Audit of Clinical Practice: Opportunities to Rationalise the Use of Resources

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Financial limits and rapidly increasing costs have emphasised the need to identify ways of rationalising the use of resources in the NHS. Clinicians have a major responsibility for the consumption of resources in that most clinical decisions on the use of a diagnostic test, treatment or follow-up result in a monetary cost. The Swansea Physicians’ Audit Group has reviewed the consumption of resources under consultant control in a district general medical unit. The purpose of the audit was to examine levels of use and to identify significant variations between consultants, which might indicate opportunities for improving utilisation.

Method

The audit was carried out in two District General Hospitals in the same city. Fifty-five beds in one hospital and 101 beds in the other were under the control of six consultant general physicians.

Three medical conditions were selected for review: acute myocardial infarction, chronic bronchitis and cerebrovascular accident. A computer printout listing the 652 patients discharged during 1980 with a principal diagnosis of one of the above was obtained from Hospital Activity Analysis (HAA). For patients discharged more than once during the year, only the first discharge was included in the sample frame. Discharges by diagnosis were then stratified according to consultant, and random samples of 20 patients with myocardial infarction, 15 patients with bronchitis and 15 patients with cerebrovascular accident were chosen from each consultant’s list of discharges. The numbers in the sample frame were less than the desired sample number for bronchitis patients (two consultants) and for cerebrovascular accident patients (one consultant). The final sample consisted of 285 discharges (120 patients with myocardial infarction, 79 with bronchitis, and 86 with a cerebrovascular accident). Of the admissions, 97 per cent were emergencies and 12 per cent had had a medical admission in the previous six months.

Four areas of utilisation were examined: diagnostic tests, drugs, length of hospital stay, and follow-up outpatient attendances. Information was obtained on admissions (discharges) sampled from the HAA listing and not on other admissions in the same medical records. Data were abstracted from the medical records by an audit assistant at least one year after the discharge or death of the patient. Information on the use of chest X-rays was obtained from registers in the X-ray departments, as another study had shown that the medical records were an unreliable source of the number of radiological investigations performed[1]. The administration of drugs was obtained from the in-patient medication forms. The cost of the drugs was based on the price paid in 1982 by each hospital and derived from either the drug contract schedules for Wales or from prices negotiated with pharmaceutical companies.

Results

The use of certain diagnostic tests in patients with a myocardial infarction, bronchitis or cerebrovascular accident is shown in Table 1. Over 90 per cent of patients, irrespective of diagnosis, had a full blood count and SMA6 investigation. Chest X-rays, ECGs and SMA12s were performed frequently. The commonest test in patients with myocardial infarction was the ECG, both in terms of the percentage of patients having one or more tests and in the mean number of tests per patient. In the management of bronchitis 72 per cent of patients had a chest X-ray, 37 per cent had blood gases analysed and 4 per cent had a respiratory function test (FEV/FVC or PEFR).

The use of diagnostic tests was examined to decide if any consultants were using a test more or less frequently than their colleagues. In the investigation of patients with myocardial infarction, one consultant carried out a separate blood glucose examination on 52 per cent of patients, whereas less than 16 per cent of patients of other consultants had this test. The consultant with the high usage is a general physician with a special interest in diabetes. The only other substantial variation noted between the consultants was in the use of blood gases in the management of bronchitis patients. Five per cent of the patients of one consultant had this test compared to 43-53 per cent of the patients of the other consultants.

A total of 200 different drugs was used in the hospital treatment of the 285 patients included in the study; the number of drugs used per consultant ranged from 63 to 101 with a mean of 84 drugs. The ratio of generic proprietary preparations was approximately 3:1 with no significant variation between consultants. The number of preparations used within certain drug categories is shown.
Table 1. Use of selected diagnostic tests by diagnosis.

| Diagnostic tests | Myocardial Infarction | Bronchitis | Cerebrovascular Accident |
|------------------|-----------------------|------------|-------------------------|
|                  | % patients having >1 test | Mean no. of tests per patient having >1 test | % patients having >1 test | Mean no. of tests per patient having >1 test | % patients having >1 test | Mean no. of tests per patient having >1 test |
| Full blood count | 93 | 1.7 | 94 | 1.7 | 90 | 2.1 |
| White cell differential | 70 | 1.2 | 63 | 1.3 | 59 | 1.2 |
| SMA12 | 93 | 3.4 | 94 | 2.3 | 86 | 2.0 |
| SMA6 | 88 | 1.2 | 82 | 1.2 | 74 | 1.3 |
| Cardiac enzymes | 85 | 3.4 | 15 | 1.2 | 19 | 1.3 |
| Serum glucose | 18 | 1.8 | 24 | 1.7 | 22 | 3.4* |
| Blood gases | 5 | 1.3 | 37 | 2.6 | 2 | 5.5* |
| Chest X-ray | 79 | 1.5 | 72 | 1.6 | 67 | 1.3 |
| ECG | 96 | 4.9 | 77 | 1.6 | 81 | 2.2 |
| Sputum culture | 9 | 1.5 | 79 | 1.7 | 9 | 1.0 |
| FEV/FVC or PEFR | 0 | — | 4 | 1.0 | 0 | — |

