Clinical audit and neurology

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Abstract

Medical audit has been defined as “a systematic critical analysis of the quality of medical care, including the procedures used for diagnosis and treatment, the use of resources, and the resulting outcome for the patient”. In Britain, recent reforms of the Health Service increase the need for neurologists to undertake audit. The basic principles of audit in relation to the management of common conditions such as headache and epilepsy are described. Audit must consider not only efficiency but also effectiveness, but the difficulty of developing valid outcome measures should not be underestimated, especially in chronic disabling conditions.

Medical audit was defined in the White Paper “Working for Patients”¹ that preceded the National Health Service and Community Care Act of 1990 as “a systematic critical analysis of the quality of medical care, including the procedures used for diagnosis and treatment, the use of resources, and the resulting outcome for the patient.” I believe this to be an excellent description of the principles of medical audit, and has not been bettered in spite of the explosion of interest in audit since the White Paper was published early in 1989.

I have drawn attention elsewhere to some specific words in the White Paper definition, as I believe that they inform our thinking about audit.^{2,3} Neurologists may object to the word audit, believing that it has overtones of accountancy and costs. The etymology of the word, however, is derived from the Latin *audire*—to hear, simply because it was customary to give accounts orally, for example, in the parable of the five talents.⁴ Neurologists may also object to the term “critical” in the White Paper definition, but they may relax when they look at Matthew Arnold’s definition of criticism “a disinterested endeavour to learn and propagate the best that is known and thought in the world”.⁵ No physician would quarrel with criticism in that sense when applied to his or her professional work. Then there are difficulties in defining what is meant exactly by “the quality of medical care”, as used in the White Paper definition. A quality car usually means a more expensive car, such as a Rolls Royce or a Mercedes. However, one outcome of the procedure for which the expensive car is used—a journey from A to B—is accomplished just as well by an inexpensive Fiat

Uno. Quality, as judged by the achievement of this successful outcome, is independent of cost. If, however, the defined outcome of possessing a Mercedes is different, for example, arriving more speedily, or more safely, or with greater satisfaction, then cost does become a relevant factor.

We are all aware of the constraint of resources available for health care. Medical care of good quality is the best possible care provided within the resources available. It is not feasible to arrange for widespread diffusion of high technology procedures. The care of a patient with an extradural haematoma cannot be as good if he is located 150 miles from the nearest neurosurgical centre as it will be if he lives next door. What determines the delivery of good quality care in this context is the provision not only of good neuroradiological and neurosurgical facilities, but also good access. Attention to means of access has resulted in excellent neurosurgical services being provided to the west of Scotland in spite of the considerable distances involved.

This example illustrates the point that care of good quality has a number of dimensions. An American physician, Donabedian, first identified the dimensions of quality as structure, process and outcome.⁶ By structure, he meant the capital resources available, such as, in the United Kingdom, the monies allocated from the Department of Health to a Health Region, the number of hospital beds available, and the number of trained staff. Good process of care has been well defined by Brook and Kosecoff,⁷ “The performance of specific activities in a manner that either increases or at least prevents the deterioration of health status that would have occurred as a function of a disease or condition.” Such a specific activity must clearly be effective. Brook and Kosecoff go on to identify that quality of care consists of two components—the selection of the right (effective) activity or task, and the performance of those activities in a manner that produces the best outcome.

In a small book already cited,² I drew upon the work of Donabedian,⁶ and also Maxwell⁸ to construct figure 1. As the figure shows, care must also be not only appropriate and effective, but ethical, equitable, relevant, co-ordinated and socially acceptable to both patients and the providers of care. The whole direction of the process of care is to achieve a defined, favourable outcome, as indicated in the last box. As described later, there are particular difficulties in defining outcomes in neurology.

Figure 1 Some aspects worth considering when measuring the quality of care. (Reproduced by permission from reference ²).

In addition to the flow illustrated between the three boxes of the system of care, it must be recognised that the system is modified by the characteristics of the patient—most notably the severity of the illness suffered, and by his or her age and co-existing illnesses (co-morbidities). The patient has also to gain access to the system. Limitations on access may be geographical, temporal, financial, or due to limitations in knowledge of the patient or family doctor or specialist of what effective care is available.

