

A SCHEME FOR THE VALUATION OF ANAESTHETICS

ITS SCOPE IN TRAINING AND IN PRACTICE *

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The system of record-keeping which I propose to describe was evolved initially for my own personal use, but in my opinion it can be modified and extended with advantage, both in the sphere of anaesthetic training and in the practice of anaesthesia. I shall outline the steps which led to the use of this scheme in its present form.

Firstly, it is necessary to answer the pertinent question, 'Why bother to keep records'? The argument usually runs on the lines that during the course of one's training one administers thousands of anaesthetics and builds up a large body of experience, and that therefore the annotation of straightforward routine anaesthetics is so much wasted time, paper and effort. Now anaesthesia, as we all know, can offer great stimulation and satisfaction to the practitioners of the art—witness the large body of fine medical men and women attracted to this speciality. This is not the place to discuss the pros and cons of anaesthetics as a speciality but one must recognize these two aspects of the obverse side of the coin: (a) Dealing as it does mainly with unconscious patients, it can become largely a depersonalized speciality; and (b) a large proportion of the work can fairly be called straightforward and routine.

Now it seems to me that it is far too important and responsible a speciality to allow of the development and encouragement in the early training period of any irresponsible attitudes which would tend to increase the impersonal and routine aspect of the art. As 'guardians of mysterious waters' we have as our first duty to be keenly and always aware of our great responsibility to the patient.

It may be well here to comment on the extraordinary unreliability of the human memory, a failing to which I believe we are all liable. If asked for an example how many anaesthetics we give in an average month or year, we all remember the nights of intense activity and forget the week-ends off and the other quiet periods. Consequently our honest impression is usually far in excess of the facts. Similarly in considering a particular technique or operation we remember vividly, for example, the days of five or six

Caesarean sections per 24 hours and forget the succeeding two weeks that contained perhaps one or two Caesareans in all.

With these points in mind I was satisfied that it was desirable to keep some sort of record of my anaesthetic experience. It immediately became obvious, however, that it was useless merely to record lists of operations done. There must be a practical reason for the keeping of any statistical records. This was brought home to me strikingly when I wanted to classify the recorded operations so as to distinguish what could be called major operations. The assessment in retrospect of what was a major case was largely fallacious—neither my memory nor my wholly inadequate records could give any indication of the duration of anaesthesia, the agents and techniques used, and the difficulties or other special features of the case. In other words, I was far from deriving the fullest possible value from the experience which was being offered to me.

I then proceeded to record the nature and duration of each anaesthetic, but realized that little benefit was to be derived unless my records were considerably expanded. Similarly, without such record the consultant anaesthetists who head an anaesthetics department can have no true idea of how the registrars whose training is their responsibility are progressing. Total numbers of anaesthetics administered give no real indication; they may, for example, include an unduly high proportion of anaesthetics for simple 10-minute operations. Opportunities to administer anaesthetics for more 'major' or difficult procedures may not exist or they may not be grasped by the trainee. Reference to the official theatre register of operations is sometimes singularly unrewarding. All too often details of lengthy major anaesthetics are condensed there into the magic word 'Pent'.

THE CALIFORNIA SCHEDULE

The need exists, therefore, for a schedule of the relative value of anaesthetics given by an individual or in a department as a whole. For my personal use I adapted the Schedule of Relative Value Standards evolved by the California Medical Association. This schedule was designed to find a

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method of measurement to be used in improving fee schedules for all medical procedures. No attempt was made to lay down the actual money value of a medical service; this will obviously vary with time, place and circumstances. The aim rather was to assess the value of one medical service relative to another. For instance, if an appendicectomy is worth x pounds, what constitutes a reasonable fee for a radical mastectomy? A schedule translating these problems from pounds to relative unit values would be invaluable in improving the fee schedules under the Workmen's Compensation Act, medical aid societies, health insurance schemes, and private practice. Thus, if an appendicectomy could be expressed as so many units in value as compared say, to a mastectomy, then those relative values could remain constant for all scales of fees; it would merely be necessary for the controlling body concerned, be it W.C.A., medical aid society, or Medical Association, to decide the worth of a surgical unit, a medical unit, or any other unit. In California, different formulae were evolved to arrive at unit values in the four separate fields of (1) medicine, (2) radiology, (3) laboratory-pathology, and (4) surgery-anaesthesia.

