SPECIALTY MEDICAL AUDIT

Dr Charles Shaw

MEDICAL AUDIT SERIES 4

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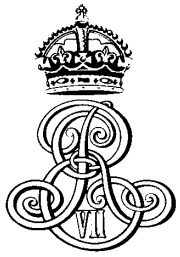

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FOREWORD

The pressures of everyday clinical work are such that all too often doctors press on as best they can dealing with fresh clinical problems arising every day. Medical audit starts with the principle that it is both necessary and right to step back from day to day clinical practice and examine the outcome of one's work, and the quality with which that work has been done. Charles Shaw, the author of this monograph, has had a career in hospital medicine, hospital management and, with the King's Fund, in the development of health policy. His papers of a decade ago were a powerful stimulus to the development of medical audit in this country. He has done all of us a service by bringing together in this volume a succinct summary of the organisation of the structures for medical audit, and of the available resources. He also summarises what might usefully be done in a number of different specialist areas.

There remains, however, much to be done — notably, the definition of outcomes of illness that are meaningful to patients and their families and about which information can be collected on a routine basis without using too many of the resources dedicated to the delivery of health care. The comparison of such outcomes between individual medical and surgical teams will be meaningless without the development also of measures of severity of illness and co-existant morbidity, so that comparable populations of patients can be compared.

Doctors tend to be among the more conservative members of the community, and few would wish it otherwise. Sometimes, however, doctors can be too conservative, and fail to take on board advances in practice derived from research. They may stick too tenaciously to styles of practice adopted in their medical youth. We also need, therefore, research into how best to change doctors' practices — another way of saying that we need research into the most effective methods of post-graduate medical education. It is right therefore that Dr Shaw's book stresses the educational aspects of medical audit. I commend it to all.

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Director, Research Unit
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None of this would have flourished without the perseverance of my secretary at the King's Fund Centre, Pat Tawn, who managed to reconcile IBM and Unix, maintain an orderly file of correspondence, and keep a sense of order through numerous changes in text, headings and numberings.

INTRODUCTION

THE AIMS OF THIS BOOK

The first King's Fund Centre handbook on this topic, *Hospital Medical Audit*, was published in 1989 as a general introduction. In the wake of the 1989 *Working for Patients* White Paper many doctors, though pleasantly surprised by the offer of central funding, were at that stage concerned about the purpose of audit and who should lead it.

Now, three years later, the issues are about how to do it, where to find ideas and how to interpret results and influence change. But there are still a number of doctors who have particular reasons for remaining unconverted. These are commonly:

'I'm busy; my time is better spent with patients.'
'Yes, but I haven't got a computer.'
'I'm quite keen, but my colleagues wouldn't go along with it.'
'All the figures in this hospital are wrong.'
'In my specialty, audit is very difficult.'
'There's no one to help us get started.'
'It would only show that we need more money — we know that already.'
'We are going to — but we're waiting for Read coding.'
'...Anyway, I'm retiring soon.'

Each of these reservations represents a legitimate hurdle; most of them can be overcome. But some doctors prefer to deny their personal anxieties and transfer them into concerns about less threatening issues such as records, computers and resources. It is the task of the enthusiasts and local organisers to lower these practical and personal hurdles and encourage others to take part. This book aims, by giving specific examples and reference sources, to suggest how audit problems might be solved.

SCOPE AND LIMITS

One of the problems with this book has been in deciding where and when to stop. Every week more ideas emerge in journals and meetings, as experience grows in the UK and overseas. But there must be a 'closing date'.

Though there are similar issues on audit in general practice and community medical services, this book concentrates on specialties found in most hospitals.

Other areas which colleagues have suggested might have been included are: the future relationship of medical audit to management and contracts; risk management; linkage to non-medical audit and quality improvement and the measurement of patient satisfaction. I agree each of these deserves attention and that patients' perceptions should feature from the start in assessing outcomes (and in recording in notes) but they should not distract doctors from examining their individual work in those technical and professional areas which they are best qualified to judge.

HOW THE BOOK WAS WRITTEN

Although most specialists rightly want to concentrate on audit in their own specialty, there are close similarities in concepts and practice between most of them. Each could gain much from the experience of the others. So it seemed important to present succeeding chapters in the same format. Having different authors for each would give variety at the expense of consistency; so I drafted each section and then sought advice from national bodies and individuals.

Thus, though the final version is from a mixture of sources (see acknowledgements) for whose help I am most grateful, I must accept responsibility for omissions, inaccuracies or inappropriate emphases.

STRUCTURE OF TEXT

The first chapters deal with general issues of organisation, methods and resources. The remainder apply these principles to individual specialties. Many of the methods and findings of one specialty could easily be applied laterally to others. In an attempt to provide easy cross-reference between specialties, each specialty chapter has a similar format.

The groupings of specialties has been a compromise between methodological similarities specific to audit and the common functional groups of hospital doctors. This has posed some problems, such as in obstetrics and gynaecology and anaesthesia and intensive care, which have been placed together although audit may in practice be separated with respect to staff, methods and data.

Charles D Shaw
April 1992

1 — NATIONAL GUIDANCE

HEALTH DEPARTMENTS

United Kingdom

Several medical royal colleges, societies and associations had been active in what is now called medical audit, but it was the government White Paper, *Working for Patients*[1] which accelerated the activity in 1989. It provides a convenient point to begin a summary of national guidance on the subject.

Included among a variety of proposals for change in the organisation of the National Health Service, in *Working for Patients*, was a plan for the introduction of medical audit. This was amplified in the subsequent working paper no.6[2] and Scottish working paper no.2.[3] Medical audit was defined as:

> *'the 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 and quality of life for the patient.'*

England

Organisation

A draft health circular of February 1990[4] was superseded belatedly in January 1991 by HC(91)2,[5] *Medical audit in the hospital and community health services*. This outlined the arrangements which health authorities and NHS trusts were required to make in order to ensure that a framework for medical audit was in place by April 1991. It defined the relevant tasks of regional health authorities and local medical audit committees, and the implications for medical education and training. Guidance on implementing medical audit in general practice was issued in HC(90)15.[6]

Funding

In December 1989, the Department of Health allocated £26m for audit in 1990/91. Of this £24m was distributed to regions and special health authorities (SHAs) pro rata to the number of whole-time equivalent consultants, on receipt of satisfactory implementation plans. The balance went to the medical colleges and faculties and other national organisations, including the King's Fund.[7] The regional plans were to specify how audit was to be organised and what resources were needed in terms of information, manpower and training.

In 1991 £11m was allocated to regions to support audit in primary care, and £38.5m was allocated to regions and SHAs for hospital and community services, on receipt of a satisfactory financial account for 1990/91 and a forward implementation plan.[8] The latter was to specify how audit funding would support postgraduate and continuing education, how hospitals would collaborate with general practice and community services, how the effectiveness and appropriateness of medical interventions would be measured, and how the effectiveness of the audit programme itself would be assessed.

General principles

The Standing Medical Advisory Committee, at the request of the Secretaries of State for Health and for Wales, presented a valuable summary of the history, principles and practice of audit, which was distributed to every doctor in England and Wales.[9]

Key points of agreement between these government documents and the views of the professional bodies were summarised by Macpherson:[10]

- The purpose of medical audit is to improve the quality of care that the health services can offer to patients.

- Medical audit is a professional activity which must be led by doctors.

- Medical audit is primarily an educational activity by which, through peer group and self-evaluation, judgements can be made about one's own performance in relation to that of others or it can be compared with agreed standards.

- The methods of audit and the criteria and standards against which performance is judged should be developed by the profession, either nationally or locally as appropriate.

- Although resources are required for medical audit, especially in terms of professional time, a start can be made relatively simply with minimal disturbance to present work patterns.

Northern Ireland

Expanding on working paper no.6,[2] the circular *Medical audit in hospital and community health services*[11] outlined the functions of the Northern Ireland Regional Audit Advisory Committee (NIRAAC), also responsible for audit in general practice, and of the four Area Audit Advisory Committees. The time required for each doctor to take part in a regular audit programme was estimated at one quarter to one half session per week. This time commitment was to be be incorporated in future job descriptions. Guidance on general practice was included in a separate circular.[12]

Funding was included in one global allocation for developments under the NHS Review.

Scotland

Guidance on implementation of medical audit, based on Scottish working paper no.2,[3] was issued to general managers of health boards and the Common Services Agency in August 1989.[13] Area Audit Committees (AACs) were to be set up by the end of September 1989 in each board, covering all hospital, community and primary care services. They reported to the national Clinical Resource and Audit Group (CRAG), chaired by the Chief Medical

Officer. CRAG is responsible for determining national audit strategy, identifying and disseminating good practice, co-ordinating audit at national level and monitoring audit training.

Wales

Organisation

In April 1990, health authorities were circulated with draft guidance on the implementation of medical and dental audit in the hospital and community dental services (WHC(90)32).[14] This outlined the functions of local audit committees, covering one or more units, and the implications for resources and education and training. The Welsh Advisory Group on Medical Audit (WAGMA) was set up, by the Secretary of State for Wales, to promote audit nationally, to organise audit of regional and small specialties and to assist the Welsh Office in the dissemination of advice to district health authorities (DHAs) and family practitioner committees (FPCs). Members of WAGMA include nominees of the medical royal colleges, the Welsh General Medical Services Committee, the Welsh Subcommittee of the Joint Consultants Committee, the postgraduate dean and two junior hospital doctors.

WAGMA offered detailed advice in November 1990 on a range of issues, including the location of specialty audit, management support, the role of audit committee chairpersons and support staff, confidentiality and links to postgraduate and continuing education.[15]

Funding

Bids for pump-priming of audit projects were invited from health authorities and FPCs in March 1990. The funding programmes were intended particularly to support training and education and to promote linkage between specialties, services and practices.[16] Information technology requirements for hospital audit were specifically excluded, being the remit of separate IT support programmes.

MEDICAL ROYAL COLLEGES

Many of the colleges and national professional associations have issued advice on the organisation and practice of audit within their specialty (see relevant chapters for details). In general, these cover:

- Purpose of audit: to identify opportunities and to implement improvement in the quality of medical care, medical training and continuing education, and the effective use of resources.

- Organisation: responsibility for implementing audit rests with consultant medical staff; effective coordination is required within and between specialties at local, regional and national level.

- Methods: audit should involve the objective peer review of patterns of care, be sensitive to the expectations of patients and other clinical disciplines, and be based on scientific evidence of good medical practice.

- Issues for audit: all types of patient, clinical condition and medical activity should be eligible for audit; priorities should be defined locally.

- Resources: medical staff should be provided with the time, data, technical assistance, library support and training required to fulfil the agreed programme of audit.

- Records: the documentation of medical care and of medical audit should comply with defined standards of good practice.

These general statements may be expanded into specifications for defining medical audit, or for the purpose of contracts.[17]

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2 — ORGANISATION

STRUCTURE

National

Northern Ireland, Scotland and Wales each have a national body (respectively NIRAAC, CRAG and WAGMA, described in chapter 1) to oversee the development of medical audit. In England, regional audit committees have no national focus within the NHS in which to share data, methods and results. Within specialties, this function has been largely absorbed by the medical royal colleges. The Conference of Colleges has established a medical audit working party to exchange common interests between the colleges. The role of the Clinical Standards Advisory Group in medical audit has yet to be defined.

Local/regional

Service departments

Within individual departments, the definition of a peer group for audit purposes is influenced by the number of consultants, their geographic distribution, the number of juniors and the normal working practices of the individual specialty (for example, in geriatrics and rheumatology audit tends to reflect the multidisciplinary work). Although every doctor and specialty needs to identify primarily with one audit group, arrangements should allow alternative combinations of staff which are appropriate for occasional review of a particular topic or regular discussion of common interests. The implications of this for individual specialties are referred to in the 'Organisation' section of each specialty chapter.

Local audit committees

The responsibilities of local audit committees in the United Kingdom are laid out in the respective national circulars.[1–4] In general, they are to:

- Ensure a comprehensive mechanism and programme for local audit, in which all doctors participate.
- Produce an annual report summarising local activity.
- Produce an annual forward programme.
- Ensure the confidentiality of audit results relating to individual patients and doctors.

Some of the organisational and attitudinal challenges met in setting up a district audit programme have been described by Gumpert and Lyons.[5]

The prime focus for audit is within provider units; many former 'district' audit committees have been reformed to reflect their separation of staff providing care from the purchasers of it. But the need to share comparable results among a peer group points in many specialties to a supra district or regional forum which, like postgaduate education, transcends local management boundaries. This hybrid of local and (sub)regional audit needs to be explicitly delineated between local and regional audit committees to ensure that it is comprehensive and adequately supported with personnel, data and finance. It also requires agreement between clinicians and managers on reporting mechanisms and on access to data generated by audit.

Regional specialty subcommittees

Whatever location a specialty chooses for its routine audit activity, regional specialty subcommittees or their equivalent can contribute:

- Agreement on sharing subjects, methods and results of audit undertaken locally.

- Advice to region on coordinating the introduction of clinical workstations.
- Agreement on common local minimum data sets, including definitions to be used and routine clinical statistics to be produced.
- Coordination of specialty training for audit within the region.
- Liaison with regional advisers and national colleges, faculties and associations.
- Reporting to the regional audit committee on general issues facing the specialty.

The contribution of one (general surgical) subcommittee is described by Collins.[6]

Regional medical audit committee

Within the guidelines of HC(91)2,[1] the functioning of regional committees in England reflects the local attitude to regional control and to the role of the medical advisory structure. In carrying out the responsibilities on behalf of the regional health authority for coordination between districts, organising audit in smaller and tertiary specialties, and producing annual reports and programmes, specific projects of regional committees have included:

- Policy on confidentiality.
- Policy on the doctor's role in clinical data capture.
- Advice on the allocation of funds within the region.
- Advice on audit priorities in the regional research programme.
- Advice to districts on the content of annual plans and reports.
- Seminars on general aspects of audit.

- Multispecialty seminars on specific topics (e.g. the regional response to national reports such as the *Confidential enquiry into perioperative deaths*,[7] and radiation to patients[8]).

- Publication of a regular newsletter.

- Establishment of a regional resource centre.

INTEGRATING AUDIT

Hospital quality improvement and clinical audit

Medical audit focuses on individual medical practice and the results obtained by doctors; it is one of a variety of mechanisms aimed at evaluating and improving the quality of care to patients in hospital. These mechanisms may be summarised in three broad categories:[9]

- Direct (managerial): framework for total quality within the organisation including defined objectives, operational standards, policies, information for monitoring, resources and mechanisms for control and effecting change (including the professional advisory structure).

- External: review by legitimate 'outside' bodies such as statutory inspectorates (e.g. fire, safety, radiation), educational bodies (eg, accreditation of training posts), community health councils, specialist organisations (e.g. Health Advisory Service, National Development Team, National External Quality Assurance Scheme for laboratories) and now purchasing authorities and GP fund-holders having contracts with the hospital.

- Indirect (professional): internal review of technical quality of clinical practice. This being professionally led by clinical groups separately (e.g. nursing, physiotherapy, medical audit) or jointly with other professions (clinical audit).

In the 1989 White Paper the references to audit concentrated on medical and dental care. The same emphasis is applied to the funding which followed. Yet the ethical responsibility for self-regulation is shared by other clinical professions which have received much less tangible support. In reality, few clinical activities exclusively involve doctors. Arrangements for medical audit should allow for joint review of appropriate topics (e.g. amputees, stroke rehabilitation, diabetic care) with other professions in the clinical team. Multidisciplinary audit is more common in specialties already working explicitly in teams, but is likely to develop further as confidence in audit and curiosity increases. As long as such audit remains doctor-led it should be eligible for funding from the central allocations made to medical audit.

Community health and general practitioner services

Community medical and dental services

Community services, both dental and medical (such as child health and family planning) have the same requirements as hospital-based specialties to implement audit. Community-based consultants and some clinical medical officers have integrated their audit activities with hospital departments such as paediatrics or gynaecology. But many community units are under resourced and under represented on local audit committees dominated by acute hospital services. In some cases, this isolation has been increased by the designation of self-governing trusts and market competition between units. If audit is to develop as a professionally-led educational activity, local arrangements must allow peer groups to transcend managerial boundaries.

Another boundary is between hospital-based and general practitioner-based services that undertake the same work such as childhood immunisation, cervical screening and family planning. It is important for local audit committees, hospital and community health services to liaise with the Family Health Services Authority (FHSA) medical audit advisory groups and to ensure adequate cover without duplication of activities. Difficulties may occur over funding of joint audit because of the differences in the amount and mechanisms of central allocation.

General practitioner community hospitals

All doctors working in GP community hospitals are expected to share the central audit funding allocated to them. Visiting consultants generally turn to their own specialty for audit, but they may also make a valuable contribution to audit in smaller hospitals, especially with regard to casualty, anaesthetics, surgery and care of the elderly. General practitioners are, for this purpose, employed by the hospital either as clinical assistants or under contract and paid through the bed fund or casualty fund, but there is as yet no national pattern for providing the audit support that is received by other hospital doctors.

Where audit has taken root in such hospitals, it has been encouraged by the influence of training practices and an active and organised GP medical staff. Subjects for audit tend to be more general than in larger hospitals. Examples include case selection, discharge procedures, transfers, prescribing, terminal care and medical records. Although GP Community Hospitals have the same clinical data capture systems, the resulting information tends to be less accessible, complete or accurate than in central hospitals. Commonly, the presenting complaint is recorded as a proxy for final diagnosis of discharged patients.

