons could expect to have 3 UK graduates, and an extra junior would have to be found simply to satisfy the demand for a 'grid' (Table IV).

TABLE IV Showing that it takes at least 4 junior doctors (A, B, C, and D) to make up the 'grid' contained in their contract

Day	Basic UMTs	Extra UMTs	Total UMTs			
			A	B	C	D
Mon	2 each	A:4	6	2	2	2
Tues	2 each	B:4	2	6	2	2
Wed	2 each	C:4	2	2	6	2
Thur	2 each	D:4	2	2	2	6
Fri	2 each	A:4	6	2	2	2
Sat	none	B:6	0	6	0	0
Sun	none	C:6	0	0	6	0
Total weekly UMTs			18	20	20	14

At present in the West Midlands 18 out of the 33 district hospitals have less than 4 permanent surgeons on their staffs. In the future, if the number of permanent surgeons is increased as set out above, this problem of a 'grid' can dissolve automatically.

Conclusion

Having restricted the number of registrars to that required by the surgical career structure it would certainly be possible to staff the surgical units in the NHS district hospitals at senior and junior level from UK graduates. There are several ways in which it could be done. Whichever way is selected the number of surgeons on a permanent contract will have to be increased by between 50 and 100%, the

number of registrars reduced by 50%, and that of the rest of the junior staff reduced by 15-20%.

Except for the 1 NHD for emergency work to which the 10-session contract commits the surgeon, all additional emergency work will be paid for by negotiated fees. This could increase his earnings by at least 25-30%.

I would like to thank Dr R L Himsworth, of the Clinical Research Centre, Northwick Park Hospital, Harrow, Middlesex, who kindly drew my attention to the paper by Nickerton *et al* (1) in the first place.

Reference

1 Nickerton RJ, Cotton T, Peterson OL, Bloom BS, Hauck WW. Doctors who perform operations. N Engl J Med 1976; 295:921-6.