* Elevated due to a very high number of tests on one patient

Table 2. Numbers of drug preparations used within selected drug categories.

| Drug Category | No. of Preparations used Per Consultant | Range | Mean | All Consultants |
|---------------|----------------------------------------|-------|------|----------------|
| Analgesic—major | 3-6 | 5.0 | 8 |
| —minor | 3-4 | 3.2 | 4 |
| Hypnotic | 3-4 | 3.3 | 6 |
| Tranquilliser—major | 0-1 | 0.7 | 2 |
| —minor | 2-3 | 2.2 | 4 |
| Antibiotic | 5-13 | 7.8 | 17 |
| Diuretic | 6-13 | 8.7 | 19 |
| β-blocker | 2-5 | 3.5 | 8 |
| Anti-hypertensive (except diuretic/β-blocker) | 2-4 | 2.8 | 5 |
| Bronchodilator (non-steroidal) | 5-8 | 7.0 | 13 |

in Table 2. Diuretics, antibiotics and non-steroidal bronchodilators had the highest number of preparations per category (19, 17 and 13 drugs respectively). For many categories of drug, there was a twofold difference between consultants in the mean number of preparations prescribed.

An average of 5.1 preparations was administered to a patient with myocardial infarction, 5.7 to a patient with bronchitis and 3.4 to a patient with a cerebrovascular accident. No substantial variation was noted between consultants. The use of certain categories of drug according to diagnosis is shown in Table 3. Hypnotics were not widely used; minor tranquillisers were administered to 18 per cent of myocardial infarction patients and to less than 10 per cent of bronchitis and cerebrovascular accident patients. Further analysis of the use of drugs in patients with a myocardial infarction showed that 65 per cent of patients had a diuretic (three-quarters with potassium supplementation), 12 per cent had a cardiac glycoside, and 13 per cent a beta-blocker. In patients with bronchitis, 70 per cent had antibiotics, 32 per cent had steroids and 85 per cent had non-steroidal bronchodilators. The only major variation between consultants in the use of drugs occurred in the treatment of myocardial infarction patients: the use of diuretics ranged from 35 per cent to 83 per cent of consultants’ patients; beta-blockers were administered to between 5 per cent and 32 per cent of patients.

The mean cost of drug treatment for an in-patient admission was £4.50 for a myocardial infarction patient, £10.60 for a bronchitis patient and £4.10 for a cerebrovascular accident patient. Mean costs per patient varied between consultants only for patients with bronchitis (range £5.40 to £38.70 per consultant). The high mean costs were due to the use of expensive antibiotics in a few patients. Among the 285 in-patient admissions, the highest cost of drug treatment for one in-patient stay was £149.00. For 84 per cent of patients, however, the cost was less than £10. Sixteen drug preparations prescribed on 24 occasions cost more than £10 for the course of treatment in hospital. Of these prescriptions, 9 were for antibiotics (5 preparations) and 5 were for heparin.

The mean lengths of stay of patients under the care of...
Table 4. Mean lengths of stay per diagnosis by consultant.

| Consultant | Myocardial Infarction | Bronchitis | Cerebrovascular Accident |
|------------|-----------------------|------------|--------------------------|
| A          | 11.1                  | 7.6        | 43.8                     |
| B          | 10.1                  | 8.7        | 47.2                     |
| C          | 11.6                  | 8.9        | 21.4                     |
| D          | 11.8                  | 14.7*      | 15.5                     |
| E          | 9.5                   | 12.8       | 10.3                     |
| F          | 10.5                  | 9.0*       | 15.7                     |
| All        | 10.8                  | 9.8        | 26.4                     |

* n<10 patients

Each consultant's are shown in Table 4. For myocardial infarction patients the overall mean length of stay of 10.8 days did not vary greatly between consultants. Bronchitis patients under the care of consultant E had a mean length of stay of 12.8 days, which was higher, but not significantly so ('t' test, P>0.05), than for patients under the care of consultants A, B, C and F. Mean lengths of stay of cerebrovascular accident patients under the care of consultants A and B were high, but these elevated means were due to the very long stays of a few individual patients.

In examining the number of follow-up out-patient attendances per patient within one year of discharge, only those patients who were discharged home and not re-admitted to hospital within the following year were included in the analysis. Myocardial infarction patients had a mean of 1.5 attendances during the year, bronchitis patients had 1.2 attendances, and cerebrovascular accident patients had 1.6 attendances. Forty-two per cent of patients had no follow-up, 23 per cent attended the out-patient clinic on one occasion and 36 per cent on two or more occasions. The number of attendances varied considerably between consultants, from a mean of 0.8 to 2.8 attendances per patient. Table 5 shows that the majority of patients discharged from hospital by consultants D and E had no follow-up, whereas almost three-quarters of consultant F's patients attended the out-patient department on two or more occasions. Patients under the care of consultant B were most likely to attend the out-patient department on only one occasion. According to annotations in the out-patient clinical records, 29 per cent of patients attending the out-patient department were discharged from further attendances, leaving 41 per cent of all patients being followed-up for at least one year. Only three of the 102 patients who attended the out-patient clinic did not keep further appointments.