General practice

The basic structure for audit in general practice in England was set out in health circular HC (FP) (90) 8 which described the establishment of medical audit advisory groups (MAAGs). These represent local general practitioners and are responsible for ensuring that all practices take part by April 1992. GPs have generally welcomed the introduction of medical audit but many issues similar to those encountered in the hospital and community health services have yet to be fully resolved.[10]

In England and Wales, a framework for collaboration is provided by cross-representation (often by the two chairpersons) between the local audit committee (hospital and community health services) and the MAAG (general practice). Several English regions have a formal group to coordinate audit in general practice; some have regular regional meetings of representatives of

MAAGs and provider units. In Scotland and Northern Ireland (and some English regions) closer liaison is provided by having one group to coordinate audit in both sectors at area level.

The Department of Health circular allocating funding to English regions for 1991/92[11] emphasises that collaboration between hospital and general practice should be more than symbolic representation. Progress is expected on joint projects, for example, audit of locally agreed management policies, such as those from University College[12] and St George's Hospital,[13] referral practices, or communication (particularly letters to and from consultants). Some regions have funded audit assistant time for joint studies including day surgery, mental health, diabetes, domiciliary visits, patient-held records, medical letters, child health surveillance, stroke management in hosptals, community and primary care. Priorities for hospital audit, as seen by GPs, include, waiting lists, response to immediate referrals, follow-up of routine referrals, reports of patients dying and quality of letters from hospital (especially concerning timeliness, medications, follow-up arrangements and information given to the patient).

Although the scope of available data varies between practices, many have a limited diagnostic index. This can identify patients with chronic diseases (such as asthma, diabetes, hypertension and epilepsy). Most GP databases are more clinically comprehensive and accurate than in hospitals.

Medical education

Common ground

The relevance of audit to medical education was notably understated in the 1989 White Paper, but later government advice sought to correct this. The Standing Medical Advisory Committee for England and Wales,[14] and the Standing Council on Postgraduate Medical Education for England[15] endorsed a close liaison between education and audit. This involves training in audit for all doctors. It should be preferably provided locally by professional peers teaching by example. There should also be training for the doctors responsible for coordinating and organising audit; and medical students

should be taught to analyse medical methods and practice in all clinical firms.

The practical linking of audit and education was also promoted by the common assertion by employing authorities of hospital consultants that the two should be designated together as equivalent to one clinical session per week (approximately 10 per cent of contracted hours). The argument has been taken further. It has been suggested that central funding for audit should be administered by postgraduate deans rather than health authority treasurers to underline its educational purpose and to retain regional coordination of peer groups, regardless of shifting managerial boundaries.

There are four elements linking audit and education:

- Teaching the principles of audit.
- 'Corrective' education in response to audit.
- Audit as a means of educating.
- Audit to evaluate education itself.

Teaching of audit

If audit is an integral part of clinical practice, it should eventually be taught by example to students and juniors on the wards. In its infancy, it is a fashionable addition to courses in epidemiology or management is itself the subject of a course. Some courses on audit are aimed specifically at junior medical staff, but more are attended predominantly by consultants. Many hospitals offer one-day introductory seminars on general issues, but do not have the resources to provide practical tuition for individual specialties. This is better organised on a collaborative basis with regional specialty committees and the appropriate national colleges, faculties and specialty associations.

The World Health Organization[16] has proposed a general framework for training in medical quality assurance (the preferred term in Europe and many

other countries), including recommendations to member states to provide funding, training and research on the topic.

Education as a response to audit

The scope for education to implement change and 'close the feedback loop' is limited by the type of opportunity for improvement which audit identifies. In practice, audit does not often reveal a lack of knowledge or skills, which might be amenable to improvement by education, or indeed a lack of resources. The problems identified more commonly result from the policy of the service or from the organisation of the available resources. Difficulties may include:

- Lack of policy (e.g. on control of intensive care beds).
- Deviation from policy (e.g. antibiotic prescribing).
- Lack of system (e.g. for avoiding redundant clinic visits).
- Failure to consult (e.g. by juniors prior to emergency surgery).
- Failure to record (e.g. what information is given to the patient).
- Inappropriate use or servicing of equipment (e.g. calibration of sphygmomanometers).

Some identified problems do stem from lack of resources (e.g. delays concerning discharge letters may be due to lack of secretarial time; inadequate anaesthetic monitoring may be compounded by lack of an oximeter). Others relate to unrealistic expectations by the public and — a fundamental problem — a paucity of scientific evidence on the effectiveness of common medical procedures and practices.

Most amenable to educational development are the knowledge and skills of individual doctors. One issue raised by audit in many specialties is the 'volume—outcome' link. In the hands of frequent operators, technical procedures and decisions tend to lead to better results than in the hands of

occasional operators. The challenge is to decide whether to increase the experience of individuals by attachment to a specialist unit, or to channel work through one or two local consultants who become more specialised. Another option is to refer all such work to the staff and facilities of another unit. Apart from technical skills, audit may highlight training needs in decision making and in interpersonal skills, such as leadership and communication.

Missives or lectures in isolation have little impact on clinical practice; several coordinated elements are required. Williamson et al[17] describes how a traditional education programme failed to correct inappropriate medical responses to unexpected abnormal results of routine testing of haemoglobin, blood sugar and urinalysis. The laboratory eventually persuaded the doctors to take note of the abnormal results by obscuring them with coloured labels which had to be scratched off the reports. But the effect only lasted until the labels ran out.

Fowkes and Mitchell[18] summarised overseas experience of educational follow-up of audit, and tested it in Britain (particularly with respect to policies for the use of pre-operative chest X-rays[19]). Essential ingredients for implementing change include:

- Explicit definition of policy.
- Local 'ownership' of definition.
- General dissemination of policy.
- Measurement of individual performance.
- Feedback of results of measurement.
- Peer review of results and of policy.
- Explicit agreement on further action.
- Repeat cycle to show progress.

If this activity is to be coordinated among specialties by the clinical tutor, he or she requires the support of a postgraduate education group and a direct link with the local audit committee. According to Batstone, in 1990, 92 per cent of districts in England had, or planned to have, an education committee[20]. Government advice on audit structures recommended inclusion of the clinical tutor on local audit committees; some audit committees are composed solely of tutors representing the postgraduate dean and the medical royal colleges.

Audit as an educational tool

Audit offers a bridge between the principles of medicine and personal clinical experience, between patterns of practice and individual patients. It does not supplant bedside teaching or case presentations, but it adds a framework for learning and comparing in objective terms. For example, audit enables discussion on:

- Standards: review of literature, explication of 'good practice' and criteria for measuring it.
- Records: definition of contents, accuracy and legibility.
- Data: availability and application of statistics in clinical practice.
- Variations: social, epidemiological, clinical and economic factors affecting uptake, process and outcome of services.
- Management: effecting change in individuals and in the organisation.

If topics selected for audit are of general interest (not the personal hobby horse of one individual), if cases reviewed are recent enough to include current junior staff and if all doctors take part, then it can be an effective and interesting activity. Consultants responsible for audit should ensure that junior staff are not left to run audit on their own. Juniors should not be subjected to repeated criticism of record keeping, nor should they be expected to devote hours of their time to data capture which could be done by audit assistants or other staff.

Audit of the educational process

On general principles, audit of any endeavour needs three elements: defined expectations, a mechanism for measuring achievement and the means to implement change. Applied to the educational process, this implies:

- Expectations: an agreed strategy for postgraduate and continuing education should define responsibilities, processes and outcome objectives at local and regional level.

- Measurement: accurate, current information and effective monitoring mechanisms should be available to evaluate the educational process. This requires collation of data from each locality on manpower, appointments, accreditation visits, educational facilities, activity, supervision, funding and individual academic and career achievements.

- Change: the regional postgraduate department should be able to influence educational policy and practice at local and regional level through the medical advisory and management structures, and in collaboration with the medical royal colleges, faculties and training committees.

Methods of auditing the educational process might include:

- Review of individual adverse events: e.g. 'stuck' doctors, drop outs from training, lost training posts, uncompleted MSc/MD theses.

- Routine key indicators: e.g. trainee:trainer ratios, percentage uptake of study leave, percentage attendance at audit/educational meetings, ratio of observed:expected achievement of higher examinations and accreditation.

- Ad hoc topic review: e.g. career counselling, appointment procedures, approval of trainers.

Audit and research

Research work pursues evidence on the efficacy of medical intervention. It is aimed at extending the body of scientific knowledge to define what is the most effective treatment. Audit examines the effectiveness of individual doctors in applying this knowledge in their own context; it is aimed at improving their care for their patients and at enhancing their own education. It focuses on the singer, not the song — on behaviour rather than technology — but it also links closely with research.

There are process-outcomes links. The logic of measuring the process of medical care as a proxy for clinical outcomes assumes there is valid research-based evidence linking 'good practice' with good results. Ideally such evidence would come from randomised controlled trials or systematic studies but, in reality, much widely accepted practice has never been subjected to these.

Audit may develop an agenda for research by suggesting fruitful hypotheses based on findings in local practice. Many audits lead to recommendations to change local clinical practice, but their design is unlikely to support much wider extrapolation.

Audit aims to converge clinical behaviour and scientific knowledge; it is appropriate that it contributes to priorities for medical research. The national and international implications of audit for research programmes are reviewed by Vuori[21] under the principal headings of:

Concepts related to quality: e.g. balancing consumer and provider views; linking quality, cost containment and technology assessment.

Epidemiology of quality: e.g. variations in the provision and quality of care, adjustments for casemix, factors influencing clinical decision making and satisfaction with services.

Methods of quality assurance: e.g. validated measurement tools for clinical practice, service provision, patient satisfaction.

Criteria and standards: development, testing and costing.

Implementation: studies to identify factors affecting organisational and individual change.

Organisation: impact of incentives, management structures and care strategies.

Evaluation: impact of quality assurance on the quality of patient care and clinical outcomes.

Audit and management

Accountability and audit

Managers are held responsible for the overall running of hospitals, including the effectiveness and efficiency of medical services. They need to know there is a mechanism for internal quality assurance, to see evidence that it is effective, to agree the resources required and to ensure that effective remedial action is taken when deficiencies are identified. This is why annual reports and future programmes for audit are given to managers of provider units. It is also why some units have invited managers to join the local audit committee.

How explicitly and amicably the roles of managers and doctors are defined in a given hospital depends on local ethos and relationships at least. It is essential to agree:

- Specifications for audit: what it is and how it will be recognised (see chapter 1).
- Structure for audit: links and activities in other units.
- Managerial input to audit agenda and process.
- Accountability of audit staff (managerial and professional).

- Resources provided for audit (time, data, help).
- Budgetary authority for audit funds.
- Funding arrangements after March 1994.
- Access to data generated by audit.

Audit and resource management

The priorities of medical audit are quality of clinical practice, medical education and training, and effective use of resources. Those for resource management are the same but in reverse order.

Although audit and resource management share needs for data, these are then aggregated differently and used for different purposes. Hence data systems designed for resource management cannot be assumed to support audit, or vice versa. The two activities have:[22]

- Common need for basic clinical data on clinical activity.
- Common costs for data capture and verification.
- Common challenges to medical organisation and behaviour.
- Different accountability: audit is primarily professional.
- Different boundaries: audit may cross management borders.
- Different end-users: resource management is a tool for purchasers and providers to monitor contracts for services; audit is for doctors to focus on their own clinical practice.

Whether the functions of medical and clinical directors can be combined with chairing of hospital or specialty audit groups depends on the support of the medical staff for the individuals concerned. In England, for example, HC(91)2(para. 9)[1] makes it clear that they 'must command the confidence of

both the health authority and the profession'. The appropriateness of clinical directorates as a structure for audit will also be determined by their size and composition in individual hospitals.

Purchaser/provider contracts

Advice from the Department of Health on service contracts suggests five broad categories of quality measures:[23]

1. Guarantees of adherence to legal requirements, national codes of practice or explicit standards.

2. The provision of systems to assure quality such as medical audit, nursing and other audit and surveys of patient opinions.

3. The setting of specific standards or key indicators of performance on matters both of general concern or specific local concern.

4. The setting of specific clinical outcome requirements both applicable generally and related to specific clinical conditions.

5. 'Common law' — a general assumption of standards which could reasonably be expected from a hospital operating in a modern medical environment.

Fulfilment of item 4 in contracts would be difficult, if not inappropriate, at the current stage of developing outcome indicators. Both providers and purchasers need to be confident of the accuracy, comparability (e.g. adjustment for case-mix) and normal distribution of such measurements.

Premature inclusion in contracts of outcome data derived from audit may bias or inhibit further audit activity, and be misleading to all concerned. However, item 2 could be implemented and monitored if accompanied by a clear and detailed specification of audit which is agreed by clinicians and managers (see chapter 1). This should also ensure that medical audit continues to be funded through contracts after central allocations cease in 1994.

The intent and organisation of internal medical audit (a 'provider' function) should be clearly differentiated from external monitoring of contracts (a 'purchaser' function). Only the general and aggregated results of audit should be made available for the purpose of contracts as evidence that an effective and comprehensive mechanism is in place.

CONFIDENTIALITY

Clinicians are unlikely to participate fully in medical audit without firm assurances on how the information they generate may be used and by whom. Although audit may be assumed to be in the public interest, specific legal protection of the activity is unlikely in the United Kingdom. It is therefore more appropriate to define codes of practice governing access to and use of audit data by medical colleagues, managers, patients and their representatives.

Interim national guidelines were issued in Scotland in 1990 by the Clinical Research and Audit Group (CRAG) for the Home and Health Department.[24] Advice in England and Wales in the report of the Standing Medical Advisory Committee (section 8.5)[12] is limited to avoiding the identification of individual patients; further guidance has been issued by the Conference of Colleges and the Department of Health, together with a suggested format for reporting audit meetings.[25]

Several health regions (including Wessex, Oxford, North Western and South Western) have developed their own policies on confidentiality. Brighton District Health Authority, has published a local policy (with South East Thames) and made it widely available 26. These documents are carefully worded and they provide useful details. They point out that levels of access to data should be defined for all users, and on a 'need to know' basis only. Minutes of audit meetings should be confidential but should be assumed to be accessible and thus not identify individual patients or doctors. No other record should be kept after the meeting which would identify them. Minutes should include: meeting — date, time, duration, place; attendance — individual name, grade, specialty; subjects — general issues considered; conclusions — reports/action to follow, responsibility for these; follow-up —

date for review of agreed actions, previous meetings; and next meeting — date, time, place.

One doctor (e.g. the chairperson of the audit committee) should be responsible for supervising and ensuring that the policy is followed.

Management access should be limited to existing routinely captured clinical data unless specific agreement has been reached for other purposes (e.g. for contracts) with the involved clinicians. The content and interpretation of routine reports to management should be agreed by the clinicians involved. Audit information is not a tool for management to seek to monitor the performance of individual doctors.

Staff with access to audit data should be taught the confidentiality policy and employment should be conditional on its observance.

The 1984 Data Protection Act gives patients and their representatives access to any identified information on computer (or word processor). The 1990 Access to Health Records Act gives similar access to manual records from November 1991.

ADMINISTRATION OF AUDIT

During the first years of central government funding for audit, much time has been devoted by managers and doctors not to reviewing clinical practice but to setting up the framework in which that could happen.

The general principles were laid out in the relevant health circulars for England, Northern Ireland, Scotland and Wales.[1–4] Less formal advice, based on local experience, came from various authors: audit committees — structure, function and organisation[5,6,27] job descriptions — chairperson,[28] audit assistant;[29,30] outline district audit programme, England — committee structure, organisation and methods, information, help, clinical time, training and education,[31] outline annual report/programme, England,[32] specialty reports to local audit committee.[33]

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3 — METHODS

Audit should involve the objective peer review of patterns of care, be sensitive to the expectations of patients and other clinical disciplines and be based on scientific evidence of good medical practice. To this end, cases for review can be selected randomly or by pre-agreed criteria. Patterns of practice, quantified where possible, can be compared with explicit guidelines and these guidelines, though agreed locally, should be consistent with regional and national advice and with the body of scientific knowledge.

No single approach is universally applicable. Indeed, by using a variety of methods, an audit group is more likely to maintain flexibility, innovation and interest. Some methods screen 100 per cent of cases for pre-defined events, which are then subjected individually to peer review. Others — the majority — focus on a limited sample of cases with a common characteristic (such as a symptom, investigation, treatment or complication).

Some issues in clinical practice — especially the rare or complex — seem to defy systematic audit. But these need not prevent a start being made on issues which are amenable to review using the many simple and proven methods. Some approaches have been pioneered in one specialty and are waiting to be adopted or adapted by others. These are described in the methods section of the specialty chapters which follow. The more common and general methods are outlined here.

ADVERSE PATIENT EVENTS

Adverse patient event, or 'occurrence', screening involves the systematic identification and analysis of events during a patient's treatment which may indicate some lapse in the quality of care. Screening criteria, aimed at recognising a particular occurrence, are defined by the participating clinicians, but may be applied to individual clinical records by non-medical assistants. For each criterion there is a detailed definition of the occurrences it is intended to identify, together with notes of known exceptions, guidelines on use, examples, and details of the information required about each occurrence. Findings are analysed by the peer group to determine causes and

effects. This information may be used to plan changes in patient management.

The method has been widely used in North America (originally for early warning of potential malpractice suits) and has been piloted in the NHS in Bromley and Brighton.[1] It can be applied across the hospital, or within a specialty and is amenable to computer scanning if a comprehensive database is available. It may be used for concurrent or retrospective screening of individual cases, or as a means of identifying trends of suboptimal care. This technique is a valuable tool in risk management. But it is labour intensive on a continuous basis and its concentration on failures rather than successes is not appealing to clinicians as a comprehensive audit system.

