DOCUMENTATION IN ANAESTHESIA

BERIC JACKSON, M.B., B.S., *Department of Anaesthetics, King Edward VIII Hospital and University of Natal, Durban*

Hippocrates is spoken of as the Father of Medicine. Probably there were physicians before him who were almost as able, and the reason why he is famed and revered is that he and his pupils led the way in accurately documenting their cases; their clinical descriptions of disease are quoted even today. This documentation had two important results, viz. (1) it raised medicine from the status of magic to an occupation of rational endeavour, and (2) it promoted the development of medical science. For medicine to develop it has been necessary for each generation of doctors to receive the recorded knowledge left by their predecessors; by adding their own contribution to this knowledge they have been able to lighten the darkness of suffering humanity.

Documentation has been as necessary to the progress of anaesthesia as in the other branches of medicine.

Apart from these considerations, why should the anaesthetist keep written case records? The answer is that it is his duty to ensure that the patient presenting for operation is in the best possible condition, and a history, general physical examination, and documentation by the clinician and the anaesthetist, will help to prevent any oversight in the pre-operative assessment of the case. In all major or prolonged operations it is also advisable for the anaesthetist to keep a written record of the condition of the patient so that he may be aware early of the development of any undesirable trends in the patient's physiology.

I will mention a few points that are of interest to the anaesthetist from the point of view of documentation, and later suggest what I think ought to be documented.

Exercise Tolerance

The patient's exercise tolerance is the most important single indication of his condition that is available to the anaesthetist. Almost all serious disabilities in the cardiovascular or respiratory systems that are likely to prejudice the course of anaesthesia will be brought to light from this enquiry. If a patient cannot perform normal physical activities, when due consideration is given to overweight and lack of exercise, or if there is a recent falling-off in exercise tolerance, further investigation will usually disclose a reason. On the other hand, if the patient can undertake normal activities, he will almost certainly stand up to his operation well.

This brings us to the evaluation of the operative risk in the presence of heart disease. A mistaken assessment of the cardiovascular system, and of the heart in particular, may have the most disastrous and irrevocable consequences. A careful history and clear documentation will greatly help towards a correct assessment, and it will be found useful to record data under the following 4 headings, viz. (1) aetiology, (2) anatomical lesion, (3) rhythm, and (4) functional capacity of the heart.

1. *Aetiology.* Where possible the aetiology of the heart disease should be noted down and consideration given to the general pathology of the underlying disease. If, for example, this is rheumatic fever, the anaesthetist will be led to examine the function of the heart valves that are particularly affected. He will also bear in mind the possibility of such complications as subacute bacterial endocarditis or active carditis.

2. *Anatomical lesion.* When lesions of the aortic valve exist, special care must be taken during anaesthesia to avoid a drop in blood pressure or cardiac output, which may seriously reduce the coronary blood flow. A marked narrowing of the mitral valve may be accompanied by a greatly increased tendency to develop pulmonary oedema with extreme suddenness, if the heart is subjected to an increased load or a reduced oxygen supply.

3. *Rhythm.* Auricular fibrillation presents little increased risk by itself provided that the ventricular rate, if rapid, is controlled with digitalis. On the other hand, when ventricular arhythmias or arhythmias due to conduction defects in the atrioventricular bundle are present, the associated pathology will add to the risk of heart failure during or after the anaesthetic.[1]

4. *Functional capacity* of the heart may be equated with 4 grades of exercise tolerance, as follows:

Grade 1: Patients have a heart lesion but are symptom-free on exertion.

Grade 2: Patients can perform all activities except heavy exertion.

Grade 3: Patients have symptoms of cardiac decompensation on light exertion.

Grade 4: Patients have signs or symptoms of cardiac decompensation even at rest.

A diseased or congenitally deformed heart will stand operation well if the functional capacity falls into grade 1 or grade 2. Generally there is no increased operative risk and operations can safely include those which are undertaken purely for the comfort of the patient. Patients in grade 3 and grade 4 can be considered as increased anaesthetic risks, and should only be subjected to operations involving a general anaesthetic if they are thought necessary in spite of this risk, which is slight in grade 3, and more marked in grade 4.

The anaesthetic risk in patients with a history of myocardial infarction is in accordance with this grading, except that after an infarction the patient is an excessive hazard for the first 6 - 8 weeks, until fibrosis is sufficiently advanced in the infarcted area, until the risk of pulmonary and systemic emboli is reduced, and until the surrounding non-functional but surviving areas of the myocardium have become functional as the meagre collateral blood supply develops. It is wiser after infarction to postpone any operation for 6 months if possible.