To return to anaesthesia specifically, the traditional yardstick has long been the 'time basis'. It needs no illustrative examples to establish that this is quite unsatisfactory. It is obvious that some procedures require little skill but prolonged surgery, while others may demand the highest level of skill for much shorter periods. A formula was therefore evolved taking into consideration (1) the anaesthetic risk, (2) the surgical problem and (3) the skill re-

TABLE I

| | | | |
|---|------------|----------|------------|
| 1. <i>Anaesthesia Risk</i> . Factors: | | | |
| (a) Patient's physical status | | Minimum | 1 |
| (b) Degree of hazard imposed by | | Average | 2 |
| (i) Depth of anaesthesia required | | Advanced | 3 |
| (ii) Type of anaesthesia and technique | | Maximum | 4 |
| (iii) Potential complications incident to anaesthesia | | | |
| 2. <i>Surgical Problems</i> . Factors: | | | |
| (a) Magnitude (not duration) of surgical procedure | | Minimum | 1 |
| (b) Degree of hazard imposed by | | Average | 2 |
| (i) Site of operative field | | Advanced | 3 |
| (ii) Position of patient | | Maximum | 4 |
| (iii) Potential complications incident to anaesthesia | | | |
| 3. <i>Technical Skill required of the Anaesthetist</i> . Factors: | | | |
| (a) Problems incident to the maintenance of | | Average | 1 |
| (i) Normal respiratory physiology | | Advanced | 2 |
| (ii) Normal circulatory physiology | | Maximum | 3 |
| (b) Problems incident to specialized techniques and procedures | | | |
| 4. <i>Anaesthesia Time</i> | | | |
| minutes | unit value | minutes | unit value |
| 30 | 1 | 210 | 8 |
| 60 | 2 | 240 | 10 |
| 75 | 3 | 270 | 12 |
| 90 | 4 | 300 | 14 |
| 120 | 5 | 330 | 16 |
| 150 | 6 | 360 | 18 |
| 180 | 7 | | |

FORMULA

$$(\text{Anaesthetic risk} + \text{surgical problem}) \times \text{skill required} + \text{anaesthesia time} = \text{relative unit value}$$

Examples

| | |
|---------------------------|---------------------------------|
| Radical mastectomy | $(2+3) \times 1 = 5 + 7 = 12$ |
| Total lobectomy | $(3+4) \times 2 = 14 + 10 = 24$ |
| Haemorrhoidectomy | $(2+2) \times 1 = 4 + 2 = 6$ |
| Subtotal hysterectomy | $(2+2) \times 1 = 4 + 5 = 9$ |
| Cholecystectomy | $(2+3) \times 1 = 5 + 5 = 10$ |
| Excision of lobe of brain | $(3+3) \times 2 = 12 + 12 = 24$ |

quired of the anaesthetist, as well as (4) the time factor. Table I shows the factors involved. While I am not here concerned with fees, it is reasonable that an assessment of the value of an anaesthesia service should remain the same whether the purpose is for remuneration or not. I have therefore used this formula in recording all my cases, with one very important difference, as follows:

The American formula was *not* developed to determine the value of a specific anaesthesia procedure in a specific instance. It was not intended for use by an individual anaesthetist to estimate the value of his services in, for example, a cholecystectomy on a poor-risk patient where the surgery was difficult or prolonged. It was developed to establish the relative value of anaesthesia services in connection with cholecystectomies (for example) as a group, taking into consideration the good as well as the poor risk, the difficult as well as the average surgery, the slow as well as the fast surgeon—all of these factors being reflected in the assignment of units. In their anaesthesia study the relative values of each procedure represent the combined judgment of a group of experienced anaesthetists. The work of setting up values for some 1,300 procedures has been completed, and changes will be required when new procedures are introduced and others become obsolete. New methods applied to old procedures, whereby the risk, the surgical problem, the skill required and the time factor will vary, will call for revisions. Changes in fee schedules expressed in £. s. d. are difficult and often require years of work, reports and negotiation. Changes in fee schedules expressed in units can be readily accomplished after a review of relative standards.

From my own point of view, on the other hand, I was interested in the value of a specific procedure in a specific instance, because my concern was not standardization of a fee, but an assessment for my own personal use of the anaesthetic experience I was gaining and the skill I was being called upon to display.