Generic (whole hospital) criteria tested in Brighton include:

- Admission because of adverse results or complications of outpatient management.
- Readmission for complications or of incomplete management of problems on a previous admission.
- Unplanned removal, injury or repair of organ or structure during surgery/invasive procedure.
- Unplanned return to theatre.
- Pathology/histology report varies significantly from preoperative/ antemortem diagnosis.
- Hospital-acquired infection.
- Cardiac or respiratory arrest.
- Cardiovascular accidents or acute myocardial infarction within 48 hours of surgical procedure, or pulmonary embolus at any time postoperatively.

- Unexpected transfer to higher dependency unit.
- Neurological deficit on discharge not present on admission.
- Unexpected death.
- Evidence of patient/family dissatisfaction.

Initial experience from Brighton showed (J Bennett, personal communication) that, of 999 patients screened in one specialty over six months in 1990 using 22 criteria, 39 per cent had no occurrence, 32 per cent had one, 9 per cent had two or more. The incidence of specific occurrences included:

- Unexpected admission following outpatient care 1.3%
- Unexpected readmission 1.6%
- Unplanned removal/repair/injury during surgery 0.9%
- Antibiotic/drug usage problem 3.5%
- Evidence of family/patient dissatisfaction 3.1%

(see Bennett and Walshe, BMJ[1].)

During one year in a tertiary referral centre in Iowa State 20,000 admissions were screened for 'adverse outcomes'.[2] The incidence per 1000 patient days was 7.2 (associated with medication), 18.2 (diagnostic and therapeutic procedures), 9.3 (new clinical problems), 2.7 (accidents), 2.8 (patient dissatisfaction). The average stay of these patients was 21 days compared with 7.8 for other patients.

Analysis of clusters showed particular problems were pulmonary embolism, falls and medication errors.

In a random sample of over 30,000 patients admitted during 1984 in New York State, 3.7 per cent were found to have disabling injuries caused by medical treatment.[3] Errors in management were identified for 58 per cent of the adverse events and 28 per cent were considered to be due to negligent care. Drug complications were the most common type of adverse event (19 per cent), followed by wound infections (14 per cent) and technical complications (13 per cent). The authors concluded that although the prevention of many adverse events must await improvements in medical knowledge, the high proportion due to management errors suggests that many others are potentially preventable now.

Traditional morbidity and mortality meetings are mechanisms for reviewing highly selected adverse events locally; confidential enquiries into maternal, perinatal, and perioperative deaths, eclampsia and suicides while under treatment are the equivalent at national level.

CLINICAL INDICATORS

A less focused, more comprehensive approach involves the monitoring of routinely generated data within a specialty, in order to identify exceptions or trends which may merit detailed ad hoc review. Ideally, each indicator would reflect an agreed policy objective, be routinely and accurately captured and be readily accessible. In practice, despite recent efforts in the NHS to improve the scope, accuracy, completeness and timeliness of data, many hospital doctors are either unaware of what information is available or depressed by its quality.

Routine presentation of such data to clinicians, though initially painful, does improve quality and usage. More detailed examples are given in the chapters on specialties. A general model might include measures, with relevant comparisons over time or place, of:

- Workload: numerical description of cases, e.g. by type, source, site, age.
- Access: measures of availability, e.g. treatment rates, waiting times, non-attendance rates, elective admissions deferred by hospital.

- Appropriateness: e.g. operations out of hours, readmissions, children on adult wards, patients admitted after day case procedure.
- Outcome: patients discharged home, in-hospital deaths, complications.
- Information: measures of quality (may be by sample study), e.g. cases with final diagnosis coded within one week of discharge, records missing at time of clinic visit/admission, delay in letters to GPs, concordance of parallel data systems.
- Efficiency: clinic/theatre sessions cancelled, length of stay (selected diagnoses/procedures), new/old patient ratio, pharmacy costs per ward/clinic, investigations requested, day cases as percentage of all planned procedures.

Most of these are available from existing data (especially from Körner returns), but need to be collated and refined. A study of three health districts showed that readmission rates could be derived from Körner figures but, to be informative, needed to be carefully defined and to be standardised for age, sex and specialty — with a cut-off point at 28 days.[4]

TOPIC REVIEW

Analysis of an agreed topic may be carried out by prospective study or by retrospective analysis of patient records. The latter often reveals inadequacies in recording but is a valuable exercise in providing a baseline for comparison in a later, prospective study. Both approaches involve a systematic review of a large enough sample of similar cases in order to identify, quantify and compare local patterns of practice.

The concept is applicable to surgical and non-surgical specialties, is objective, yields quantitative data and is repeatable. But is very labour-intensive. For this reason, the clinicians may define explicit criteria by which an assistant can extract key information from large numbers of medical records. The steps in this 'criterion-based' audit[5] are represented in table 3.1.

Table 3.1. Criterion-based audit

Step	*Clinicians*	*Audit assistant*
1	Define topic	
2	Define criteria for analysis	
3	Define sample size, dates, etc	
4		Identify cases for analysis
5		Find individual medical records
6		Abstract data against criteria
7		Tabulate aggregated data
8	Discuss findings and exceptions	
9	Agree action and future policy	
10	Repeat audit against criteria	

The topic should be of general interest and of high volume, risk or cost. Or it should be a subject of wide local variation or other concern. It may be a symptom, diagnosis, investigation, treatment, outcome — or just a clinical problem. The simpler and more common the topic, the easier it is to collect data and repeat the audit before junior staff initially involved in the work move on.

Discussion on the criteria and sample details should involve the audit assistant to minimise later problems of interpretation. Typically, the criteria should form about a dozen self-explanatory questions, with a numerical or a yes/no answer which can be gleaned from the record.

The purpose of these criteria is not to act as a protocol for clinical management but to establish current patterns and to help identify records which may merit individual review. Local groups may develop different ideas and these may represent the lowest common denominator on which agreement is achievable. For a particular inpatient diagnosis, these may be under headings such as:

- Referral: e.g. delay before seen by junior/consultant.
- History: e.g. specified symptom(s) recorded.
- Examination: e.g. specified sign(s) recorded.
- Investigation: e.g. specified test(s) reported.
- Treatment: e.g. specified drugs (type, dosage, route) given.
- Follow-up: e.g. drugs monitored, specified progress recorded.
- Outcome: e.g. discharged asymptomatic within agreed time — from ward/ from clinic.
- Communication: e.g. summary to GP within n days.

It is wise at this stage to test the criteria on a very small sample of records, say five, to check that there is a realistic chance of finding the required information.

The assistant then has the often challenging task of finding an accurate, up to date, listing of patients who had the specified diagnosis and were treated by the doctors concerned within the defined timescale. The next task is to find the records themselves, and not to bias the sample by giving up on the ones that are missing. (In one large hospital, a search for 94 cases of renal failure found only 30 records, of which 17 were in the form of temporary folders issued in the absence of the originals. On realising their patients had only a one in six chance of meeting up with their original notes, the consultants locked away the remaining one sixth for safe-keeping.)

Abstracting of the records, once found, can take 10-30 minutes per case, depending on the number and complexity of the criteria. Multiplied by, say, 20 cases for each of three or four firms involved, this occupies many hours of work.

The results have to be tabulated and presented (ideally with the help of a computer spreadsheet and graphics package) to the clinicians. They must satisfy themselves that the findings are accurate.

Discussion tends to turn to the choice of criteria (which may, on reflection, have been devised more precisely), to the interpretation of results (which are often not as expected) and to agreement on action (which may be hard to reconcile, and harder to implement).

The audit can be repeated, using the same or modified criteria after an agreed time in order to measure the impact of the changes on patient care.

Examples of common topics for audit within specialties are given in the 'Methods' section of the respective chapters. The examples which follow do not all complete the cycle but may be applied across a hospital.

Clinical organisation

Domiciliary consultation: feedback to specialty subcommittees on the use of domiciliary visits in the Northern Region (except Newcastle) was associated with a reduction over five years of 53 per cent, compared with a national reduction of 27 per cent over the same period, 1984-89. The general practitioner was recorded as accompanying the consultant in 6 per cent of visits.[6]

Clinic appointments: by changing from a fixed 10-minute appointment system to variable times allocated by the consultant, mean waiting time in one Sheffield medical clinic was reduced from 40 to 10 minutes over six months. There was no change in the numbers attending or in the length of the clinics.[7]

Clinic attendances: of 418 consecutive patients attending a general medical clinic in Leicester for follow-up, 27 per cent had appointments in another medical clinic for the same or related problems; 49 per cent of these duplications were due to routine follow-up after an acute admission, 30 per cent to a second GP referral, and 17 per cent to cross-referral to another specialist. Many of the patients were elderly, lived over five miles away and relied on friends, relatives or the ambulance service for transport and 70 per cent did not see the need for multiple attendance.[8]

Medical records and letters

Clinical content: the review of records of 19 inpatients with schizophrenia took 13.5 (consultant) minutes per case for 17 criteria. The findings included:

Criterion recorded	*% failed*
Mental state examination on admission	5
Admission diagnosis	32
Differential diagnosis	53
Physical examination within 24 hours	63
Treatment plan	26
Weekly note of 'other therapies'	89

Criticism at national level (particularly in the pilot and national reports of the Confidential Enquiry into Perioperative Deaths, CEPOD) has stimulated scrutiny of surgical and anaesthetic records. Clinical guidelines for minimum standards of records have been issued by the Royal College of Surgeons;[9] more detailed guidelines for records in general have been issued in Brighton;[10] checklists for evaluating records were included in the first audit report of the Royal College of Physicians.[11]

One group of anaesthetists set out to audit the records of every fifth patient who had general anaesthesia over a two-week period. The records of the 138 cases were missing in 23 cases, and 22 were excluded. Those retrieved were compared with the following criteria:

SPECIALTY MEDICAL AUDIT

	Percentage met
Records correctly filed	47
Anaesthetic record present	100
Patient name on sheet	100
Pre-operative assessment recorded	100
Operation date recorded	78
Operation type recorded	86
Anaesthetic technique specified	92
Blood pressure recorded	84
Oximeter reading recorded	62
Name of anaesthetist legible on record	80

Discharge summaries: a three month study of discharge letters on 89 acute hospital admissions from one group practice showed that a first note was received for 89 per cent after a median delay of eight days; by then 53 per cent of the patients had already contacted their GP. A second letter was received on 52 per cent of the patients (median delay 24 days). No letter had been received on 11 per cent of the patients after two months.[12]

Availability of records: one district hospital issues figures for missing outpatient case notes based on a one week sample each quarter. For example:

Clinic	*Case notes required (n)*	*Found at first pull (%)*	*Available in clinic (%)*
General OPD	713	66	97.9
ENT	290	92	98.3
Orthopaedic	306	69	99.3
Radiotherapy	263	76	99.6

Therapeutics

Prescribing: audit of drug usage is valuable both clinically and economically, and data (on choice, route, dose, and duration) are generally well recorded. Such audit also highlights some of the problems of implementing and maintaining change in clinical practice.

Prescriptions for antibiotics assessed by medical microbiologists were deemed unnecessary in 28 per cent of cases in a Bristol hospital. After distribution of these results, with written guidelines advice on the use of laboratory tests, choice of drugs, dosages and routes, a repeat study the following year showed unnecessary prescriptions had risen to 35 per cent.[13]

Another study demonstrated a more encouraging response to peer group comparison and feedback on prescribing habits, but this effect ceased when continuous review, intervention and feedback stopped.[14]

Other studies of medications have focused on:

- choice of drug: e.g. thrombolytics[15]
- appropriateness: e.g. 36 per cent of benzodiazepines prescribed on or 'prior to' admission to a psychiatric hospital were in response to the patient's clinical state[16]
- route of administration: e.g. in an acute unit in Dundee 86-95 per cent of intravenous antibiotics could have been given orally[17]

- serum monitoring: e.g. of 56 requests for serum digoxin concentration during one week, 54 per cent were considered appropriate and 43 per cent of samples were taken at an appropriate time.[18] An earlier study of 285 requests in Newcastle yielded figures of 76 per cent and 51 per cent respectively[19].

Other forms of therapy also lend themselves to audit and these often involve other clinical specialties and disciplines. Blood transfusion in surgery is referred to in chapter 15 (surgery); non-surgical uses in the hospital could also be reviewed. Although primarily relevant to dermatology, the use of PUVA treatment illustrates a general model for the discussion of appropriateness which might precede audit of any therapy, in terms of criteria for entry, process and exit:[20]

Entry: on what criteria are patients selected/refused?
— diagnosis?
— disability (physical/social)?
— extent of disease?
— age of patient?
— failure of first line therapy?
— ability to attend for regular treatments?

Process: how should the treatment be conducted?
— what machine capacity/power is appropriate?
— what staff supervise therapy?
— safety/calibration procedures?
— number of exposures/frequency?

Exit: when should treatment cease?
— percentage improvement?
— failure to respond?
— side effects?

Similar issues were raised by the national survey of electroconvulsive therapy in the United Kingdom in 1980 and these concerned selection criteria, practical technique and reliability of equipment.[21] Although it may be considered beyond the remit of medical audit, the calibration and safety of equipment used by doctors is central to the overall quality of medical care.

DIAGNOSTIC INVESTIGATIONS

Radiology

Audit of the use of diagnostic radiology is indicated by evidence of clinically unproductive 'routines' in many specialties, by potential savings in inconvenience to patients, staff time and hospital costs, and by growing concern over exposure to medical radiation.

The Joint Working Party of the Royal College of Radiologists and the National Radiological Protection Board estimated that the current population dosage could be halved without detriment to patient care. The remaining half would still be three times greater than the total of all other man made sources of population radiation. Some of this reduction could come from various means of optimising dosages per examination, but the greater contribution would be in avoiding unnecessary X-rays. At least 20 per cent of X-ray examinations currently carried out in the UK are clinically unhelpful in the sense that the probability of obtaining information useful for patient management is extremely low.[22]

A UK study found that the use of pre-operative chest X-rays (CXR) in elective, non-cardiopulmonary surgery ranged from 12 to 54 per cent of operations among eight hospitals. The variation could not be explained on clinical grounds, the X-ray did not influence the decision to operate or the choice of anaesthetic, nor did it provide a valid baseline for future investigation. On this basis the Royal College of Radiologists recommended a 'temporary norm', based on the lowest rate found, of 12 per cent. The report was published in August 1979 and, on the evidence in table 3.2 might have influenced practice on surgical wards without direct intervention and without evidence of increase in morbidity or mortality.[23, 24]

CXRs as % of elective operations		
Year	*Hospital A*	*Hospital B*
1976	50.3	51.1
1977	52.3	50.4
1978	44.6	50.4
1979	41.3	39.4
1980	30.1	37.1

Table 3.2: *Changes in use of chest X-rays on surgical wards, 1976—80*

The Royal College has now combined findings from a large number of studies on appropriate use of diagnostic X-rays into a pocket book, *Making the best use of a department of radiology*.[25] Apart from being helpful, especially to juniors, in clinical practice the guidelines may easily be developed into explicit criteria for the audit of current request patterns.

Laboratory medicine

In a medical teaching unit in Cardiff the issue of clinical guidelines and a weekly review of records were associated with an immediate reduction in requests for laboratory tests.[26] Average weekly tests per patient fell from 2.0 to 1.1 in haematology and from 4.4 to 2.7 in biochemistry, particularly among repeat requests. The consultants found that formulating the guidelines and discussing them with junior staff was educational and improved their own critical thinking; but the authors wondered whether the impact of the guidelines lay less in their content than in triggering discrimination in the use of tests generally.

The introduction of similar regular audit without explicit guidelines did not produce the same effect in Birmingham.[27]

A review of the methods of controlling requests for laboratory investigation concluded that it was essential to have a supportive attitude among senior staff, a long-term strategy and different approaches for different doctors.[28]

Emergency investigations

Requiring medical staff to take their own bloods for 'stat' tests reduced demand in a Spanish teaching hospital, particularly on surgical wards, without evidence of disadvantage to patients. Differences found between services were attributed to the higher proportion of elective admissions in surgery. The results of the audit, which excluded intensive care, recovery and emergency services, are in table 3.3.[29]

	April 1984	*May 1984*	*May 1985*
Maternity	62	53	63
Surgery	43	31	28
Medicine	34	34	36

Table 3.3: Percentage of 'urgent' tests, by specialty, 1984—5

A two-year study of 555 acute medical admissions in Barnsley, South Yorkshire, examined the utility of emergency tests.[30] Only 17 per cent of the 2372 investigations were abnormal and, of these, only one-third helped in treatment and less than one-third helped in diagnosis. The most requested tests, urea and electrolytes, were abnormal in 7 per cent and rarely helpful. Only 13 per cent of the patients had conditions in which a negative result was considered to be of value. But a normal initial ECG for patients with chest pain and a normal chest X-ray for patients with respiratory infection was associated with earlier discharge.

Post-mortem examination

Autopsy findings are consistently reported to differ substantially from antemortem diagnoses in 10 to 25 per cent of cases — indeed the 'ultimate audit'.[31]

Perinatal post-mortem: a review of 300 stillbirths and neonatal deaths confirmed the clinical diagnosis in 40 per cent and 19 per cent respectively, added important information in 34 and 66 per cent, and found the clinical diagnosis incorrect in 26 and 15 per cent.[32] Even in the most thoroughly

investigated cases, post-mortem examination has a high yield of clinically important pathology which is undetected during life: retrospective review of 76 children with a clinical diagnosis of congenital heart disease showed that 80 per cent had unsuspected abnormalities. For example, these contributed to death in 17 per cent of all cases.[33]

Adult post-mortem: an American study to identify predictive factors for 'high yield' autopsies showed little difference in yield between a university hospital and a community hospital. The incidence of major unexpected findings whose antemortem diagnosis would probably have improved survival was 11 per cent and 12 per cent respectively.[34] Neither pathologists nor clinicians were able to identify from the clinical data which autopsies were likely to be most helpful. (This echoes the conclusion of a Scottish study that clinical confidence in the diagnosis was not an assurance of its accuracy.[35]) The most common major unexpected findings were fungal infections in immunocompromised patients and pulmonary embolism.