Anaemia

As a general working rule, a patient whose haemoglobin is less than 10 g.% should be treated for anaemia before undergoing an elective operation. If a patient with anaemia is submitted to operation it is worth remembering that he would die from a smaller blood loss than a normal individual in the same circumstances, and that he would suffer irreversible tissue damage sooner if a period of anoxia should complicate the anaesthesia. In patients with rapidly growing cancers or cancers of the gastro-intestinal tract, severe anaemia, together with deficiences of blood proteins, is often accompanied by a loss of weight and a reduced blood volume. When the weight loss represents 10% of the body weight a reduced blood volume can be assumed[2] and the loss in blood volume corrected by giving 30 - 40 c.c. of blood per lb. of weight lost. In the above circumstances the transfusions should be given

efore the day of operation. When there is a possibility of a failing heart it should be remembered that each unit of blood contains about 8 g. of sodium chloride and sodium citrate, and that the increased plasma volume may overload the heart; in such circumstances it is safer to use packed cells for pre-operative transfusion.

DOCUMENTATION DURING ANAESTHESIA

Anaesthesia may be considered as an applied science rather than an art. Because a large proportion of human ailments are trivial or self-limiting, human kindness and understanding have been identified with the so-called 'art of medicine'. These qualities might more truthfully be termed the 'art of medical practice'. They are most desirable in an anaesthetist, but they are not enough, because patients do not necessarily recover after anaesthetics, and even 'skill' gives precedence to applied knowledge and a close attention to detail. Documentation is merely a part of this attention to detail.

It is by recording the measurements of the effects of drugs, trauma and haemorrhage on the patient during and after anaesthesia that the anaesthetist can gain a sound knowledge of his craft. There are some who rightly emphasize the importance of observing the general condition of the patient during the operation, but it would be fallacious to think that this is achieved by standing back from the scene of action like an artist surveying his picture. Individual measurements when added together, will help to give a sound assessment of the patient's condition; so let us discuss some measurements.

The Pulse

Palpation of the pulse wave in a peripheral artery is always very reassuring to the anaesthetist. Each case anaesthetized is in a way a physiological experiment, in that the effects of the anaesthetic and the surgery on the patient are not predictable in advance with certainty. Because of this uncertainty, it is necessary to get a 'base-line reading', and it is a useful habit to palpate a peripheral artery just before starting the anaesthetic. At any time after induction, particularly immediately after induction, when the patient does not appear to be reacting in the expected manner, it is very useful to know what the pulse felt like before the anaesthetic began. The pulse rate before and after the operation may be a useful clinical sign, but during anaesthesia the use of such drugs as belladonna, gallamine triethiodide, chlorpromazine, and neostigmine, makes interpretation of the heart rate complicated, and haemorrhage is usually obvious, so that an increased heart rate is not of particular help by itself in such circumstances.

Blood Pressure

Recording of the blood pressure by auscultation is one of the few measurements of the cardiovascular function which anaesthetists commonly have the facilities for making, and it is worth while taking some trouble to obtain satisfactory readings of the systolic and diastolic pressures. If the stethoscope is placed inaccurately, or if it is placed correctly but the arm is subsequently rotated so that the diaphragm is no longer over the artery, or if the artery is in a state of spasm because of a rapid infusion of cold blood, a satisfactory measurement may be difficult to obtain. It has been found that when the systolic blood pressure is below 60 mm. Hg, usually in vasoconstriction following blood loss, palpation of the radial artery and auscultation of the brachial artery are unreliable,[3] and in these circumstances an oscillometer is most useful.

Knowledge of the pulse pressure is of value because in any one individual it is proportional to the stroke volume and to the cardiac output, the heart rate being taken into account. The pulse pressure is early reduced in cases of unreplaced blood loss, prior to any marked fall in systolic blood pressure. There are a few occasions when time-consuming measurements by the anaesthetist are unwarranted and are likely to divert his attention away from matters which more urgently require his attention, but usually he has all the time in the world!

Relation of Blood Pressure to Haemorrhage

When blood is withdrawn from conscious volunteers, between 500 and 1,000 ml. may be removed before the systolic pressure drops, but a patient who has been starved, premedicated and then anaesthetized has not nearly the same capacity for compensation. At operation, the fall in blood pressure and pulse pressure follows the actual blood loss closely enough to make these measurements very useful in assessing and replacing blood loss. In a small proportion of all operations, it is necessary to weigh the blood loss. When blood is being lost at operation without adequate replacement, the fall in blood pressure seldom follows a regular curve, but takes the form of progressive falls each followed by periods of compensation, until finally collapse occurs. Recovery often follows the reverse pattern, and when blood replacement has been inadequate it is not unusual to register a fairly satisfactory blood pressure, and to find later that this pressure has not been maintained (Fig. 1).