AUTHOR'S ADAPTATION

The personal records which I keep at present are illustrated in Table II. (Note: Post-operative visits are made to all but the most minor cases. Notes on the use of intubation and any special features of difficulties are included in order to correlate with any post-operative complications, particularly regarding chest or larynx. In this way I hope to form opinions of the complications of anaesthesia based on direct observation rather than on hearsay.) Most of the column headings, including the abbreviations for anaesthetic agents, will be self-explanatory. The factors used in the formula are listed in order of anaesthetic risk, surgical problem, anaesthetic skill required, time in units, time in

TABLE II

| Race and Sex | Number | Age | Word | Operation | Anaesthetic Agents | Intratracheal Tube and Size | Anaesthetic Risk | Surgical Problem | Anaesthetic Skill required | Time in units | Time in minutes | Details and Difficulties | Post-operative Examination | Relative Unit Value |
|--------------|--------|-----|----------------|-----------------------|--|-----------------------------|------------------|------------------|----------------------------|---------------|-----------------|---------------------------------|----------------------------|---------------------|
| N (F) | 12345 | 21 | Mat. | Caesarean | Pent. Scol. Gas O ₂ Ether | Oral 8 | 2 | 2 | 1 | 2 | 45 | — | Seen 24 hrs. Chest nil | 6 |
| N (F) | 23456 | 26 | Mat. | Caesarean | Pent. Scol. Gas O ₂ Ether | Oral 7 | 2 | 2 | 1 | 1 | 30 | — | Seen 24 hrs. Rhonchi + | 5 |
| N (F) | 24680 | 30 | Mat. | Caesarean | Pent. Scol. Gas O ₂ Ether | Oral 8 | 3 | 2 | 1 | 4 | 90 | 7 pts. blood needed Bleeding ++ | Seen 24 hrs. Chest nil | 9 |
| N (M) | 11211 | 60 | N ₂ | Bronchoscopy | Pent. Scol. O ₂ | — | 2 | 2 | 1 | 1 | 10 | — | Seen 24 hrs. Satisfactory | 5 |
| N (M) | 22322 | 2 | N ₂ | Skin graft, Burns | Ethyl chlor. Ether | — | 1 | 1 | 1 | 1 | 15 | — | — | 3 |
| N (M) | 22324 | 65 | N ₃ | Skin graft, Burns | Pent. Gas O ₂ Ether | — | 3 | 1 | 1 | 2 | 60 | Hb. 60% BP. 90/60 2 pts. blood | Seen 24 hrs. Fair | 6 |
| I (F) | 6789 | 21 | I ₄ | D. & C. | Pent. Gas O ₂ | — | 1 | 1 | 1 | 1 | 15 | — | — | 3 |
| I (F) | 6665 | 3 | I ₄ | Abscess of foot | Ethyl chlor. Ether | — | 1 | 1 | 1 | 1 | 5 | — | — | 3 |
| N (M) | 17863 | 27 | N ₁ | Decortication of lung | Pent. Tubarine Gas O ₂ Cyclopropane | Oral 10 | 2 | 3 | 2 | 7 | 180 | — | Seen 24 hrs. Good | 17 |

N=Native I=Indian (M)=Male (F)=Female

minutes and, in the extreme right-hand column, the relative unit value arrived at by the formula.

The examples used in Table II illustrate the flexibility of the assessment, the same operation yielding a different relative unit value in each case. The 3 Caesarean sections were performed by the same surgeon on the same day. In the first case adhesions from previous operations prolonged the operation time but the other factors (risk, surgical problems, anaesthetic skill required) were the same as in the straightforward second case. In the third case, however, a copious antepartum haemorrhage had increased the anaesthetic risk from 'average' to 'advanced' and the subsequent development of a bleeding condition (afibrinogenemia) prolonged the operating time to 90 minutes—both factors leading to the much higher relative unit value shown in the table.

The next example, a bronchoscopy, illustrates that even a 10-minute procedure can yield a relative unit value of 5 units, (i.e., it can be classed as a major anaesthetic procedure). The allocation of 2 units for anaesthetic risk and 2 for surgical problem is justifiable on the grounds that any procedure in which the anaesthetist must share the patient's vital airway with the surgeon must be of more than a minimum risk and minimum surgical problem.