Perioperative deaths: 21 per cent of autopsies on 213 perioperative deaths demonstrated treatable conditions which would have affected survival if diagnosed clinically.[36]

Despite these findings, consent to autopsy is sought and obtained in a minority of cases. Reported examination rates per resident population imply wide variations between health districts in England.

RANDOM CASE REVIEW

Cases may be selected randomly or by a predetermined system from among the general workload for critical review by doctors not previously involved in the clinical management. Findings can then be presented to the audit group for discussion. Checklists may be used to ensure that each case is reviewed according to an agreed system of questions.[11]

The method is easy to use, requiring minimal resources and no numerical data. Many groups find it a useful introduction to more structured discussion of clinical management. But it requires considerable time from the reviewers

prior to the meeting. Major issues may be missed through the randomness of selection. Discussion tends to be subjective and criticism often centres on the inadequacy of the record and thus the junior staff.

In many hospitals, one or two audit meetings a year are given to random reviews as a change from more focused analysis of single issues.

PATIENT SATISFACTION

Although not an audit method in itself, the assessment of the views of patients and their relatives must be incorporated into the judgements which doctors apply to their work. Formal surveys of patients' views are generally included in the overall quality improvement programmes of hospitals, rather than in medical audit. But audit may scrutinise evidence of thorough history — taking treatment plans agreed with patients, information given, perceived value of treatment, and outcome measurements expressed in the patient's own terms.

The honest views of patients and doctors on the objectives of medical intervention do not always tally. For example, cancer patients may choose less interventional therapy in preference to a higher chance of five year survival.[37]

Complaints leading to litigation are increasing and analysis of the causes can provide guidance for avoiding similar events in the future. Failure to communicate, explain or apologise can add substantially to even a relatively minor mishap and become a prime reason why patients or relatives pursue legal redress. Clinical and administrative lessons can also be gleaned from the experience of the defence organisations, and provide material for audit.

Among 55 cases in which litigation followed the management of head injury, extradural haematoma was the commonest diagnosis.[38] The most frequent error was failure or delay of transfer from a general hospital to a neurosurgical unit. Treatment was often delayed while awaiting a CT scan, despite evident clinical grounds for immediate transfer or an exploratory burr hole. Other errors included:

- Inadequate records on admission, and on discharge following observation.
- Failure to ensure or to respond to appropriate nursing observations.
- Failure of communication between A&E and ward staff, and between doctors and nurses.
- Lack of involvement of more senior staff by relatively junior admitting doctors.
- Inadequate and delayed review by senior staff of skull X-rays in the A&E department.

COMPARATIVE AUDIT

The confidential pooling of aggregated data, using standard definitions and formats, allows individual doctors to receive feedback on their own performance compared with others working in the same field. This can be simplified with standardised data systems, but the method of production of the statistics is less important than their accuracy. The most reliable data are those collected by individual clinicians. Many examples of the use of comparative data are found in surgery (such as in Lothian Health Board, and the Royal College of Surgeons of England — chapter 15), but the principle has been applied within health regions to obstetrics and medical specialties.

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Further reading

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4 — RESOURCES

TIME

Clinicians

The amount of time recommended by the Royal Colleges to be set aside for audit varies between one quarter and one half-day session per week according to specialty and to definition. The time allocated depends on the degree of overlap with other educational activities. In practice, much of the time devoted to audit, for example in recording and verifying clinical data, is not as readily quantified as that spent on formal audit meetings. The time needed depends on how long is currently spent on similar review processes, how much travelling is involved, what methods are used and what asssistance is available — quite apart from the duration of meetings.

For local audit, many hospitals have designated a rolling half day each month to allow participation by various specialties and to minimise reduction of clinical services. This appeals particularly to anaesthesia and surgical specialties, but the audit assistant(s), who could otherwise contribute to most meetings, cannot be in several places at once.

For regional audit, many groups meet less frequently but for longer. Full participation in audit is more difficult when meetings are held off-site and for specialties with a high proportion of emergency work (especially accident and emergency medicine) or a commitment to drop-in clinics (such as genito-urinary medicine) or a high proportion of part-time staff (such as family planning).

Some hospitals provide help by, for instance, arranging additional clinical assistant sessions. But, until all contracts are designed to include time for audit, managers and doctors must agree that time will be reduced for other clinical commitments. It is a fundamental challenge to audit to demonstrate that this reduction in volume of patient care is at least compensated by an increase in quality.

The participation of individual doctors in audit is, for various reasons, expected by provider managers, purchasers and the national colleges and faculties. Since much of the time spent on audit is 'soft' and therefore less easy to identify, the recording of individual attendance at meetings is likely to become a proximate measure for participation generally. 'Reasonable' attendance will also have to be defined, e.g. two-thirds of all monthly meetings, allowing for emergencies and leave.

Co-ordinators

The additional work of planning, organising, minuting and ensuring that appropriate action ensues is generally allocated to one lead clinician for each specialty and, overall, to the chairperson of the audit committee. Many districts have agreed honoraria or additional sessional payments (commonly one session for a district coordinator, sometimes more) in recognition.

Audit assistants

Audit assistants (also facilitators, officers, analysts or administrators) can minimise the extra time required of doctors in moving from traditional case-review to more formal audit of patterns of care. For example, one consultant tallied his time spent on an audit of 100 patients attending his A&E department with chest pain:

	Hours spent		
	A	*B*	*C*
Meeting to discuss topic, set criteria	2.5		
Type and copy proforma		1.0	
Obtain computer printout		0.5	
Obtain 100 casualty cards		1.5	
Abstract data @ 6 minutes per card			10.0
Obtain 25 hospital records		2.0	
Abstract data @ 12 minutes per record			5.0
Analysis of data, tabulation			6.0
Audit meeting to receive, discuss findings	2.5		
Minutes and follow-up	1.5		
	6.0	5.0	21.0

A = consultant tasks B = possible clerical staff tasks C = possible audit assistant tasks

Without any help, the consultant spent 32 hours on one audit, covering two meetings. With careful definition of the criteria, much of the work could be done by an audit assistant (column C) or clerical staff (column B). The actual time required to retrieve records and abstract and analyse data depends on a host of local administrative factors, as well as on the subject and detail of the audit itself. Experience in Britain suggests that to collect a defined set of 12—15 data requires 15—25 minutes for an inpatient record or 6—10 minutes for an outpatient record.

DATA

General issues

The process of audit, workload agreements, service contracts and resource management have all placed a new value on the patient records service, which in the NHS has traditionally been given low status. Systematic audit emphasises not only the need to put information into records, but also to extract it — a function for which many departments are ill-equipped. The immediate problems are identifying samples of patients with common characteristics, finding their records, and interpreting their content when found.

Identifying cases for audit

Most clinical computing systems collect only a limited subset of the total clinical record; this allows overall statistical analysis of the variables captured. But the individual patient record remains the prime source of detail when looking for a defined sample of cases with a common characteristic. The need is therefore for timely, accurate and complete lists to identify cases according to the chosen theme: by primary diagnosis, medication, investigation, procedure or complication. A variety of potential sources is available to staff in NHS hospitals but many have suffered from disuse, and underinvestment. There has been a lack of awareness of the potentials of systems. Also, while clinical practice increasingly moves to outpatient care, most clinical data systems continue to focus on inpatients; there is also a pool of data on day cases.

Finding patient records

The likelihood of finding a record can be inversely proportional to the size of the hospital and the complexity of the case. The presence of 'temporary' folders on the wards or the absence of records in clinics are symptoms of a common problem which also afflicts audit — and should itself be subject to scrutiny. Since they often represent the atypical cases, it is important to persevere in the search for missing records. The added burden this gives to records departments should be met with additional funded clerical time.

Content of patient records

Another unsurprising discovery of audit is that records are often unable to explain what happened to patients and why. Much of this may be attributed to lack of agreed definition, teaching and monitoring of the purpose and characteristics of a 'good' clinical record — another topic for audit (see chapter 3).

Sources of data

Clinical microcomputers

The proliferation of stand-alone and linked personal computers (PCs) has improved the accuracy and availability of data for many clinicians. The arguments over whether to take this route in preference to existing standard hospital computer sytems[1,2] and which package to purchase[3,4] are beyond the scope of this book and have been well described elsewhere. The Royal College of Surgeons has given a useful summary of the required characteristics of computers for audit; most of this advice is equally appropriate to physicians.[5]

Before adopting any information system, doctors should be able to define what data they require. This may be most usefully done within a specialty through the appropriate regional subcommittee to ensure that data from each hospital are comparable and consistent with minimum data sets proposed nationally. Before seeking to set up a new data system, potential users should examine what is already available locally.

Even those doctors who already have PC systems may benefit from exploring data from other hospital sources; and those who do not could reflect that their existing hospital system could be equally accurate, if clinical input were given the same personal attention as enthusiasts give to their PCs.

Patient Administration System (PAS)

PAS is the core of most hospital computer systems, comprising a master index of all patients (and their personal and demographic details) and a range of added modules, usually including inpatient, day-case and outpatient activity, waiting lists and sometimes accident and emergency. From this can be obtained routine reports including consultant and specialty-specific data on:

- bed allocation, availability, occupancy, admissions, transfers, discharges, deaths, length of stay
- day cases
- source of admissions, destination of discharges
- non-arrivals for booked admission, waiting list
- clinic session numbers, attendances, non-attendances, cancellations, waiting list.

PAS is generally relatively complete and accurate (compared with clinical data-capture systems descended from hospital activity analysis HAA). But many hospitals continue to be erratic in their definition and recording of day cases and outpatient procedures. Doctors whose workload is thus likely to be under-recorded may be particularly concerned to obtain and verify these data. It is also important to ensure that deaths in the community, which are notified by the Registrar to the director of public health, are reported to the master patient index of the hospital.

From April 1991, the NHS minimum data set for ambulatory services (outpatients and ward attenders) has included in each case the identification of GP and consultant, and any procedure performed. From 1993 this will extend to day cases, and will include the patient's NHS number, GP diagnosis, clinic diagnosis and the grade of doctor seeing the patient.[6]

Clinical Data Capture (CDC)

Under a variety of titles, the former hospital activity analysis lives on. In each hospital it captures details of primary and secondary diagnosis, complications and procedures from the discharge letter (or note) of every inpatient and day case. It is therefore able to generate consultant-specific lists of patients:

- by diagnosis
- by complication
- by procedure.

But the completeness, accuracy and timeliness of CDC data rest heavily on the quality of the discharge letter. Regular scrutiny of these, and liaison with the clerks who have the task of translating them into codes would for most hospitals radically improve the quality of clinical data held locally and centrally. Quite apart from CDC's value in audit, it is also the basis for calculating overall workload and case-mix (aggregated into diagnosis-related groups — 'DRGs') for the Department of Health and the hospital. Anonymised data are collected nationally from this to produce comparisons between districts and hospitals on selected topics, including Health Service Indicators (see below).

Discharge summaries and thus CDC often does not record complications, or secondary diagnoses even when these (such as diabetes, hypertension) are likely to affect outcome. Further inaccuracy may be introduced in translating diagnoses and procedures into codes. In one region where samples of records are double checked, the three-digit error rate within districts ranged from 2.9 per cent to 22 per cent, with a regional mean of 8.8 per cent. Even when data entry is accurate, many doctors find that simple reports are slow to arrive, are unhelpful, and more complex ones are unavailable.

Errors have also been identified in translating correct diagnosis and procedure codes into diagnosis related groups (DRGs). Of 153 joint replacements identified from theatre and ward records in Leicester, 9 per cent of the patients' records were missing. Of those available, 24 per cent were

considered to have been allocated to the wrong DRG; of these errors, 64 per cent were ascribed to incorrect primary coding and the remainder to incorrect translation (by computer) to DRG.[7] The commonest cause of incorrect coding is incomplete recording of clinical details.

The practical challenges of requests to hospital data systems were epitomised in a reported audit of 200 patients with acute stroke in West Glamorgan:[8]

- A printout of strokes took 32 days to arrive.
- The list contained stroke as the primary or secondary diagnosis.
- Only 2 per cent of records were wrongly coded.
- Patients were listed in alphabetical order, adding to the work of the records clerks in searching for files ordered by terminal digit.
- Patients transferred to rehabilitation were not listed on CDC because no discharge summary was produced until final discharge.

Departmental computers

Many departments have computer data systems which, though set up for other purposes, may yield valuable data for audit such as:

- Laboratory: many systems are capable of reporting usage profiles for individual firms, specialties or investigations (e.g. lithium assays for psychiatrists).
- Radiology: some record radiological diagnosis, others only the investigation. Either could be a source for topic audit or for routine monitoring (e.g. of selected X-rays requested out of hours).
- Pharmacy: most systems can identify stock issues to individual outpatient clinics or to inpatient wards but not to individual patients; but this enables trends in prescribing to be monitored or offers a basis for audit of individual drugs (e.g. streptolysin, anaesthetic agents, interferon, antibiotics).

- Nursing: systems for measuring patient dependency (and estimating required nurse staffing levels) may provide data on medical management (e.g. patients on full oral diet but receiving intravenous medication).

- Maternity: clinical system well tended (often by midwives) to offer accurate clinical reports (e.g. episiotomy and Caesarian section rate).

- Theatre: management systems record timing, staffing and resources used for individual operations (e.g. implants). They can also identify critical events (e.g. delayed recovery from anaesthesia).

- Child health: usually community based, but may be able to identify children with selected handicaps, diagnoses or problems (e.g. for use in joint hospital—GP audit).

- Other departments: e.g. medical photography, cardiology, A&E, paramedical services.

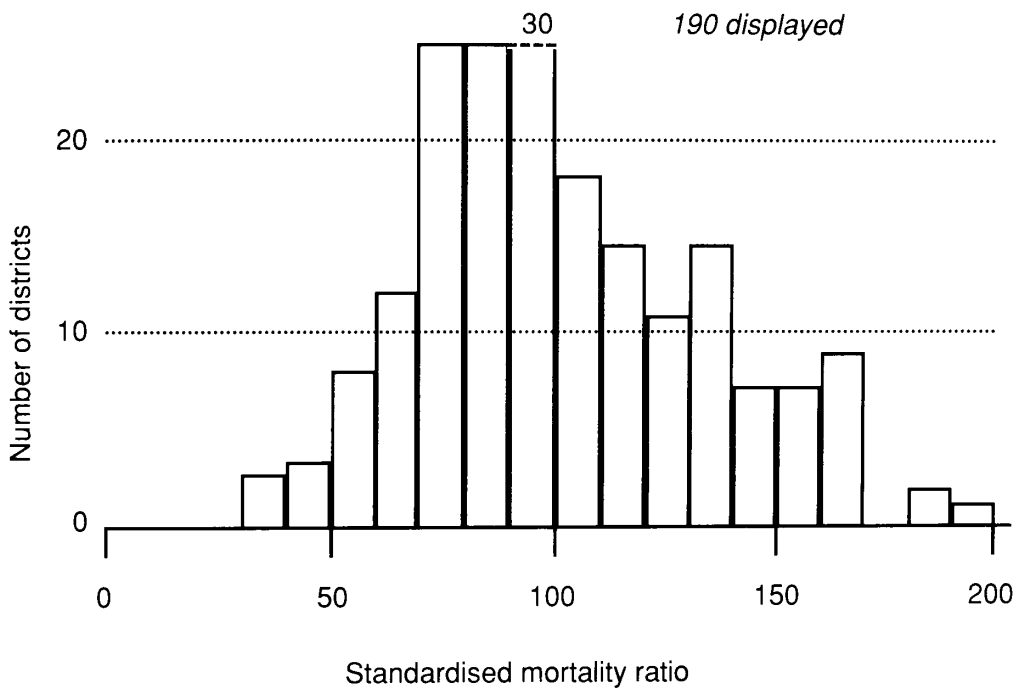
Unfortunately, even though many departmental and hospital systems are capable of answering ad hoc or unusual requests, staff are sometimes either unaware of this or do not have the knowledge or time to retrieve the data. Advice on the available data may be sought from the information officer locally.

Health service indicators

Formerly misnamed 'performance indicators', health service indicators (HSIs) are available for health districts in England and Wales and are becoming increasingly accurate and clinically relevant. HSI data and systems disks are issued each year to health authorities in a variety of formats for comparing individual districts and regions with the country as a whole. A dictionary of indicators is published by the Department of Health;[9] many of these relate to resources, but others describe clinical process or outcome such as:

HEALTH SERVICE INDICATORS

Figure 4.1 Myocardial infarction SMR age 35-64 1989



- Avoidable deaths (standardised mortality ratios): e.g. hypertensive disease, cervical cancer, breast cancer, lung cancer, asthma, rheumatic heart disease, common surgical conditions (hernia, cholecystitis, appendicitis), Hodgkin's disease, myocardial infarction.