I now use the system outlined by Donabedian, filled in by Maxwell, and illustrated in fig 1 to show how the practice of neurology may be audited.

The structure of neurological practice

Langton Hewer and Wood have accurately recorded for the first time the numbers of neurologists in different Health Regions, and the amount of time (notional half days) that they work in the health service.⁹ They showed that there are nearly 600 000 people per whole time equivalent neurologist in Trent, nearly four times less than in the North East Thames Region. There is therefore *a priori* evidence that, through deficiencies of structure (trained personnel), neurological care cannot be as good for the whole population of Trent as in the North East Thames Region, however hard our colleagues in Trent work.

The natural response of physicians, public health physicians and neurologists in the under-provided regions may be to request the provision of more consultants in order to approach the population/neurologist ratio in the better provided regions. However, from the data of Langton Hewer and Wood it cannot be said that there is necessarily an under-provision of neurologists in Trent, it could be that there is an over-provision in North East Thames. Unless the purposes of the structure are defined exactly (the supply of trained neurologists and their associated colleagues and equipment), and the effects of their process of care upon the outcomes of care, no decision can be made about whether sufficient capital is employed. The data suggest that the neurologists in Trent, Wales, and other under-provided regions are hard pressed in looking after acute neurological illnesses, and new presentation of serious neurological disease such as multiple

sclerosis and motor neuron disease. It is unlikely therefore that they can take a great interest in stroke and in rehabilitation, and in the acute care of patients admitted under the duty general medical firm. If there be a national consensus that neurology should take a much greater interest than before in patients with cerebrovascular disease, and in rehabilitation from stroke and cranial injury, then even the number of neurologists in North East Thames is probably insufficient to allow this. However, that national consensus should be founded on good research evidence that the outcome achieved by an intervention by a neurologist is significantly greater than that achieved by a physician with less advanced training.

Outcome measures are difficult to determine. Until the effectiveness of neurological care can be more clearly demonstrated, a worthwhile audit is to discover exactly what neurologists are doing now. Thirteen neurological colleagues in the United Kingdom kindly kept a diary of all their new patient encounters during one week. Figure 2 shows the number of new patient encounters made by these neurologists in one week in 1986.¹⁰ Colleagues were asked to record all new encounters whether they were National Health Service (NHS) outpatients, private patients, or ward referrals. Bearing in mind the difficulty of keeping such a log in a day to day practice, it is probable that the numbers considerably underestimate the true total. The range of values is striking (33–144; mean 74; median 79). However, such a simple study illustrates the weakness of simple performance indicators based upon activity, which have been the only available audits nationally within the Health Service during the past four decades. Without being aware of the individual backgrounds to the raw data presented in fig 2, it cannot be stated that the most active neurologist is necessarily working harder in the Health Service. As it happened, inspection of the data showed that the most “active” neurologist was very active in private practice, and the least “active” neurologist was a distinguished professor of neurology who was contributing extensively to biological and neurological research. The second least “active” neurologist had been appointed only a few weeks before the survey, and had not built up his pattern of work to that which he is now undertaking. Such activity

analyses are useless unless they take account of the complexity of the work undertaken, and the contributions made by participants to other aspects of medicine. Corrections for such crude data could be inserted into fig 2 to take into account the varying number of notional half-days, for example.

Menken, Dr Friese and I asked our colleagues for a provisional diagnosis made at the time of the first new patient encounter, and these diagnoses were subsequently coded (fig 3). No analysis was made of the type of work undertaken by any individual neurologist, as the numbers were too small. However, when the diagnoses were pooled, our findings agreed with previous reports,¹² that headaches, migraine, and "funny turns" (that may or may not be epilepsy), are the commonest diagnostic groupings for first presentation to a neurologist. More important, and more difficult is to take into account the complexity and severity of illness—and these variables are not the same. For a patient who first attends outpatients with a slowly progressive hemiplegia, and who has mild papilloedema on examination, the correct outpatient management is to take an immediate decision to arrange a chest radiograph and cranial CT Scan or MRI and review the patient later that day. All of us who are experienced in clinical practice know that such decisions about severe disorders can be taken within five minutes. However, a patient with recurrent migraine who has many questions to ask, and who wishes to explore dietary advice and review his or her medication may well take considerably longer to manage. That is to say, the time taken by the activities which a neurologist undertakes, and the intensity of those activities are not readily revealed by simple diagnostic coding. In resource management terms, one needs to distinguish case-mix groups which consume the same resources ("iso-resource") from "iso-diagnosis" and from "iso-severity". Neurologists must therefore be very chary of any attempts to impose any crude analysis of activity as an audit measure of their work. It is not uncommon in the United States for large private clinics to lay down contracts with their neurological staff on how many patients they should "see" during the course of a year, and continued employment and promotion in the private sector depends upon such activity. This is simplistic, indeed foolish.