Discussion

What are the opportunities for rationalising the use of the clinical resources studied? This review showed little variation in the use of diagnostic tests between consultants; no consultant (or his junior staff) was a particularly high user of tests. Despite this similarity in levels of use, there might still be scope for a reduction in the overall use of some tests (and alternatively for an increase in the use of others). The difficulty is that for most tests we do not know what is an appropriate level of use[2]; that is, a standard of practice is not defined. For example, how frequently should patients with a myocardial infarction have an investigation for serum cardiac enzymes? Is a random or fasting blood glucose a worthwhile screening investigation on patients admitted to medical wards? The Royal College of Radiologists' multi-centre studies of diagnostic radiology are attempting to delineate appropriate levels of use for certain X-rays[3,4], but until more widespread information is available on the appropriate use of tests, standards must be based mainly on clinical experience. In analysing the results of this study, the Audit Group did not consider that there was scope for a substantial reduction in the use of diagnostic tests. Some concern was expressed at the low use of chest X-rays and respiratory function tests in patients with bronchitis. The recorded level of use was considered, however, to be below that which occurred in practice, suggesting poor recording rather than a failure to perform the tests.

Although mean drug costs per patient were relatively low (in comparison with those observed recently in a survey of Regional specialty units[5]), the Audit Group considered that this audit revealed some opportunities for reducing drug costs.

1. Very expensive drugs, particularly antibiotics, might have been replaced with equivalent cheaper preparations.
2. A more limited less expensive range of diuretic and bronchodilator preparations might have been used (while recognising that the width of the range may have been due partly to the continuation in hospital of drugs prescribed by general practitioners).
3. When beta-blockers were used, propranolol, being the cheapest preparation, should have been the drug of first choice. The Audit Group could not agree on the indications for the use of beta-blockers in the treatment of myocardial infarction, but did recognise that they were being used more frequently since 1980, the year covered by the audit.

The introduction of a limited hospital formulary is presently under consideration as a means of rationalising the use of drugs and reducing costs.

The mean hospital lengths of stay did not vary significantly between the consultants. Comparison with lengths...
of stay for similar diagnoses in the Hospital In-Patient Enquiry for England and Wales[6], showed that the lengths of stay noted in this study were below the 1978 national averages of 15.2 days for myocardial infarction, 21.9 days for bronchitis/emphysema, and 63.0 days for cerebrovascular accident. The data on lengths of stay for cerebrovascular accident patients were not useful in identifying opportunities for reducing lengths of stay in that much of the variation was undoubtedly due to difficulties in finding long-stay accommodation and was outside the control of the consultants. Even if reductions in lengths of stay were possible, cost savings might not have followed[7], due to a likely increase in admissions to occupy empty beds.

The large number of follow-up out-patient attendances in the NHS has been criticised as being both unnecessary and uneconomic[8-10]. There is, however, no good evidence of what constitutes appropriate follow-up and it is not surprising that nationally the number of follow-up attendances continues unabated[11]. In this audit, the considerable variation in number of out-patient attendances per consultant stimulated much debate on the ideal follow-up of patients. The Audit Group was unable to decide on a uniform policy that might be implemented in the general medical unit, but participation in the audit has undoubtedly motivated individual physicians to examine their own follow-up policies and seek ways of reducing unnecessary attendances.

How practicable was this method of review in examining the use of clinical resources? Proceeding with the audit was not difficult in that Hospital Activity Analysis provided a listing of patients with the required diagnoses and a non-medical audit assistant abstracted the data from the medical records. Time spent by physicians on the audit was minimal. The main practical difficulty was in acquiring resources and in training and supervising the audit assistant[12]. The collection and analysis of data took about four months and the cost (salary of audit assistant and computing) was approximately £2,200.

In conclusion, use of diagnostic tests and length of stay did not vary significantly between consultants, and the Audit Group considered the levels of use to be satisfactory. Opportunities for reducing drug costs were identified. Substantial variations were noted between consultants in the number of follow-up out-patient attendances, but the Audit Group was unable to decide on the ideal follow-up of patients. It should be recognised that similar audits in other general medical units would not necessarily produce the same results, as the findings of this study were dependent on the homogeneity of practice of the consultants, variations in the mixture of cases, and on the diseases and resources selected for review.

Audit would appear to be a feasible method of identifying variations in the use of resources in a general medical unit where changes can theoretically be made, but a lack of defined standards of use may limit the adoption of new policies to alter utilisation.

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