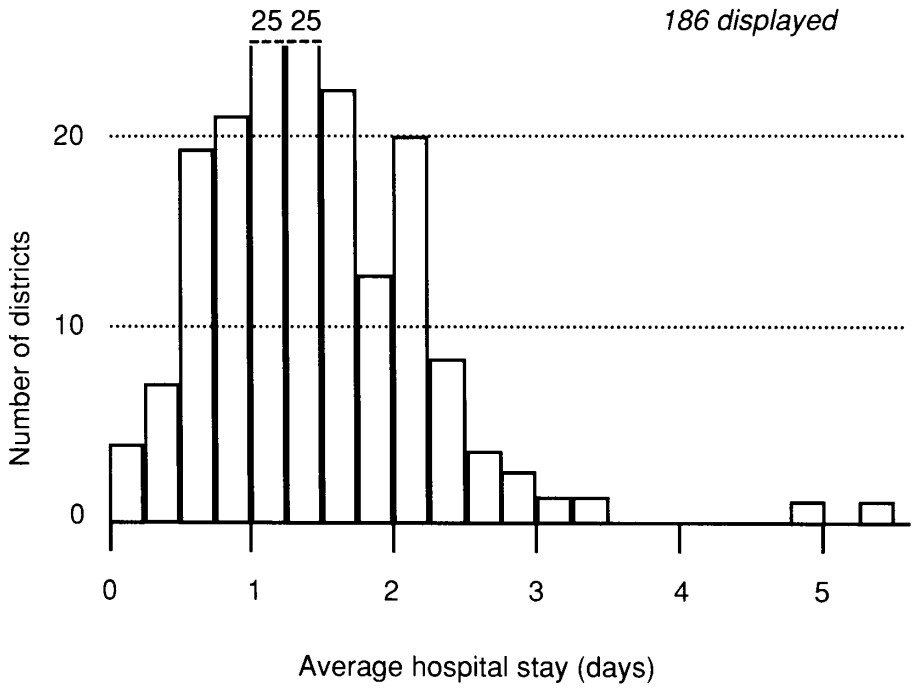
- Admission rates and lengths of stay (by age group).

- Medicine: cerebrovascular accident, ischaemic heart disease, poisoning.

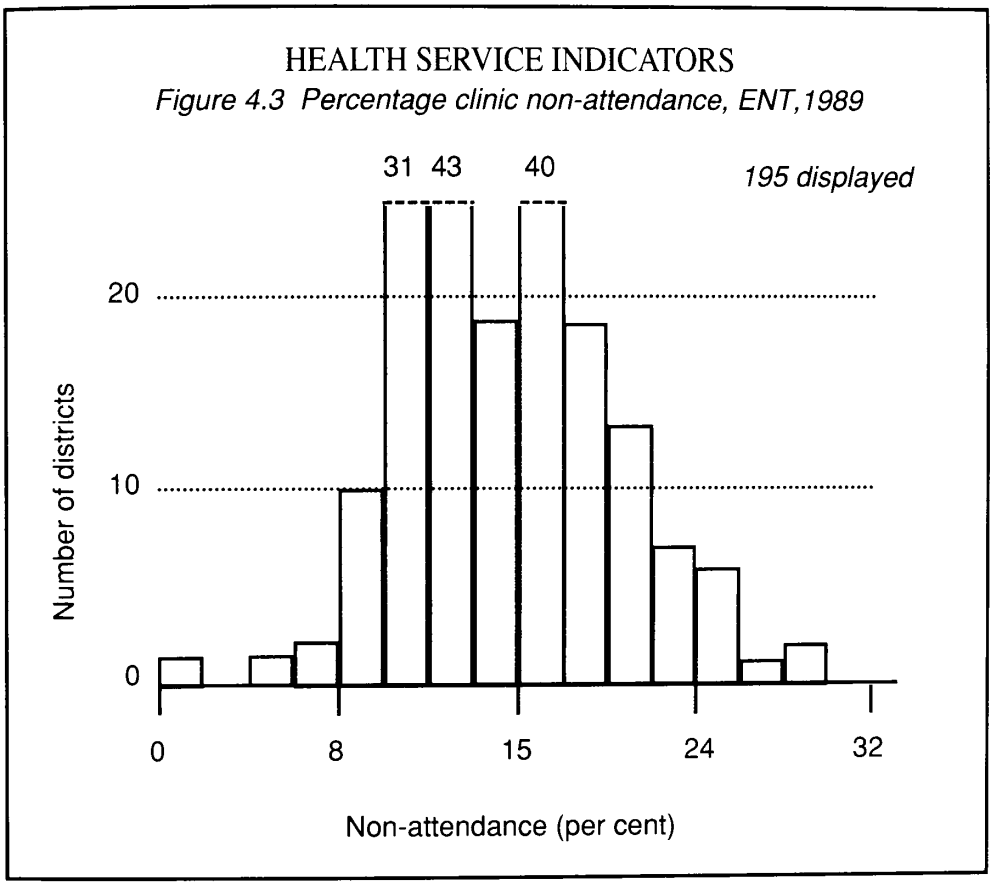
- General surgery: appendicectomy, repair inguinal hernia, varicose vein operation, cholecystectomy, mastectomy.

HEALTH SERVICE INDICATORS

Figure 4.2 Average hospital stay (days) for orchidopexy, age 0-15, 1989



- Urology: prostatectomy.
- Paediatric surgery: orchidopexy, pyloric stenosis.
- Trauma/orthopaedics: concussion, femoral fracture, joint replacement (hip, knee).
- Otolaryngology: tonsillectomy, adenoidectomy.
- Ophthalmology: correction of strabismus, cataract surgery.
- Gynaecology: prolapse repair, abdominal hysterectomy, cervical biopsy, dilatation and curettage.



Manual sources

Apart from the individual patient record, other traditional manual sources may provide information for audit. These include registers in maternity, theatres and the accident unit, and admission books in wards (especially ITU). If there is no other central record of cardiac arrests, the switchboard may have a log of emergency calls.

Clinical coding

For the purpose of storage and analysis, clinical information is usually coded in standard nomenclature before computer entry (or it may be encoded automatically). This bred a number of acronyms and eponyms:

ICD-9: the ninth revision of the International Classification of Disease issued by the World Health Organization and used throughout the NHS for coding diagnoses and causes of injury. Criticised by some as unsuitable for 'problems' as opposed to morbidity, and community as opposed to hospital settings, it is being replaced on 1 January 1993, by ICD-10.

OPCS 4.2: the version introduced in 1990 of the operations and procedures coding developed by the Office of Population Censuses and Surveys.

DRG: diagnosis related groups were developed in the USA to gather clinical entities into clusters of equivalent hospital cost DRGs. May have application in Britain for resource management but audit requires a more clinically sensitive system.

Read: a framework developed by Dr James Read (originally for general practice), which is compatible with ICD, OPCS and pathology codes. But it also allows classification of implants, medications, social situations and other factors affecting ambulatory care. Many national specialty groups are collaborating to develop coding structures for their own clinical areas but these are unlikely to be universally available in the near future.

Data quality

The responsibility for accurate clinical data should be agreed and shared between clinicians and managers; no amount of investment in technology alone will suffice. Practical local steps might include:

- Define and monitor minimum standards for clinical records (e.g. adapt or adopt guidelines from the Royal College of Surgeons[10] and the Royal College of Obstetricians and Gynaecologists[11]).

- Define minimum data to be recorded on diagnosis, complications and procedure for abstraction into hospital clinical system.
- Routinely check that these data are complete and accurate in the discharge note, summary or card from which they will be captured.
- Explore scope, accuracy and potential of data already collected.
- Test response of sources to ad hoc enquiry (e.g. for topic audit).
- Define and request regular provision of routine statistics.
- Involve information officer, records staff and coding clerks.
- Monitor key indicators: some of the criteria used by hospitals to monitor performance of the records service may also be of value to the medical staff, such as:

  — percentage of duplicate records on master patient index
  — case notes not delivered to ward 24 hours after request
  — temporary folders still in use after 24 hours
  — computer records without diagnostic codes completed within four weeks of discharge documentation being available
  — discharge letters not sent within seven days of discharge
  — case notes missing from clinic
  — temporary case note folders in clinic
  — GP clinic letters not sent within a week of dictation
  — concordance of PAS and clinical information systems: in one audit of 71 cases, 12 were recorded only on the clinical system and 13 only on PAS; 65 per cent were recorded on both.

AUDIT ASSISTANTS

Under various titles, one or more assistants have been appointed in most hospitals in Britain since 1990 to support the medical staff and to avoid the unnecessary use of medical time in audit. Job descriptions vary[12] but the main elements are to:

- Be professionally accountable to the doctor responsible for coordination of audit, who should supervise the allocation of time to individual projects.
- Be bound by agreed written code of confidentiality.
- Assist with organisation of meetings, collation of reports from specialty groups, drafting of annual reports and programmes, abstracting and presenting audit data, collation of relevant clinical literature.
- Receive initial and continuing training in the organisation and methods of audit.

Prime requirements include the ability to work effectively with individual medical staff but with limited supervision; experience of hospital organisation and operation; knowledge of clinical terminology and records.

Ability to handle basic statistics and use standard computer software to generate reports is an asset.

The required level of skill, experience and initiative implies a salary at least equivalent to A&C grade 5. This, and the number of hours required, depends on the activity of the medical staff (particularly in criterion-based audit), the scope of the job description and the availability of clerical support (e.g. for retrieval of records).

A current list of training courses is available from the Medical Audit Information Service at the King's Fund Centre.

REFERENCE SOURCES

Medical libraries

Apart from information on local activity (described above), doctors need access to information from elsewhere on audit methods, on good medical practice and on comparable results from other hospitals. For most doctors, the nearest reference source is the local medical library; staff time and other revenue should be allocated to cover additional literature searches, copying, interlibrary loans, subscriptions and acquisitions.

A list of items recommended for a core library is available from the King's Fund Centre. It includes current advice from the Department of Health and the Royal Colleges and specialty organisations, books on audit in general practice and hospitals, and review papers.

Periodicals

Papers on medical audit now feature in many clinical journals. There is also a growing number of periodicals dealing primarily with audit and related issues (often under the general term 'quality assurance').

Australian Clinical Review: easy to read, short articles on practical examples of medical, nursing and paramedical audit. Published quarterly by Blackwell price US$70 p.a. From PO Box 20, Glebe, New South Wales 2037, Australia.

European Newsletter on Quality Assurance: quarterly collation of short articles and news published by the Dutch National Organisation for Quality Assurance in Hospitals (CBO). From CBO, PO Box 20064, 3502 LB Utrecht, The Netherlands.

Quality in Health Care: published quarterly by the British Medical Journal from March 1992. Price £75 p.a. (institutions), £45 (individuals). BMA House, Tavistock Square, London WC1 9JR, England.

Quality Assurance in Health Care: formal, refereed papers, including proceedings of annual congress of the International Society for Quality Assurance (ISQA). Published quarterly by Pergamon Press plc, Headington Hill Hall, Oxford OX3 0BW. Institutional subscription DM200 p.a., free to members of ISQA (see below).

Quality Review Bulletin: variety of papers focused on the United States. Published monthly by Joint Commission on Accreditation of Healthcare Organizations (JCAHO), 1 Renaissance Boulevard, Oakbrook Terrace, Illinois 60181. Price US$80 p.a.

Medical Audit Network: bi-monthly newsletter addressed, primarily, to audit assistants in the UK. Available from, the Medical Audit Association, Suite 8, Cleethorpes Centre, Jackson Place, Wilton Road, Humberstone DN36. Tel. 0472 210682.

Medical Audit News: monthly newsletter on general audit topics in the UK. Annual subscription £25 (individual), £50 (institutional). Published by Churchill Livingstone, Longman Group UK, Subscription Department, 4th Avenue, Harlow, Essex CM19 5AA.

National and regional centres

King's Fund Centre: the Medical Audit Programme was set up in 1989 to identify current activities (primarily in the hospital sector), to disseminate information on practical initiatives and to influence national and local policies so as to promote effective audit. In April 1992, it passed certain functions to the King's Fund Centre library:

- reference library on audit
- information service on literature and current activities
- liaison with audit information units of Royal Colleges.

Further details from the Information Officer, Medical Audit Information Service, King's Fund Centre, 126 Albert Street, London NW1 7NF. Tel. 071-267 6111. Fax 071-267 6108.

Medical Royal Colleges: many of the colleges have established an information unit and research officer to assist doctors with audit in the specialty. See 'National resources' section of the appropriate specialty chapters for details.

Regional Units: some regions have audit units, primarily to promote effective activity within the region but also offering support without, especially with training e.g.: North West Thames RHA, 40 Eastbourne Terrace, London W2 3QR, tel. 071-262 8011, fax 071-258 0530; and the South Western RHA, Clinical Audit Unit, University of Bristol, Canynge Hall, Whiteladies Road, Bristol BS8 2PR. Tel 0272 738223. Fax 0272 238568.

Associations and organisations

Medical Audit Association: founded in 1991 by the King's Fund Centre to provide information, training and support to staff assisting audit in the UK. Subscription (includes newsletter and information about current activities) £20.00 pa. Details from the Medical Audit Association, Suite 8, Cleethorpes Centre, Jackson Place, Wilton Road, Humberstone DN36. Tel 0472 210682.

International Society for Quality Assurance: founded in 1985 to promote information, research and communication on quality assurance and cost containment. Annual congress held in varying continents. Individual membership (includes subscription to Quality Assurance in Health Care) is US $39 pa. Details from the Secretary of ISQA, Department of Haematology, Karolinska Sijkhuset, PO Box 60500, S-10401 Stockholm, Sweden.

National Association for Quality Assurance: founded in the UK in 1986 provides a networking and information clearing house. Subscription (includes Journal, newsletter and information about current activities) £30.00 pa. Details from the Secretary of NAQA, Birmingham Research Park, Vincent Drive, Edgbaston, Birmingham B15 2SQ. Tel 021-414 0847.

Royal Society of Medicine: the RSM has a forum devoted to quality in clinical care, which meets four times a year in London. Fellows of the RSM can join without charge; others can become associate members of the forum, except for medical doctors and dentists who are required to become fellows of the Society. Details from the Membership and Information Secretary, Royal Society of Medicine, 1 Wimpole St, London W1M 8AE. Tel 071-408 2119. Fax 071-355 3197.

North Thames Clinical Audit Forum: holds monthly seminars. Details from the Health Services Research Unit, London School of Hygiene and Tropical Medicine, Keppel Street, London WC1E 7HT. Tel 071-927 2064.

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5 — ACCIDENT AND EMERGENCY MEDICINE

NATIONAL GUIDANCE

The advice issued by the Royal Colleges of Physicians and Surgeons is generally applicable to accident and emergency medicine. More specific advice on clinical audit is offered by the Clinical Services Standing Committee of the British Association for Accident and Emergency Medicine (BAEM, formerly the Casualty Surgeons Association).[1] This endorses the need to define good practice, to observe current application, to compare practice with others and to implement appropriate change.

ORGANISATION

Organising audit meetings offers special challenges in a department where consultants are often single-handed, the case-mix includes almost every specialty in the hospital and workload is unpredictable. For many departments, meetings have to be held on site, and some departments bring in clinical assistants to cover the regular staff for the monthly audit session. Some departments link with near neighbours, or invite other A & E consultants to participate.[2] The appropriate 'peer group' depends primarily on the chosen subject for audit and demands scheduling well in advance for joint meetings with other specialties (including general practice).

Regional specialty committees can nonetheless support audit by sharing methods, data and results for comparison within the specialty.

METHODS

Adverse patient events

Events which may trigger automatic review within the department may include:

- patients reattending within one week of being discharged
- missed fractures
- injuries to patients or staff within the department
- deaths within department, or during transfer out
- cardiac/respiratory arrest
- patients leaving against clinical advice
- complaints.

Key indicators

In addition to the above and to the general indicators listed in chapter 3, 'Clinical indicators', the following should be routinely collected in the NHS or are fairly readily available for review of A & E departments:

Workload: new patients — number (%) by age (e.g.<16 years, 16-64 years, 65+ years); percentage arrivals by ambulance; disposal — number (%) discharged, admitted, died, clinic appointment, immediate cross-referral.

Access: percentage new patients seen by doctor within 30/60 minutes, by age (<16, 16-64, 65+), by triage category.

Outcome: number (% of all new patients): planned reattendances; unplanned reattendance within 3 months, deaths (ambulance arrivals).

Records: percentage concordance of A&E computer with other systems (e.g. radiology/pathology usage, patients admitted).

Efficiency: reattendance rate; radiology requests per 1000 new patients; pathology requests per 1000 new patients; length of stay in accident ward.

Topic review

Subjects which may be appropriate for occasional, focused review include:

- nursing triage
- management of trauma
- resuscitation
- acute myocardial infarction
- accident prevention
- use of radiology
- sprained ankle.

Chest pain: a retrospective audit of 93 patients presenting to an English District General Hospital with chest pain found that key items of history, examination and investigation were often not recorded. Some 17 of 21 patients confirmed as having a myocardial infarction did not receive aspirin in the department. Two-thirds were seen by a doctor within ten minutes of arrival. Other findings were:

Criterion recorded in A&E	*Percentage compliance*
Arrival	
Time seen by doctor	93
Time discharged/admitted	46
History	
Duration of chest pain	73
Reference to past history	80
Examination	92
Pulse rate	
Blood pressure	78
Heart sounds	85
Breath sounds	93
Investigation	
Interpretation of ECG, if done	89
Interpretation of chest X-ray if done	86
Treatment	
If diagnosis acute myocardial infarct	
— intravenous opiate given	48
— oral aspirin 300mg given	19
— admitted to CCU	80
If not acute mycardial infarction, advice to patient recorded	63

In a north London study, 174 patients discharged after attending with chest pain were followed up two weeks later.[3] Four patients were considered to have been underinvestigated or undertreated; 85 per cent of patients over 65 had an ECG recorded. Half of the GP referrals were for ECG, possibly adding unnecessary delay in commencement of thrombolytic therapy; 15 per cent continued to have chest pain. The authors concluded that all patients over 50 years should have an ECG.