We need to be cautious about advising the

Department of Health that more neurologists are needed if, by creating a further supply, we increase the demand for referrals for headaches and migraine, which might be better looked after in primary care practice. It would be proper to make such a demand if it could be shown that a neurological consultation had a major impact upon the natural history of someone with headaches and migraine, a topic to which I shall return later, when considering the measurement of outcomes.

With reference to fig 1, I have so far considered in detail only the structure in terms of the number of neurologists. The next aspect to consider is the access of patients to that structure. Until 1 April 1991, access in the United Kingdom had not been limited by financial constraints. That is to say, any family doctor could refer patients to a neurologist if a neurological opinion was necessary. In the 1960s and 1970s, it was not unusual to try and restrict such access by running what was termed "closed clinics". It was thought that neurological time was so precious that patients with neurological complaints should first be reviewed by a general hospital physician (specialist in internal medicine), and then referred on to a neurologist only if this physician thought it to be appropriate. Such clinics have now almost entirely disappeared, probably due to better postgraduate education of general practitioners and growing trust between hospital physicians and neurologists and family doctors. The full implications of what may happen under the National Health Service and Community Care Act of 1990 have not yet been realised, but some scenarios may occur. Under the Act, certain large general practices have been allocated their own budgets from which the care of their patients can be purchased. Towards the end of the financial year, it is probable that such budgets will run low, and a family doctor will then have to make a decision as to the "worth" of a neurological referral for a patient with headache or migraine or funny turn, compared to the "worth" of sending another patient for a badly needed hip replacement.

Within the hospital community, the creation of new neurological consultant posts, or the replacement of those neurologists who are due to retire, may depend upon the family doctor's continuing awareness of their value to the quality of the patients' lives. It is essential therefore that neurologists set in place work to establish the "value-added" by their work. Individual neurological departments will also become increasingly financially dependent upon providing a specialist service that District Health Authorities other than their own wish to purchase. For example, some neurological departments with the necessary expertise may well find it worth their while setting up specialised epilepsy clinics, and marketing their services with some sort of special deal. Such deals may involve appropriate imaging procedures and video monitoring for patients with intractable epilepsy. Neurological departments without specialised expertise may find themselves attracting few patients outside the

Figure 2 Distribution of numbers of new patients seen by 13 neurologists in one week in 1986. (Reproduced by permission from reference¹⁰).

Figure 3 Distribution of diagnoses of 411 new patients seen by 13 neurologists in one week in 1986. (Reproduced by permission from reference ¹⁰).

geographical area of their own District Health Authority.

Apart from the probable limitations on access for financial reasons to neurologists as a result of the National Health Service and Community Care Act of 1990, and the likely changes that the Act will have upon some neurological departments, there remains the running problem of geographical access. Is it better (that is, more value added to outcome) to have neurologists congregated in regional centres, together with neurosurgeons, neuro-radiologists, neurophysiologists, neuro-pathologists, physiotherapists, and other capital intensive resources, or is it better to have a neurologist primarily in a district, with a less intense relationship with the high technology centre? I shall not discuss the arguments for and against each system of care, as I have reviewed the development of the pattern of neurological services in the United Kingdom elsewhere.^{13,14} My impression is that over the last ten to fifteen years a reasonable compromise has been reached between the two possible ways of providing neurological care, and the National Health Service and Community Care Act of 1990 may de-stabilise this situation through the mechanisms suggested above.

If patients are offered high technology care of proven efficacy at some distance from their homes, they may well choose to opt for the less efficacious but local care. This has arisen in relation to radiotherapy services for cancer in

the North East Thames Region, in which at least one local population pressed for the retention of their technically less well equipped local treatment centre, rather than make the journey to a linear accelerator in central London.