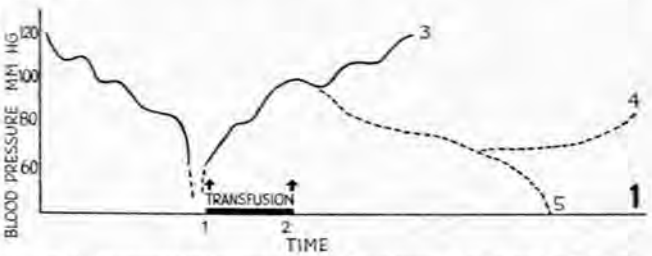

Fig. 1. Illustrating the irregular fall in blood pressure often seen as a result of blood loss at operation. A transfusion is started at (1), and a blood-pressure reading taken at the completion of transfusion at (2) will not necessarily indicate whether the shock will subsequentlly be adequately compensated (3), poorly compensated (4), or progressive (5).

Should a patient be hypovolaemic at the start of an operation even a small loss of blood may cause a marked fall in blood pressure. It is of interest that patients with diabetes insipidus are liable to pass into a state of shock after a blood loss that would not affect a normal person, probably because in the insipidus case the extracellular fluid volume is in a state of chronic slight depletion,[4] and less fluid is available to replace what is lost from the circulation. A blood donor will suffer little upset in giving a pint of blood provided his extracellular fluid volume has been sustained by at least a drink within the previous 2 or 3 hours. This puts him in a position to withstand the blood loss in the circulation by providing a fluid shift into the capillaries when the capillary pressure falls as a result of the bleed. On the other hand, a donor who has missed his previous meal or drink frequently shows some temporary signs of shock after giving a pint of blood. The anaesthetist would do well to remember that his patient compares with this second donor in that food and fluid have often been withheld for many hours. Regular blood-pressure measurement by the anaesthetist will convince him that, after operations during which about a pint of blood has been lost, the patient will often have a blood pressure well below the normal pressure for some time, and that it will rapidly respond to an infusion of glucose water or saline. This infusion can be given with more advantage during the operation.

One or two points about the measurement and the significance of blood pressure and pulse have been mentioned. There are many measurements which an anaesthetist may elect to make which may help in particular circumstances, but the bodily systems likely to fluctuate most during anaesthesia are probably the respiratory and cardiovascular systems. Therefore the anaesthetist, particularly while training, should have at his disposal the means to measure the electrical activity of the heart, the venous pressure, and ventilation volumes and pressures. The automatic respirator and the electro-encephalogram will possibly be used much more frequently in the future at the larger medical centres because they facilitate a more precise control of respiration and cerebral activity.

Function of Documentation

Now let us come back to review the function of documentation. Before operation documentation of the history and the physical condition of the patient helps to ensure that major points in his assessment will not be overlooked. During the operation the patient is usually in good hands when his anaesthetist documents the case properly, for to do this the anaesthetist must be attentive. He has by the discipline of his training become a more competent observer, and has a better practical knowledge of drugs than if he had not been trained in this way. By developing these good habits while training, the anaesthetist will also be in a position to assess the teachings of his predecessors and to make a contribution to his calling, which is the essence of medical progress. Documentation also serves to make the anaesthetist more aware of any undesirable effects that the anaesthesia may have on the patient during the recovery period.

It is the obligation of the doctor committing the patient for operation to see that the general medical history and the physical

condition of the patient are documented. This being so, it is a duplication for the anaesthetist to rewrite routine clinical findings which are already in the notes. I feel that he should make a statement which includes the exercise tolerance, the haemoglobin level, the weight, and the blood pressure, and then only positive or pertinent negative findings in the history or clinical examination. As an example of pertinent negative findings, if albumin is found in the urine statements on its aetiology and on the renal function are pertinent even if negative. It is pertinent to note down that a baby presenting for a hare-lip repair is well nourished and free from upper respiratory or alimentary infection, though such a note would be unnecessary in a fit adult undergoing surgery of the hand. When cardiovascular disease has been found I think it necessary for the sake of the anaesthetist's perspective and judgment to set down systematic notes as described above, but should no such disease exist this writing would be a waste of time.

For these reasons an anaesthetic chart with a mass of standard pre-anaesthetic information to tick off or encircle is not the ideal. Similarly, charts which contain rows of drugs and require the anaesthetist to place a tick here and there at the completion of the operation fill little useful purpose.

It is the sequence of events and the drugs used in their relation to the patient's condition during anaesthesia which should be recorded; such a record is of benefit to the patient and to the anaesthetist.

In research, the majority of investigations are planned in advance, and documentation of the factors under consideration are seldom facilitated by an elaborate printed standard anaesthetic chart.

The chart I favour contains headings for the patient's name, age, sex, etc., and his disease, exercise tolerance, weight, haemoglobin and blood pressure; the amount of blood lost and of blood and other intravenous fluids given; premedication; and operative and post-operative notes. The chart is made of cardboard of adequate size to give space for documentation. Whatever chart is used, its value to the anaesthetist is lessened if it is lost to him in the hospital records. These charts should be kept in the anaesthetic department, where they may be scrutinized and where they represent *the work and the progress of individual anaesthetists* and the department as a whole.

SUMMARY

The role of documentation in the development and application of clinical anaesthesia, which includes aspects of interest in the pre-operative and operative phase, is discussed.

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