Missed diagnoses: in a busy DGH unit over a six-month period, a correct diagnosis had not been made initially in 134 patients (about 0.6 per cent of new patients). Injuries and musculoskeletal conditions in children were common in this group. Of the missed diagnoses, 70 per cent were failures to see X-ray abnormalities and 5 per cent were failures to interpret them; 6 per cent were attributed to inadequate physical examination. The audit led to revisions in guidelines for use of radiology and confirmed the need for all films to be reviewed.[4]

Over two years in a London teaching hospital casualty department, 490 radiological abnormalities were missed in 10,000 patients; about half these were attributed to inadequate care in examining the films and many were associated with a change of casualty officer when films were interpreted by a doctor who had not examined the patient.[5]

Other methods

Video recording: recording of consultations with patients has been widely used in general practice, with the prior consent of the patient. Several accident units in Britain and overseas have found the later analysis of resuscitations to be a valuable tool for audit and training — as well as being of benefit to the subsequent management of the individual patient. Ethical concerns are generally met if reasonable effort is made to obtain consent from the patient or a relative, or if the recording is erased after review (unless specific consent is subsequently obtained). Review should be limited to the immediate staff responsible for the acute and continuing care of the patient.

Random review: the BAEM also suggests the random examination of records and cases; some units take a 10 per cent sample of records, others 10 or 20 cases. This process can be made more objective by using a systematic checklist of recording and appropriateness of care.

National audit

Many departments participate in the national Major Trauma Outcome Study and submit data on management to the North Western Injury Research

Centre in Manchester.[6] The TRISS (trauma, risk, injury severity score) method can also be applied locally even without submitting all the data required for the Major Trauma Outcome study.

DATA

Sources

Although some departments have a computer-based patient registration system, many of these have difficulty in abstracting clinical data for audit and more have no case-mix measurement system at all. The patient administration system (PAS) should be able to identify all patients admitted through the department (e.g. according to age, ward, consultant) or who died in it. If all A and E attendances are entered, reattendances or later admissions should be recognised by the PAS.

The pharmacy stock control system should identify the range and quantity of drugs and supplies issued to the department, and radiology and pathology systems may be able to list work requested from A&E.

Health service indicators available for English districts for 1989/90 include:

screen no.	*HSI no.*	*Indicator*
Overall acute 23	AE41	% first attenders at A & E

Classification

For the purpose of monitoring A and E workload, 'activity related groups' have been proposed, according to the time spent with the patient by doctors or nurses[7] . A minor injury expected to require less than 30 minutes would be classified as group 1, compared with a major resuscitation (group 4).

For the purpose of relating waiting times to urgency, the following triage categories have been proposed:[7]

Immediate: patients requiring resuscitation in a resuscitation room. Should be seen immediately — maximum 10 minutes' delay.

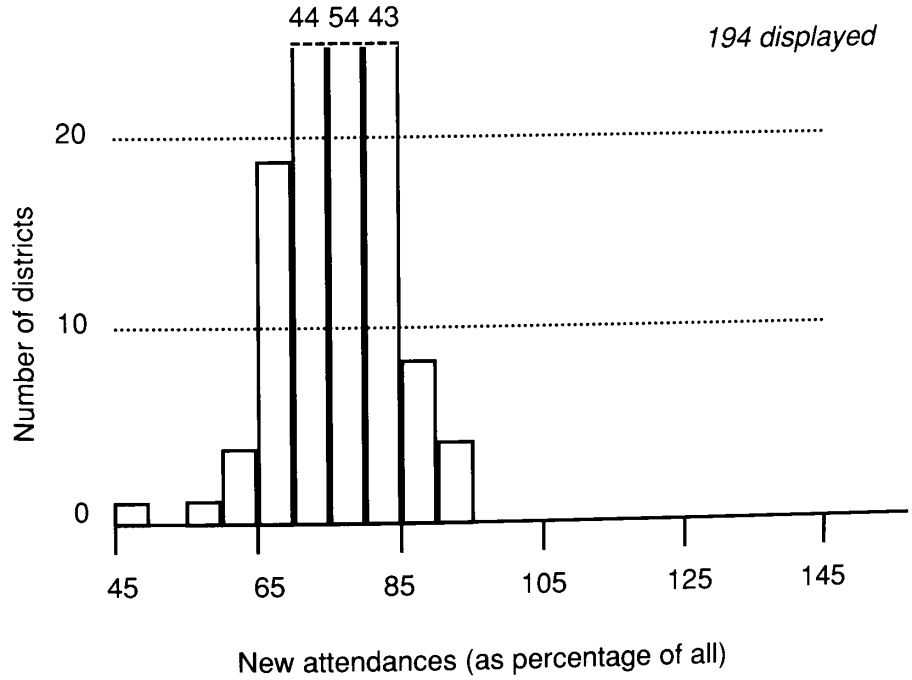
Urgent: patients usually ambulance-borne and suffering from conditions such as major isolated fractures or acute chest or abdominal pain. Target time of 30 minutes.

Non-urgent: minor injuries and chronic conditions with acute exacerbations. Waiting time not more than four hours, ideally much less.

Inappropriate: includes patients with chronic conditions for which facilities are not available in the A&E department; advised by triage nurse to seek attention elsewhere or wait until all emergencies have been attended to. No upper limit of waiting.

HEALTH SERVICE INDICATORS

Figure 5.1 Percentage new attendances, A&E, 1989



NATIONAL RESOURCES

The British Association for Emergency Medicine (formerly the Casualty Surgeons Association) is based at the Royal College of Surgeons, 35 Lincoln's Inn Fields, London WC2A 3PN. Tel. 071-831 9405. Fax 071-405 0318.

The UK Major Trauma Outcome Study is based at the North Western Injury Research Centre, Stopford Building, Oxford Road, Manchester M13 9PT. Tel. 061-789 1421. Fax 061-787 7432.

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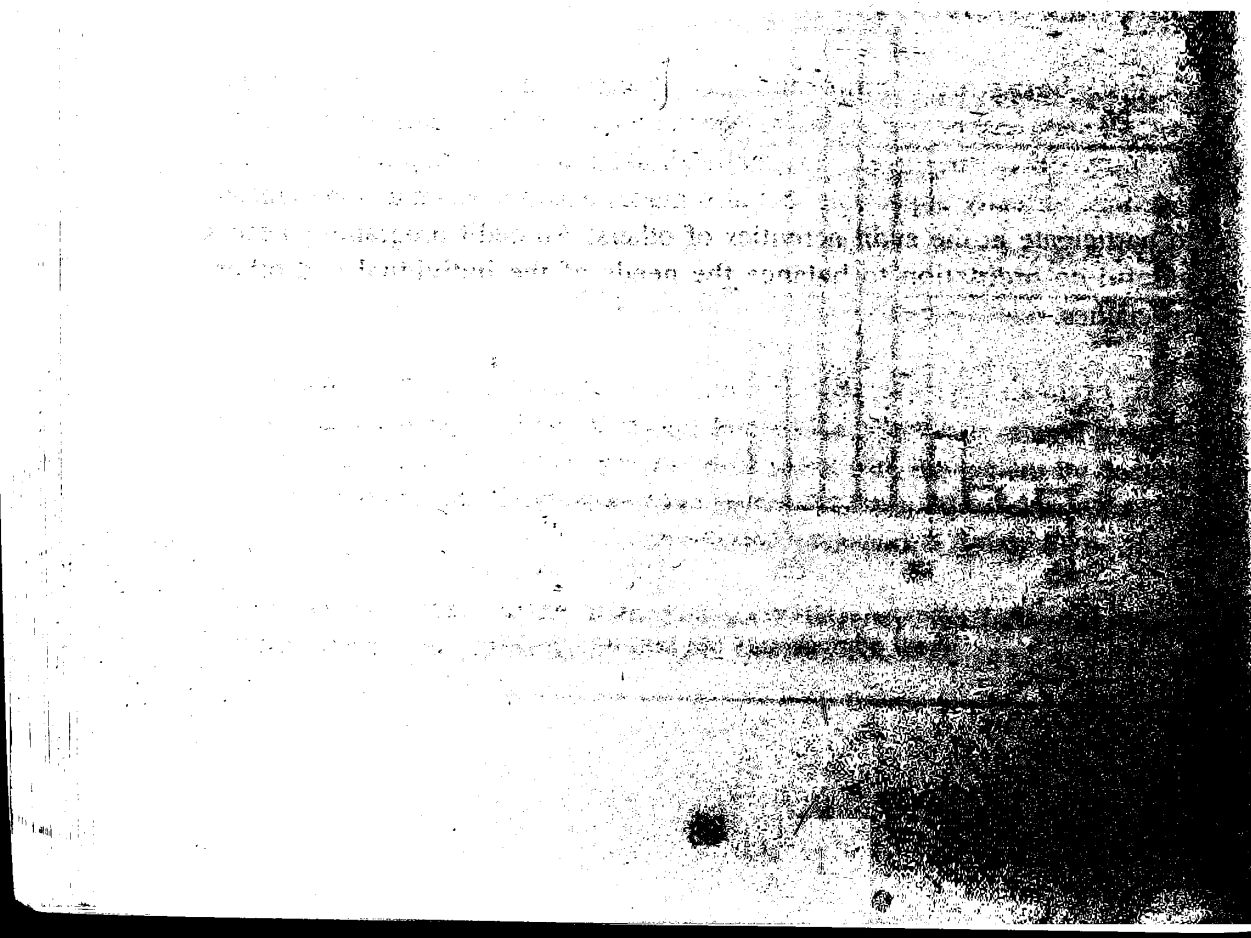


6 — ANAESTHETICS AND INTENSIVE CARE

NATIONAL GUIDANCE

The College of Anaesthetists issued preliminary guidance on audit in 1989[1] and promised firmer recommendations when more ideas are tested. In the meantime, the establishment of and involvement of all doctors in audit are emphasised as a condition of hospital recognition. To assist in this, all juniors are expected to maintain logbooks of numbers and types of anaesthetics, results, and educational activities. This may later extend to all anaesthetists. The College requires records of attendance at departmental meetings and clinical audit is monitored by the Hospital Recognition Committee.

The Intensive Care Society has issued guidelines on a minimum data set and on the content of clinical records of admission, treatment, dependency and outcome.[2]

ORGANISATION

Despite being more populous than doctors in surgical specialties, anaesthetists face particular challenges in organising audit: daily commitment to many other specialties makes high attendance at department audit meetings virtually impossible, but also makes anaesthetists much in demand to participate in the audit activities of others. An audit programme needs careful co-ordination to balance the needs of the individual and other specialties.

Many hospitals have evolved a 'rolling' half day once a month when elective surgery ceases in order to allow joint meetings with surgeons. This allows scheduled cancellation of operating (and redeployment of staff) and has not been reported to increase waiting lists noticeably, but it tends to overlook the legitimate needs of non-surgical specialties.

Subspecialties within anaesthetics, such as intensive care, may not have enough doctors within one hospital to form an effective peer group locally.

Also, the nature of clinical work and thus audit in intensive care is very different from theatre work and needs different organisation, methods and resources. Similarly, staffing is even lower in pain clinics, whose audit may be based regionally. Whatever structure and resources are locally appropriate, the complexity of anaesthetic audit within and between specialties, and the definition and sharing of audit data require active regional coordination.

METHODS

Adverse patient events

Situations which may warrant automatic clinical review relate to anaesthetic process (critical incidents, misadventures, accidents) or to patient outcome (mortality, morbidity). A classification of the latter emerged in 1984 from an international symposium on preventable anaesthesia morbidity and mortality, reported by Lunn:[3]

Major: Permanent disability and/or disfigurement.

Intermediate: Serious distress and/or prolongation of hospital stay but no permanent disability.

Minor: Moderate distress without prolongation of hospital stay or permanent sequelæ.

Although it is necessary to unravel the relative contributions of anaesthetics, surgery and the patient's own condition, the following examples have been offered for study:[3]

Minor morbidity:

haematoma following intravenous injection
headache following general anaesthesia
nausea, retching, vomiting
accidental damage to teeth, lips, gums
loss of memory
partial recall

sleep disturbance
myalgia following suxamethonium
neuropraxia, temporary neuritis or paresis.

Intermediate morbidity:
prolonged vomiting
postdural puncture headache
renal, hepatorenal failure
chest infection
myocardial infarction
psychological disturbance.

Major morbidity:
permanent neurological damage.

To these may be added laryngeal damage, transfusion accident, anaphylaxis, fitting, and burns arising from anaesthetic equipment or procedures and morbidity arising from the use of intravascular monitoring devices.

Analysis of technical failures has suggested that 65—80 per cent are due to human error, usually in failing to perform a normal check.[4—6] Detailed checklists have been shown to reduce their incidence[5] — and oxygen analysers and disconnect alarms reduce their impact.

Adverse events in intensive care which may be monitored include:

- Endotracheal tube complications (e.g. displacement, nasal ulceration).
- Arterial/central line complications.
- Drug errors, especially infusions.
- Readmissions to unit.
- Hospital acquired infections.

Key indicators

Indicators should measure explicit policies. These should be agreed locally, but may be inspired by the findings of regional or national studies such as confidential enquiries. Examples may include:

- Anaesthetic complications rate.
- Patients in recovery >2 hours (general), >3 hours (spinal) .
- Unplanned transfers to intensive care, related to anaesthesia.
- Unplanned admissions to hospital from day unit.
- Percentage cases in ASA class 4 or 5 anaesthetised by consultant.
- Percentage emergencies anaesthetised by consultant.
- Percentage procedures done out of hours.
- Percentage children under 5 years anaesthetised by consultant.
- Percentage preoperative visits done by consultants.
- Percentage attendance at audit meetings.

Topic review

Subjects which lend themselves to occasional analytical review include:

- Pre-operative monitoring.
- Pre-medication.
- Post-operative pain relief.
- Management of cardiac arrest.

- Use of selected analgesics, anaesthetics.

- Supervision of trainees

- Calling the consultant: once local policies are explicit, they can be audited; one general hospital, encouraging resident staff to contact the on-call consultant to discuss any serious medical, ethical or administrative problems made this mandatory for any patient

  — requiring admission to intensive care

  — when cancellation of surgery is considered

  — in ASA class 4 or 5

  — under 5 years requiring surgery.

Published examples include:

- Pre-operative assessment: the survey by Lunn and Mushin of deaths associated with anaesthesia in 1980 found that 8.8 per cent had not received a preoperative visit;[7] in 1983/4 a questionnaire survey of 7.2 per cent of anaesthetists in Great Britain and Ireland reported that 22 per cent saw fewer than 50 per cent of patients pre-operatively (a rate apparently independent of type of hospital, geographic location or number of sites served by the anaesthetists).[8] The national CEPOD showed that in 1989 80 per cent of children were seen by anaesthetists beforehand.[9] A study of nine Dutch hospitals[10] examined the reasons for assessment, the range of tests used, and the logistics involved; it included a list of 34 recent papers on the use of preoperative investigation.

- Premedication: a prospective audit of premedication management over two months in an Australian teaching hospital revealed several opportunities for improvement: 20 per cent of patients received oral premedication less than 30 minutes before arrival in theatre; 18 per cent of elective cases fasted for more than 12 hours; regular medications were stopped abruptly in 45 per cent of cases.[11]

- Anaesthesia-related admissions to intensive care: 53 patients (one per 1543 anaesthetics) were admitted to a district intensive care unit (2 per cent of all admissions) after a complication of anaesthetic techniques.[12] The complication was considered to be partly or wholly avoidable in 14 cases.

- Discharges from intensive care: 79 patients admitted to a Melbourne ICU over 2 months were followed up after 12 months.[13] Mortality in the Unit was 13 per cent but only 3 patients died in the 12 months after leaving hospital. One result of the audit was agreement to complete prospectively a proforma on each admission to make future audit easier. Computer-based analysis of 1257 patients admitted to another Australian unit showed that age alone was not a good predictor of mortality, but patients with septicaemic shock consumed a much greater proportion of ICU resources and received far less benefit than the average patient.[14] A two-year study of discharges from an ITU in Glasgow suggested that the patients who may benefit most from ITU in terms of survival — young patients and trauma victims — showed significant decrease in their quality of life; these results conflict with reports from outside the UK.[15]

- Artificial ventilation: a survey of neonatal units in Britain suggested that humidity of inspired gas was often below levels consistent with mucociliary clearance.[16]

- Organ donation: a survey of 273 intensive care units in England[17] and a report from one in Scotland[18] suggested that a higher proportion of donors could be achieved if confirmatory tests were carried out on all patients where brain stem death is a possible diagnosis.

Other methods

Review of records: two surveys of anaesthetic records in Great Britain and Ireland detailed their inadequacy in 1973;[19] a similar message came from the first report of the national confidential enquiry into perioperative deaths (NCEPOD) in 1990[9] which exhorted attention to the guidelines on clinical

records in surgery and anaesthesia published by the Royal College of Surgeons.[20]

A simple audit of 13 criteria was used to assess the content of anaesthetic records in an Australian teaching hospital before (n=49) and after the introduction of new record forms (n=53) [21]. Results are in table 6.1.

	Criterion recorded	*percentage compliance*	
		1983	*1985*
1	Patient identification	96	100
2	Evidence of preoperative assessment	37	91
3	Premedication given, and effect	19	55
4	Operation performed	96	83
5	Drugs administered	98	98
6	Doses of drugs administered	90	100
7	Duration of anaesthesia	22	40
8	Record of airway invasion	92	96
9	Record of monitoring used	86	87
10	Fluids lost and given	2	0
11	Postoperative note	4	2
12	Anaesthetist's name	100	100
13	ASA classification	0	30
	Overall score	57	68

Table 6.1. Audit of anaesthetic records

The authors concluded that improvements had been made in recording preoperative assessment, premedications, other drugs and ASA class; a significant drop in recording of the operation performed was attributed to a failing of the new form design.

Patient expectations: closely related to medical audit is the assessment of patient satisfaction by questionnaires in non-technical language which can be

completed by the patient or an untrained observer. General issues might include:

- Was apprehension adeqately managed, especially in children?
- Was premedication effective, and correctly timed?
- Was the time of operation known to the patient in advance?
- Was post-operative pain adequately controlled?