As for temporal access, most hospitals run such audits as part of management. The timing of available appointments in outpatients should, as far as possible, reflect the reality of the neurologist's time of arrival and their other commitments, in order to minimise the patient's waiting time. However, an audit of the days or weeks spent by new patients waiting to see a neurologist after their referral from their family doctor is another matter. Personal experience suggests that if strenuous efforts are made to reduce the mean waiting interval, then more neurological referrals from family practice may be made, so that the waiting list extends again, and the neurologist is more pressed by even larger numbers of referrals. This may be no bad thing (apart from possibly destroying the health, sanity and marriage of neurologists!) but returning to the point made previously—a neurological intervention must add value over and above the care of a primary family practitioner to make the referral appropriate.

There is another problem related to access to care which I term "covert inaccessibility." By this, I mean that a referral to a neurologist is not made because a family practitioner or other physician chooses not to do so, believing that the best has already been done for his or her patient. A common example is older patients with Parkinson's disease who can be significantly further helped by the appropriate prescription of levodopa, a medication which many family doctors still seem anxious about using. Or a patient after a stroke may not be provided with a simple aid which a neurologist could instantly have recommended as being effective simply because the family doctor made the decision that "nothing could be done". Covert inaccessibility by its very nature cannot easily be measured, but a notable example in another field is that of Hampton *et al*¹⁵ who found that in primary care practice there were patients who would have benefitted from cardiological intervention and had not been referred.

The central box in fig 1 refers to the process of care, which must be appropriate, effective, ethical, relevant, equitable, coordinated and socially acceptable. I have explained the meaning of these terms elsewhere² and with particular reference to epilepsy,¹⁶ but here I write specifically about coordinated care and effective care.

Those with a chronic illness, including many neurological disorders, need to obtain health care from a variety of providers. For example, someone who is paraplegic and incontinent with multiple sclerosis will need help from the local housing authority, the Department of Social Security, neighbours, meals-on-wheels, community nurse, community physiotherapist, local incontinence adviser, family practitioner, and neurologist. I have written elsewhere of the difficulties that arise in co-

ordinating such activities,¹⁷ but the aim of the provision of our services should always be "seamless care." That is to say, the patient should not be aware of the administrative aspects of coordinating the various providers of care, but rather be the recipient of coordinated patient-centred care. Often, there are unfortunate stories of failures of communication between the various providers of care. Then the patient, or their family, has to take on the role of attempting to integrate the team of providers. A useful example of audit in this field is the provision of services to patients with multiple sclerosis in Glasgow by Elian and Dean.¹⁸ A neurological department could well audit a group of patients with a common disorder or disability in a similar way. Such a small scale project would be suitable for a medical student to undertake under supervision.

An effective intervention is one that achieves an outcome that significantly enhances the quality of the patient's life, or at least prevents the deterioration in quality that would have otherwise occurred. Without a defined outcome, it is impracticable to measure effectiveness. Before moving to a discussion of outcomes, it is important to distinguish between efficacy, effectiveness and efficiency. Efficacy is the ability of a medical or surgical intervention to produce the desired outcome in a defined population under ideal conditions. It is what is measured in randomised controlled trials. However, an efficacious procedure may well be less effective when introduced into everyday life, simply because the profession uses the efficacious treatment in a different patient population (for example, older than those in the trials, or with co-morbidities) and because the availability of medical skills is not necessarily the same in everyday practice as is available in those centres which commonly undertake trials. Also the follow up of patients in trials may increase compliance with the intervention under study, and compliance in everyday life may be so much less that the procedure is less effective than the efficacy suggested in the trial.

Efficiency is the extent to which resources are consumed by the interventions relative to their effectiveness. If two procedures are equally effective, one should choose the more efficient (cheaper) one.