The two skin grafts again illustrate varying relative unit values for similar procedures. The first example, in which the anaesthetic risk, the surgical problem, the anaesthetic skill and the time units are each recorded as 1, yields a relative unit value of 3, which is, of course, the lowest value ever yielded by the formula. In the second case, however, the area to be grafted was more extensive, the patient was anaemic, despite previous transfusions, the nutrition was poor and the blood pressure abnormally low. Thus, although the surgical problem remained the same (1 unit),

the anaesthetic risk was advanced (3 units) rather than minimal and the time was greatly increased (2 units). The resulting relative unit value becomes 6 as compared with 3 in the previous case. The distinction is more important than in the 3 Caesarean sections quoted, for the following reason: Even if the relative unit system is not used, anaesthetics for Caesarean sections are always regarded as major; but without the relative unit system, the second, bad-risk, skin-graft case quoted would unjustifiably be regarded as minor because the surgical procedure was admittedly a minor one.

The next two examples in Table II (dilatation and curettage, and abscess) are included to illustrate again the straightforward recording of unit values in these minor cases. The final example is a decortication for a post-traumatic empyema in a comparatively fit young man. The anaesthetic risk is average (2), the surgical problem advanced (3) and the technical skill required of the anaesthetist advanced (2), and the operating time is prolonged to 3 hours (7)—relative unit value $(2+3) \times 2 = 10 + 7 = 17$.

It will have been noted that the technical skill required of the anaesthetist is the only multiplication factor in the formula and therefore is the factor most responsible for really high relative unit values. The strictest criteria are therefore applied in its use. The use of a figure higher than 1 unit here is restricted to a minimum of cases, notably intrathoracic work. It may be worth noting that in the formula there is no 'minimum' assessment of anaesthetic skill. The formula pays the profession the compliment of regarding 'average' as the lowest grade of technical skill required.

A weakness in the scheme as I have adapted it is the fallibility, according to experience, in assessing the anaesthetic risk and anaesthetic skill required. This will obviously vary with the experience and judgment of the indi-

vidual anaesthetist. From this point of view, a system that works satisfactorily for personal use may lose validity when applied to the work of a department as a whole. The Californian formula has the advantage there of standardization, but it is coupled with a rigidity which I consider to be a disadvantage. However, it should not be impossible in a well-organized hospital department to establish a system whereby individual assessment is made on each case, the records being under regular scrutiny and supervision by the departmental heads.

CONCLUSIONS

A scheme introduced in America for the valuation of anaesthesia fees and accepted with approval by 90% of the anaesthetists concerned, has been described. Its adaptation for use in record-keeping by an individual trainee anaesthetist has also been noted. What are the possible applications of such a scheme in general anaesthetic training? They are as follows:

1. It would enable the standard of anaesthetic experience demanded by universities and colleges before permitting a candidate to sit for a degree or diploma to be greatly improved. To take an example from one South African university: Before writing the final examination a candidate must have administered 2,000 anaesthetics, at least half of which must have been for *major surgical procedures*. I have shown by examples that major surgical problems and major anaesthetic problems do not necessarily go hand in hand. Then is the anaesthetist in compiling his 2,000 cases to regard skin grafting as a major surgical procedure or not? In the tiny infant with extensive areas to be covered, or in the elderly debilitated epileptic with associated anaemia and malnutrition following the burn, the anaesthetic problem must be regarded as major, regardless of the assessment from the purely surgical point of view.

How then would the unit system be applied with advantage? The experience I have had with several hundred anaesthetics administered in a teaching hospital (King Edward VIII Hospital, Durban) obviously needs to be many times multiplied by myself and duplicated by others; but the following have been my constant and consistent impressions:

- (i) The average unit value per anaesthetic has been 5 units and
 - (ii) the number of anaesthetics totalling 5 or more units, has constantly been 3 out of every 8 administered. A university could therefore, in addition to demanding 2,000 cases, insist that these 2,000 should total not less than 10,000 units and that 750 cases (3/8ths) should be worth 5 or more units each.
2. Arising from the above suggestions, the total worth of anaesthetic work done in a hospital department can be compiled, and on this the following conclusions are based:
 - (iii) The Medical Council could obtain an accurate criterion for deciding on the merits of a particular hospital for the purposes of recognition.
 - (iv) With the strict record keeping of anaesthetic techniques and the drugs used, and their sequelae, we could expect a greater number of valuable publications from our hospitals.
 - (v) The Society of Anaesthetists is strongly urged to consider the adoption of a relative unit value scheme for private, medical aid, and W.C.A. work, and so to arrive at tariffs more satisfactory to public bodies, anaesthetists and patients alike.

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