National audit

The national CEPOD collects surgical and anaesthetic information on controls and on deaths within 30 days of operation. It is a direct descendant of the study of deaths related to anaesthesia in which Lunn and Mushin pointed out the need to review anaesthetics in the context of surgery and vice versa. Both the pilot CEPOD and its national successor offer valuable pointers to areas of clinical practice and organisation which might benefit from local audit.[9,22]

The confidential enquiry into maternal mortality was established in 1952 and reports every three years in relation to obstetrics and obstetric anaesthesia. The latest report showed a marked reduction in deaths associated with anaesthesia.[23]

DATA

Sources

PAS/CDC: the starting point for systematic audit is an accurate listing of patients who have a common clinical characteristic. Anaesthetics shares with clinic-based specialties the challenge of having minimal data relevant to case-mix routinely available; other in-patient clinical services have access to indices, albeit underdeveloped, of diagnoses, complications and procedures from the clinical data capture (CDC) system which is standard in the NHS. However, this and the patient administration system (PAS) should be able to list, for example: patients discharged from intensive care (e.g. by age, diagnosis, specialty, length of stay); patients having a selected operative

procedure; patients above/below a given age; obstetric patients. Routinely derived (Körner) data include percentage of theatre time used, sessions cancelled, etc.

Theatre management systems: although not yet universal, many theatre management and anaesthetic audit systems are now available to capture and analyse data more sensitive to anaesthetic need, such as agents and techniques used, duration and outcome of anaesthesia — and the identity of the anaesthetist.

Maternity systems: most systems capture the type of delivery, duration, Apgar scores, birthweight, etc., but further details of anaesthesia are variable.

Pharmacy systems: most stock systems can quantify analgesics or anaesthetics issued to theatres or wards, but cannot directly identify the doctors who prescribe them or the patients who receive them. Outpatient prescriptions may be identified according to consultant.

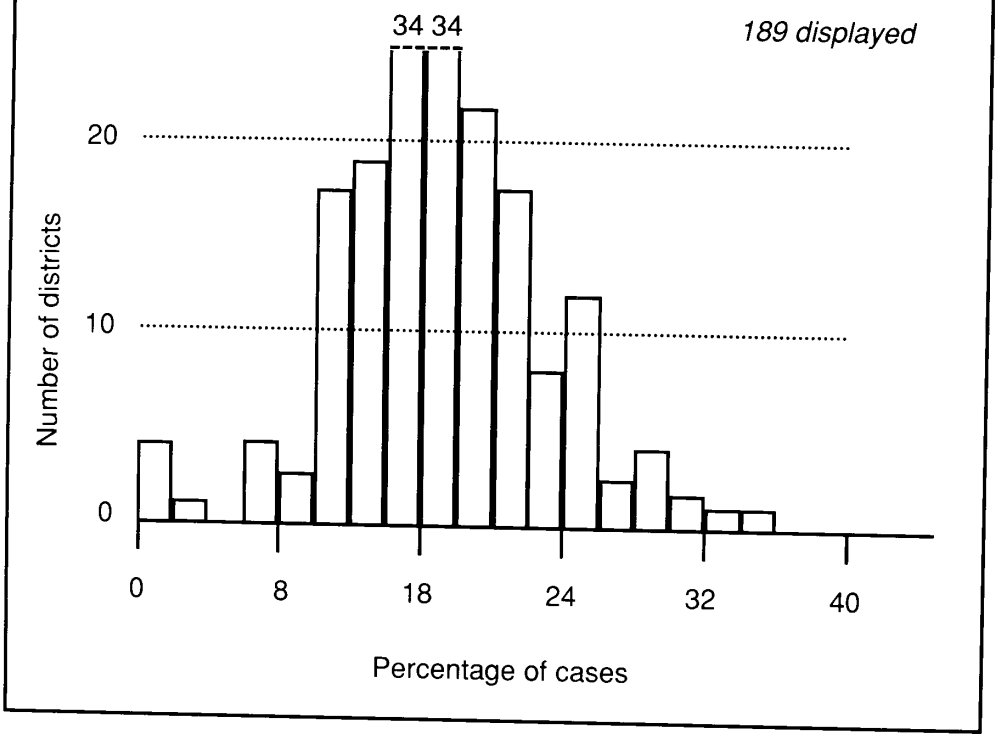
Radiology/pathology systems: these capture investigation, patient identification and consultant in charge and may be able to generate aggregated lists.

Health service indicators: comparisons for each region and district in England for 1989/90 include:

Menu	*HSI no.*	*Indicator*
Acute	TH51	Average number cases per theatre session
Acute	TH41	Percentage theatre sessions cancelled
Acute	TH52	Percentage theatre cases out of hours
Children	NB52-6	Average stay neonates in normal, special or intensive care
Manpower	MD34	Ratio non-consultant:consultant anaesthetists
Manpower	MD37	Ratio junior:senior trainee anaesthetists
Manpower	MD47	Anaesthetic consultants per patient episode

HEALTH SERVICE INDICATORS

Figure 6.1 Percentage of theatre cases out of hours, general surgery, 1989



Manual sources: anaesthetists' log books, theatre/ITU/maternity registers, operating lists and individual patient records should not be overlooked as sources of information for audit.

Recommended contents of clinical records and minimum data sets for intensive care have been published by the Intensive Care Society.[2]

Classification

Standard coding of diagnosis is according to ICD-9 (including complications, when recorded, using codes 996-999); procedures are usually coded under OPCS-4; both these will be enhanced when Read coding is more widely available.

For the purpose of defining anaesthetic risk, the classification of the American Society of Anesthesiologists (ASA) is commonly used:

1. The patient has no organic, physiological, or psychiatric disturbance. The pathological process for which the operation is to be performed is localised and does not entail a systemic disturbance.

2. Mild to moderate systemic disturbance caused by either the condition to be treated surgically or by other pathophysiological processes.

3. Severe systemic disturbance or disease from whatever cause even though it may not be possible to define the degree of disability with finality.

4. Severe systemic disorders that are already life-threatening, not always correctable by operation.

5. The moribund patient who has little chance of survival but is submitted to operation in desperation.

Several intensive care units in Britain are collaborating to validate and apply the APACHE II (acute physiology and chronic health evaluation) system in Britain.[24] This severity score was developed in the United States based on 12 physiological variables which are weighted for age and chronic disease. Mortality probabilities have been derived for each level, permitting the calculation of expected deaths for a given case-mix for comparison with the actual numbers in a given unit.

Minimum data set

The Royal College of Anaesthetists and the Society for Computing and Technology in Anaesthesia is expected to advise on minimum data sets and records. As yet, no minimum data set has been adopted nationally for theatres but one system, developed in Derby and using optical mark readable cards, includes:[25]

Identification: patient number, sex, birth date, anaesthetist(s).

Pre-operative: visit, ASA status, premedication.

Operation: type, specialty, theatre, date, start/end time.

Anaesthetic: drugs, agents, fluids, monitoring, assistant.

Outcome: morbidity, analgesia, discharge.

Ideally, any system would ensure that no item is recorded more than once (e.g. by anaesthetist, surgeon, records staff). Definitions must be agreed such as for the type of operation (CEPOD splits these into emergency, urgent, scheduled, elective) and the 'end' of the anaesthetic (e.g. when handover to recovery nurse, or when leave recovery).

The adoption of CEPOD definitions, including critical incidents and type of operation is recommended throughout the UK.

NATIONAL RESOURCES

The Royal College of Anaesthetists has set up a Quality of Practice Committee which includes representatives of other interested organisations (e.g. the Intensive Care Society, the Pain Society and the Association of Anaesthetists) to support audit and develop measurement systems for treatment in anaesthetics and intensive care. Enquiries from fellows are welcomed. The committee's current work includes:[26]

- Record keeping: assessing methods of computerised perioperative record keeping; use of Read coding in anaesthesia; DRGs in intensive care.

- Morbidity and mortality: National CEPOD; national confidential enquiry into brain damage and/or cardiac arrest occurring during or within six hours of completing an anaesthetic; critical incidents during anaesthesia; incidence of neurological complications of obstetric epidural anaesthesia (together with the Royal Colleges of Obstetricians and Gynaecologists and General Practitioners).

Contact the College at 35-43 Lincoln's Inn Fields, London WC2A 3PN Tel 071-405 3474. Fax 071-831 9019.

The Intensive Care Society is based with the Association of Anaesthetists, 9 Bedford Square, London WC1B 3RA. Tel. 071-631 1650.

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7 — CLINICAL ONCOLOGY

NATIONAL GUIDANCE

The Royal College of Radiologists issued advice on audit in clinical oncology in 1990.[1] This emphasised that the College supports audit as a means towards progressively higher standards of care for patients and that its role is in collecting, processing and distributing information and experience on audit. This would include the development and measurement of departmental treatment policies. A broad knowledge of the methods and practice of audit will be expected in the final Fellowship examination, and evidence of involvement in effective audit will be sought during accreditation visits.

ORGANISATION

Most departments of clinical oncology serve several district populations and have sufficient numbers of consultants to make an effective peer group for audit locally. Smaller units may have to combine for audit. However, the management of cancer by surgery, chemotherapy or palliative care involves many other specialists at unit or district level, who should also be included in audit of appropriate topics. The oversight of audit in clinical oncology is therefore likely to be the task of local and of regional audit committees. All medical staff should attend audit meetings. Other staff may be included; for example, physics and radiographic staff should participate in discussion of radiotherapy practice or technique. Nursing staff and laypersons may also be appropriately involved.[1]

This chapter deals primarily with measuring the medical application of the treatment technology, rather than research into the technology itself or quality assurance of instrumentation.

METHODS

Adverse patient events

Events which might be subject to automatic peer review might include:

- Deaths from cancers which are successfully treated in the great majority of cases.
- Major complications.
- Deaths within a short time after treatment.
- Treatment courses constituting a significant proportion of the patient's remaining life.

Key indicators

Many of the indicators for radiation oncology proposed in the USA require more detailed data than are available in most UK centres for routine monitoring. The Association of Community Cancer Centers has suggested that clinical indicators should be clearly defined, available in the clinical record, and easily documented. They should directly affect care and outcomes, and they should discriminate between good and poor clinical cancer programmes.[2] Unless limited to diagnosis, staging and acute treatment, they require some mechanism for long-term follow for the evaluation of treatment results. A preliminary study using the Community Hospital Oncology Program database of 2728 cases of breast cancer in 1987 and 1988 showed the pattern in table 7.1.[2]

Percentage:	*Done*	*Not done*	*Unknown*
Oestrogen receptors	64	20	16
Progesterone receptors	63	21	16
Mammogram of involved breast	66	18	16
Mammogram of opposite breast	17	44	39
Nodes examined	77	16	7
Adjuvant chemotherapy for stage II	40	60	0

(73 per cent of patients receiving adjuvant therapy were premenopausal)

Table 7.1 Breast cancer variables

Topic review

Subjects which may reward occasional detailed audit by virtue of high volume, high risk, high cost or wide variation include:

- Waiting times: for referral, in clinic, for treatment.
- Diagnosis and staging: accuracy and recording.
- Information: given to patients and relatives.
- Drug preparation, administration and usage (e.g. cytotoxics, radiopharmaceuticals, steroids, hormones, analgesics, antiviral agents).
- Treatment policies (e.g. fractionation, radical, palliative and terminal care; emergency radiotherapy; consistency of dose delivery and calculation).
- Specific treatments (e.g. lung cancer, head and neck cancer, craniospinal axis irradiation, spinal cord compression, superior vena cava[3]).
- Outcomes: acute reactions to treatment, late side effects, local recurrence, survival.
- Follow-up: effectiveness of long-term policy.

Palliative therapy for carcinoma of the bronchus: a preliminary study by three consultants found that key information on the timing of referral, documentation of diagnosis, evaluation of symptom improvement and patients' perceptions were rarely recorded in department records. Variations identified in process and outcome led to an objective reassessment of treatment policies. Findings included:

Criterion		*Dr A*	*Dr B*	*Dr C*
1	% histology report filed/quoted	66	0	0
2	% chest X-ray report filed/quoted	88	0	50
3	% palliative/radical identified on treatment prescription	100	78	100
4	% target symptom identified	63	56	20
5	Radiotherapy to primary site:			
	average number treatments	10.4	8.0	7.2
	average duration (days)	17.2	12.6	8.6
6	% courses completed as planned	75	80	100
7	% patients survived 10 times duration of therapy	56	66	56
8	% letters to GP <8 days first clinic	33	50	40
9	% letters to GP <8 days of review	100	13	50
10	% letters refer to follow-up	86	33	100
11	% letters refer to medication	14	0	33
12	% letters refer to what patient told	0	0	33

Fractionation: a survey published in 1989 of 227 radiotherapists in the UK (76 per cent response rate) showed a wide range of treatment schedules being used to achieve a reasonably constant biological end-point for six clinical situations.[4] The numbers of fractions varied between individual therapists

from 1 to 36 in palliative treatment and from 6 to 45 in potentially curative therapy. When aggregated, this translated to one region requiring two-and-a-half times more machine time than another. Major influences on clinical practice of individuals were training and the presence of established local policies. The effect of clinical trials, either as a result of current participation or from the literature, appeared relatively small.

Delay pattern analysis: on the assumption that timely diagnosis and intervention improve outcome for the patient, the timing of key events may be studied to identify inappropriate delay for a given diagnosis or group of diagnoses. For example, when:

- Patient first recognises problem.
- Patient seeks GP appointment.
- Patient seen by GP.
- GP seeks consultant opinion.
- Patient seen by consultant.
- Diagnostic test arranged.
- Test performed.
- Patient referred to clinical oncologist.
- Patient seen by clinical oncologist.
- Treatment commenced.

Such follow-up of diagnostic and treatment delays in a large hospital in Barcelona led to improved surgical timetabling, a priority system for urgent diagnostic tests and redesign of treatment cycles. Delays were reduced and follow-up improved as below:[5]

	Breast		*Ovary*		*Larynx*	
	yr1	*yr2*	*yr1*	*yr2*	*yr1*	*yr2*
Number of cases	32.0	35.0	23.0	23.0	26.0	42.0
First consultation to diagnosis (weeks)	2.0	2.4	3.5	2.3	2.9	2.2
Diagnosis to treatment (weeks)	1.7	1.1	2.2	1.2	3.8	2.8
Protocol followed (per cent)	94.0	93.0	91.0	87.0	78.0	97.0
Follow-up (per cent)	93.0	96.0	87.0	85.0	80.0	91.0

Similar delay analysis of 330 patients with bladder cancer in the North West Region of England showed that 91 per cent were seen as outpatients within one month of GP referral, but only 43 per cent were treated within one month thereafter.[6] Records of 23 servicemen with testicular tumours showed that delays were attributable to the patients, their own doctors and the hospital.[7]

DATA

Sources

Hospital patient administration systems (PAS) should identify diagnoses and procedures for individual inpatients and day cases but data on outpatients are generally limited to total numbers of patients seen. However, since most clinical oncology units maintain patient records separate from the rest of the hospital, they also maintain their own patient registers — and lose fewer records.

Diagnostic listings may also be obtained from some radiology or pathology computer systems. The range and quantity of drugs issued to the department may be available from the pharmacy stock control system but this but can often identify individual consultants only in relation to outpatient prescribing.

Regionally and nationally, cancer registrations provide data for comparison.[8] Health service indicators available for English districts 1989/90 (listed under 'purchaser districts') include:

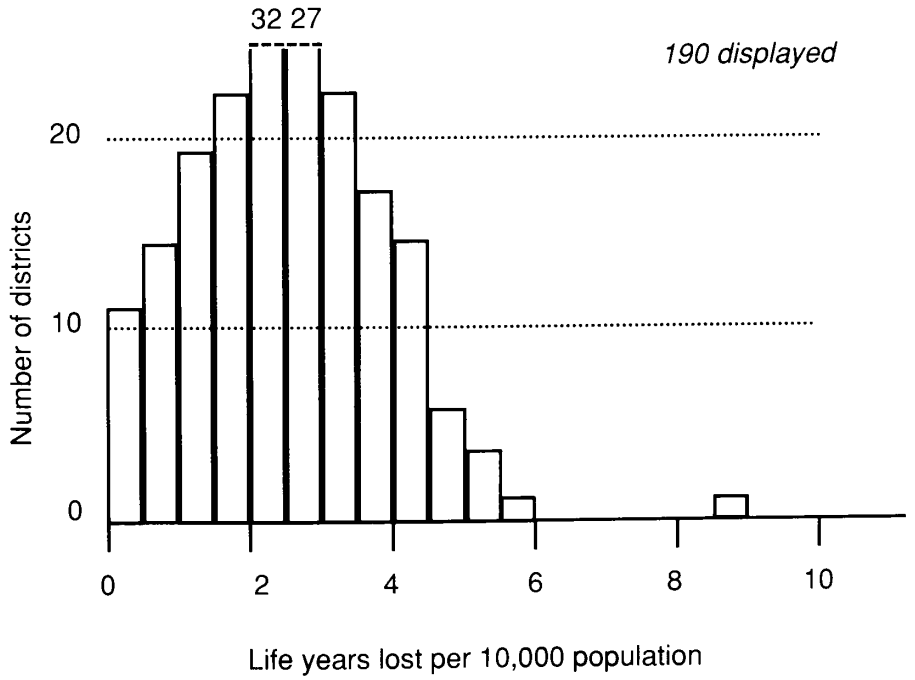
Mortality no.	*HSI no.*	*Indicator*
65	ML65	ca cervix, SMR
74	ML67	ca breast, SMR
96	ML62	Hodgkin's, SMR
128	ML61	ca lung, SMR
222	ML90	ca intestine/colon, life-years lost
224	ML90	leukaemia, life-years lost

Classification systems and nomenclature

An assessment score (STAS), developed at University College Hospital, London, enables teams to measure fairly objectively the perceived benefits of palliative care.[9] Subjective assessments of patients' quality of life by doctors and nurses do not correlate reliably with the views of patients.[10]

HEALTH SERVICE INDICATORS

Figure 7.1 Life years lost per 10,000 population, Hodgkin's disease, males, 1989



NATIONAL RESOURCES

The Royal College of Radiologists has set up a working party on audit in clinical oncology and, with funding from the Department of Health, appointed a medical audit manager to assist individual clinicians and departments. The College intends to survey the current state of activity in audit, and to develop techniques such as outcome indicators specific to clinical oncology. Further details from the manager of the medical audit unit, Royal College of Radiologists, 38 Portland Place, London WIN 3DG. Tel. 071-436 4251 (direct line). Fax 071-323 3100.