The United Kingdom led the world in the design of randomised controlled trials, and in the proof of the efficacy of various interventions. Unfortunately, the lack of any information-gathering strategy about outcomes in the Health Service has not resulted in useful information about the effectiveness of many procedures that we undertake. The data available on MediCare magnetic tapes in the United States means that, for this client population, there is an increasing body of knowledge about the outcomes after various interventions. For example, Wennberg *et al*^{19,20} have shown that after prostatectomy, the 30 day mortality rate, the incontinence rate, and the impotence rate are all very much higher than that suggested from trials emanating from tertiary centres specialising in urology. In general, we are not

so concerned with surgical interventions of a curative sort in neurology, (although the effectiveness of carotid endarterectomy has recently been well studied.²¹ Neurology lacks basic studies of the efficacy of a number of commonly used interventions, particularly those relating to therapies used in rehabilitation, although there are some notable exceptions.^{22,23}

How can we measure the outcomes of neurological care, and therefore choose our effective procedures? Acute disorders such as meningitis or cerebral abscess are comparatively rare in everyday neurological practice, although there remains concern that acute infective disorders are not as well managed as they might be, possibly because of their unfamiliarity.²⁴ Mortality is clearly an inappropriate outcome measure for many of the disorders with which we deal, such as multiple sclerosis, epilepsy, motor neuron disease and Parkinson's disease. It would be difficult to use crude death rates among those attending a neurological clinic with these disorders, or within a Health District or Region as a measure of the neurological care provided, because of the many confounding variables. However, the example of epilepsy can be used to illustrate how an unexpected death can be used as a measure of medical audit. Status epilepticus is a potentially remediable condition. I believe that every neurological team should review in detail all such deaths to improve the system of care. Such an audit in my own hospital some years ago suggested a lack of readiness on the part of the general physicians on admitting duty to appreciate the potential seriousness of repeated convulsions, resulting in a delayed referral to a neurologist, and a delayed institution of appropriate therapy in an intensive care unit.

Epilepsy can also be used to illustrate the potential use of another type of adverse outcome — intoxication with drugs. Intoxication with phenytoin and carbamazepine is now rare, but certainly the records of any such cases should be reviewed by a neurological team to assess if there had been avoidable errors in advice about dosage, or in communication with the family practitioner.

Another adverse outcome is the development of a pressure sore, now fortunately uncommon in people with neurological disease, but such an outcome should trigger a review of ward practice.

If health status is measured before and after an intervention, then any change in health status becomes an outcome measure. A well known example is the Kurtzke scale which is widely used internationally in trials of interventions in multiple sclerosis. This is a reliable and valid scale which measures changes in functional performance, and therefore the efficacy of an intervention, but it does not measure the quality of other neurological interventions in multiple sclerosis. These are more difficult to define and relate to support and encouragement and to the facilitation of autonomy in patients with this progressive and disabling illness. Such aspects of care are exceedingly difficult to measure, but in

our type of practice are probably especially important.

It might be thought that it would be easy to measure outcome in epilepsy, to continue our example. However, the following illustrates various difficulties. At an individual level, all the patient is concerned about is that he or she becomes free of seizures, but if the intention is to audit the quality of care of a neurologist's intervention upon his population of patients, then the severity of epilepsy with which he deals becomes a pre-eminent factor. For example, the patients of colleagues working in special centres for those with intractable epilepsy would have very poor outcomes if seizure frequency was taken as a measure of their neurological performance. Also, at an individual case level, it is often hard to understand the meaning of changes in seizure frequency, which sometimes appear random and unrelated to changes in anticonvulsant medication.²⁵ It may be that patients referred to special epilepsy centres for monitoring could provide an audit of the quality of diagnosis in epilepsy, bearing in mind that approximately 10–15% of patients with intractable (epilepsy) turn out to have pseudoseizures on such review. It is, however, the neurologists who are most concerned about the quality of their care that are most likely to refer patients to special centres for long-term monitoring. The less successful neurologist who may wrongly diagnose epilepsy for pseudoseizures frequently may be supposed to fail to refer.

Then there is the point that it is possible to identify a number of outcomes for the same disorder. A neurologist may do well on some outcome measures and less well on others. I illustrate this point with the work which I carried out with Fitzpatrick on headache and migraine about ten years ago.^{26–28} The outcome measures that we used included the relief of headaches, using the dimensions of severity and frequency, the satisfaction of patients with their neurological consultation, the degree of reassurance about organic illness, and the change in frequency of consultation with their family doctor one year following the neurological consultation. Some of these outcome measures were inter-linked. For example, 60% of the 109 patients when first interviewed expressed some anxiety about the possibility that their headaches were due to a serious organic illness such as a brain tumour or an impending stroke. A further three weeks after the examination showed that of those who had been concerned, 60% had been completely reassured by their consultation, at least on this aspect, and a further 28% had been partly reassured. Twelve per cent remained concerned, and this unfavourable outcome was linked to another—those who were critical of the information received during the consultation were less likely to be reassured ($p < 0.01$).²⁶ Here there is an inextricable link between properties of the patient, process and outcome. Were the patients critical of information received because of poor information given or did they remain unreassured due to some personal reason? Such an audit may encourage

us to pay more attention to communicating information, but a failure to do so cannot be laid entirely at a neurologist's feet, any more than can a failure of an oncologist to cure a patient with acute myeloid leukaemia. Fitzpatrick and I showed that patients who are dissatisfied with their neurological consultation had a clear cluster of characteristics: in particular, women who had initiated the referral themselves, were rated anxious or depressed, who had a clear view that their headache was migrainous in nature, and had experienced headaches for more than one year.^{26–28}

A year later we followed up our sample of patients with headache (we achieved interviews in only 75 of them) and found that patients who had been satisfied with their neurological consultation were much more likely to rate the severity of their headaches as improved.²⁷ However, only 17 patients enjoyed complete freedom from headaches. What was particularly striking was that in spite of the continuing headaches (albeit with less severity and less frequently), the great majority decreased the number of visits to their general practitioner. As for reassurance one year later, nearly all (86%) attributed their reassurance to the hospital referral, whereas only 16% felt that the hospital doctors contributed to an understanding of their headaches, and even fewer (8%) felt that they had learned anything from the doctor that had allowed them to avoid or to manage their headaches better.²⁷ This range of outcome measures shows the diversity of dimensions that need to be considered in medical practice. Hospital information systems are not going to give us these data on a routine basis.

Conclusion

How can a neurologist begin to audit in the specialty? Bearing in mind the importance of outpatient (ambulatory) practice in neurology, I believe that it is appropriate to begin there. All new outpatient visits should receive at least a diagnostic code so that a department is aware of the range and quantity of its work. In consultation with the local family doctors, and drawing upon the evidence of published research on suitable investigations in various disorders, the neurological department should lay down policies for the management and investigation of some of the more common disorders, such as, headaches, migraine, and new cases of epilepsy. Without undertaking formal research studies of the type described above for headache,^{26–28} it would be worth instituting local well designed surveys of the views of the patients on the help that they had received from a neurological consultation, also, at a more technical level, assessments could be made on the outcome of therapy that the neurologist had suggested, for example, the provision of a short course of physiotherapy to release spasticity.

The Research Unit of the Royal College of Physicians is developing audit measures for the process of care of a number of common disorders.²⁹ At an international level, research endeavours must continue to find treatments

that are efficacious for our principal disorders. Where efficacious and effective treatments already exist, such as in Parkinson's disease, it would be helpful if the international neurological community could agree upon some simple scoring system that would identify the various dimensions of a patient's disability, such as rigidity, tremor and dyskinesia. The only advantage in collecting such information on a routine basis would be to enable the selection of a group of patients for particular review, for example, patients under 60 years with Parkinson's disease and severe dyskinesia might be reviewed at a clinic to discover if all the available therapeutic options had been considered. There is absolutely no point in scoring patients on a routine basis for any other purpose, unless such scores are part of a particular research project.

The institution of medical audit is largely an act of faith. By directing attention to the measurement of some more accessible items of process of care, and of outcome, it is hoped and believed that doctors will become more attuned to evaluating critically the quality of their work, so that aspects which are less easily measured, such as the facilitation of patients' autonomy, are also improved. The danger, however, is that the mechanical introduction of numerical audit measures may irritate and distract hard-pressed clinicians from time that could be usefully spent with patients. Neurologists may also rightly say that the quality of their care is largely restrained by the underprovision of resources. To take a simple example, all neurologists would agree with the principle that a family doctor should receive a discharge summary within one week. Neurologists would gladly adhere to that principle if the secretarial resource was made available. It is important not to be distracted by the underprovision of resources, of which this is a simple but everyday example, and concentrate upon delivering the best quality care within the area which is within one's own personal professional control, and use epidemiologically sound methods of measurement of that quality.

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