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8 — GERIATRIC MEDICINE

NATIONAL GUIDANCE

The general advice issued by the Royal College of Physicians (RCP) in 1989 may be applied to geriatric medicine.[1] The audit subgroup of the Policy Committee of the British Geriatrics Society issued an interim report in 1990.[2] The aim of the subgroup is to identify existing and potential measures of standards in geriatric medicine.

ORGANISATION

The degree of designation of care of the elderly as a specialty distinct from general medicine varies widely between districts — even within the same region. For some issues, geriatricians may find sufficient expertise and numbers to form an effective peer group locally by joining with general physicians or other clinical professions; audit of other issues will be specialty based. Except in very small districts, only those issues which are uniquely geriatric require a supradistrict audit group. But regional sharing of approaches and results is valuable, such as through a regional specialty committee. The structure and programme of geriatric audit must also allow involvement of the inclusion of surgeons, psychogeriatricians, general practitioners and nursing and rehabilitation staff.

METHODS

Review of adverse events

Events in geriatrics which qualify for automatic clinical review may include:

- Unexpected deaths.
- Falls causing injury.

- Development of conditions not present on admission (e.g. confusion, incontinence, constipation, pressure sore, infection).
- Readmission under one month.
- Formal complaints.

Monitoring of clinical indicators

If it is possible to define the objectives of a geriatric service, it should also be possible to identify routine key measurements which reflect progress towards or achievement of those objectives. Proposals for common basic data sets (including outcomes) are being developed by the British Geriatrics Society with the Royal College of Physicians. Possible indicators of structure and process may be selected from:

1. Workload: every consultant should know the volume and case-mix of individual and department workload, with relevant comparisons, in order to plan future development.

   1.1 Number (percentage) admissions by:
   — source (home, part III, hospital, etc.)
   — type (emergency, urgent, etc.)
   — indication (falling, incontinence, confusion, terminal care, investigation, etc.)
   — mean nursing or functional dependency on admission and on discharge.

   1.2 Day hospital/clinic:
   — new patients
   — total attendances.

   1.3 Domiciliary visits (assessment/consultation).

2. Access to service: patients should be provided care with minimum delay and maximum equity appropriate to their clinical and social condition.

2.1 Waiting time:
— for admission, by type
— for day hospital/clinic.

2.2 Cancellations:
— non-attendance at day hospital/clinic
— planned admissions deferred.

3. Appropriateness of care: care should be provided by medical staff with appropriate skills, training and supervision and with minimum disruption to the patient, and consistent with local policy.

3.1 Admission policy:
— % admissions < one week after domiciliary visit
— % non-surgical admission >75 years of age to geriatric beds
— % all admissions >75 years of age transferred to geriatrics
— % bed days occupied by low dependency patients.

3.2 Investigation:
— weighted radiology requests per admission
— pathology requests per admission.

3.3 Prescribing:
— % inpatients prescribed night sedation
— % discharge on >3 systemic medications.

4. Patient records: records should provide an accurate, complete and up-to-date account of individual patients as a basis for clinical care, service management and quality assurance.

   4.1 Timeliness:
   — % discharge not coded within one month
   — % discharge summaries not completed within one week.

5. Efficiency: available resources should be used efficiently in order to offer optimum benefit to the population.

   5.1 Average inpatient stay: emergency stroke admission.

   5.2 Attendance per new clinic/day hospital visit.

   5.3 Day hospital length of stay (for assessment/ rehabilitation/ maintenance).

   5.4 Percentage of discharges to original domicile.

To these should be added, when available, measures of patient satisfaction, change in health status and dependency, outcome of community services. The above list is drawn from data which could be readily derived in most hospitals on a routine basis.

Selected topic audit

Topic audit, possibly using predetermined criteria (see chapter 3) may be applied to issues which are risky, common, expensive — or which show wide local variation or cause concern. Common topics for review in care of the elderly include:

Diagnosis:	myocardial infarction confusional states hypothermia anaemia upper GI bleeding leg ulcers acute admissions for stroke hip fractures
Management:	pre-admission assessment domiciliary visits care of the dying patients discharge procedure and results long-stay patients
Prescribing:	e.g. laxatives, hypnotics, antibiotics, anticoagulants
Complications:	e.g. pressure sores, falls in hospital
Communication:	consultations with carer/relatives education, e.g. on inhaler technique in asthma, dietetic advice

Published examples of specific audit topics include:

Outpatient clinics:	the opinions of 97 patients attending for review, and their clinical records, were used to assess the value of continued follow-up.[3] Routine post-discharge attendances were found least beneficial.
Failed discharges:	half the patients discharged from a general hospital died at home soon after or had to be readmitted; men were particularly at risk of 'failed discharges'.[4]

Stroke follow-up: six months after discharge for stroke, patients with severe disability were less likely to be receiving support than those who were less severely affected and were able to attend outpatient clinics.[5]

Review of selected patient records

Randomly chosen records may be reviewed against agreed checklists (such as those published by the Royal College of Physicians)[1] or adapted from them.[6]

DATA

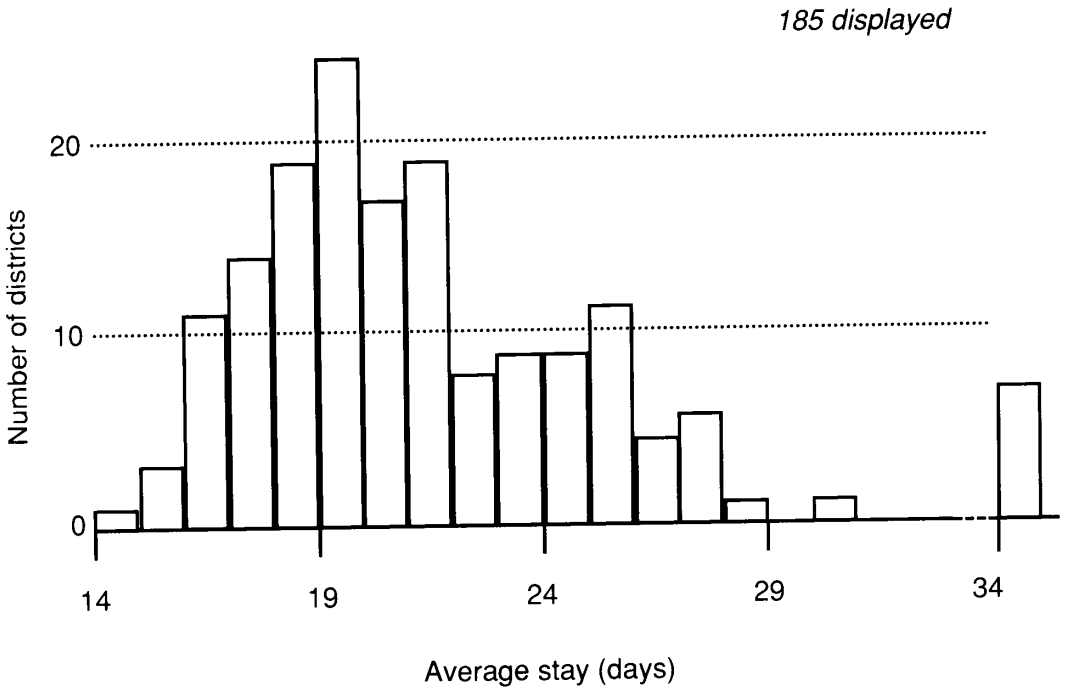
The audit potential of routinely generated hospital activity data on the elderly is limited by the inability (in most regions) to tally readmissions and the failure to record and code complete problem lists, as opposed to a 'principal diagnosis'. The latter could be achieved by more medical attention to the data capture and by the adoption of coding more suited to problems rather than to medical diagnoses.

Although much effort has been invested in devising simple but valid scoring systems for disability or function, no single method has become universal.[7] Where they are established, nursing dependency systems may be explored as a proxy, emphasising the value of interdisciplinary audit. Whatever scoring is used, common definitions and computations are essential within and between units if comparison is to be helpful.

Health service indicators (HSI) relevant to geriatrics (elderly defined as 75 years+) and available for districts in England for 1988/89 include:

HEALTH SERVICE INDICATORS

Figure 8.1 Hip replacement, average hospital stay, age 75 and over



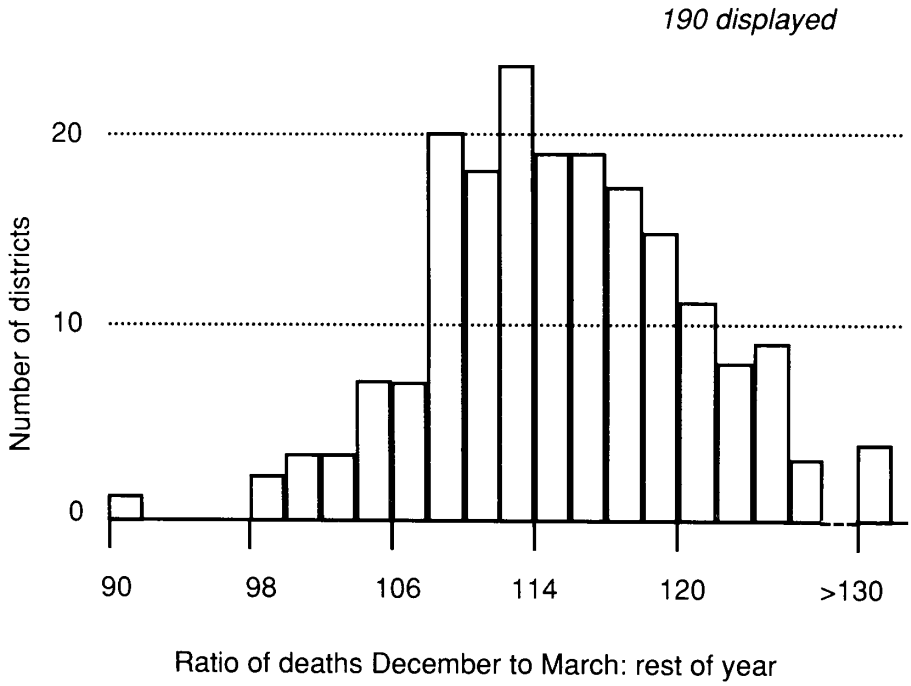
Reference	*Indicator*
LS52	Average stay emergency admissions for stroke
LS53	Average stay proximal femoral fracture
LS51	Average stay hip replacement
WL47	Patients awaiting admission per 100,000

Community indicators for 1989/90 include:

LS90	Hospital stays over six weeks
ML46	Excess deaths in winter

HEALTH SERVICE INDICATORS

Figure 8.2 Excess winter deaths, over age 75, 1989



NATIONAL RESOURCES

Further advice on audit in geriatric medicine may be obtained from the British Geriatrics Society, 1 St Andrew's Place, Regents Park, London NW1 4LB. Tel: 071-935 4004. Fax 071-224 0454.

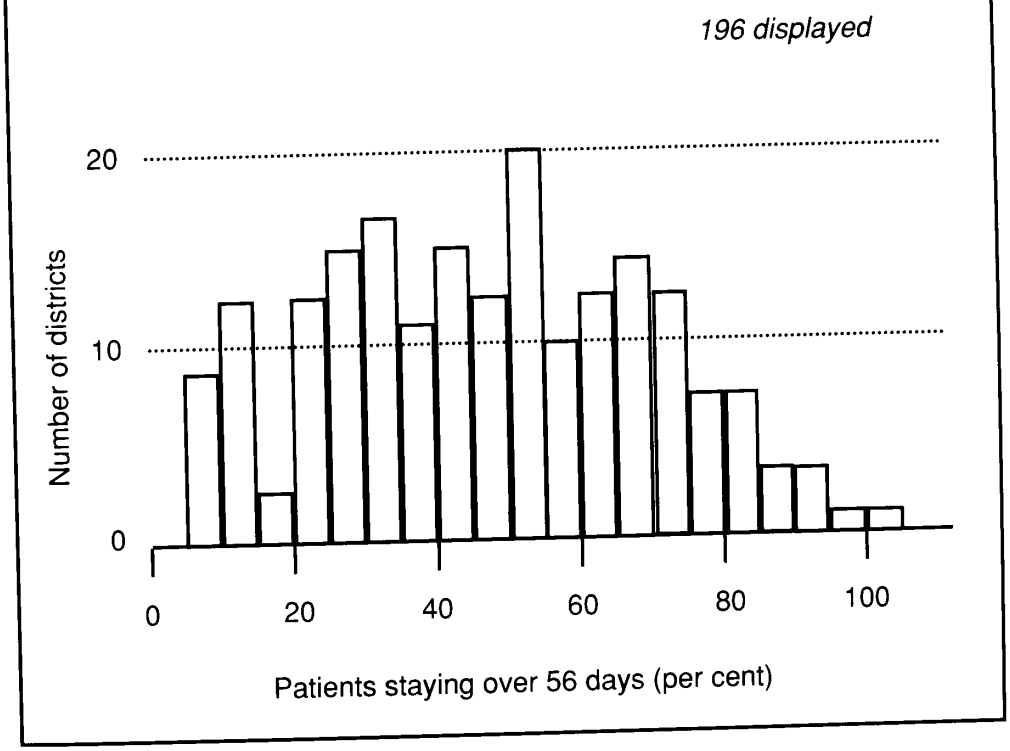
The Research Unit of the Royal College of Physicians is working with the British Geriatrics Society in a number of areas, including:

- Guidelines for good practice: standards for care of the elderly are being developed, together with indicators for their audit which are being piloted in London and Manchester.

- Measures of functional status: a common system for measuring case-mix

HEALTH SERVICE INDICATORS

Figure 8.3 Percentage patients over age 75 in hospital over 56 days, 1989



(with respect to physical function, cognitive function, social and financial needs, and quality of life) is being piloted in several sites. This programme is linked with work by the Royal College of General Practitioners on screening the healthy elderly.

- Inappropriate medication: a draft protocol to measure appropriateness in hospital practice is to be piloted.

- Care of patients with stroke: guidelines are being developed from the King's Fund Consensus Statement 8 and tested in local practice.

For further details, contact the Research Unit of the Royal College of Physicians, 11 St Andrews Place London NW1 4LE. Tel. 071-935 1174. Fax 071-487 5218.

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9 — LABORATORY MEDICINE

NATIONAL GUIDANCE

The Royal College of Pathologists has not published specific guidelines on local audit but general organisational requirements for laboratory services and codes of practice for each specialty department were published in November 1989.[1] Reports of the pilot study of UK laboratory accreditation were published in 1990[2] and 1991.[3]

ORGANISATION

There are various mechanisms to promote quality in clinical laboratories; not all are appropriate for discussion in this book, which is about medical practice, or of this chapter, which is about laboratory medicine. (The use of laboratory investigations by clinicians is covered in chapter 3.) A general terminology for quality mechanisms has been suggested by Whitehead:[4]

- IQC: (internal quality control) concurrent monitoring of reproducibility and control of issue of results within a laboratory.
- EQA: (external quality assessment) retrospective checking of results to detect systematic bias and promote comparability between laboratories.
- QA: a combination of the above linked to monitoring, education and training systems relating to the examination of specimens and to their collection, transport and handling.

Inadequate performance in laboratories has been attributed to equipment, to reagents or to operators. EQA is most useful in correcting the first two. Variation in operator performance, for example in histopathology, has been related to four factors:[5]

Workload: as has been demonstrated in many clinical specialties, those who perform technical procedures regularly tend to obtain better results than those

who do not; laboratories reporting fewer than 20 lymphomas per year were shown to attribute a significantly smaller proportion to Hodgkin's disease.[6]

Technical performance: variation in gross handling, preparation and examination of specimens.

Pattern recognition: variation partly perceptive but also due to inadequacy of definition of diagnostic categories.

Report: variation in accuracy, completeness — and redundancy — of information.

Since most district hospitals do not have enough consultants within the principal subspecialties (histopathology, chemical pathology, haematology and microbiology) to make an effective peer group, regional and subregional audit groups are common. These tend to compete for time with more generic laboratory audit locally.

Another challenge for pathologists (shared with radiologists and, to an extent, anaesthetists) is regular requests from clinical specialties to participate in their own audit sessions. This underlines the need for coordination of audit between specialties and for selective invitations to discussions of relevant topics. Clinical haematologists often link permanently to general medicine.

METHODS

Adverse events

Issues which may lead to automatic clinical review might include:

- lost specimens
- lost reports
- false negative cytology/histology
- diagnostic discrepancy between frozen and paraffin sections.

Key indicators

Various bodies are seeking standard methods of measuring workload and performance. Numerical data which could be routinely available for review either from standard systems or from ad hoc surveys include:

- urgent requests as percentage of workload
- waiting time e.g. venepuncture clinic
- % urgent requests taking >15 minutes (specimen to report)
- % cervical cytology reports taking > one month
- % cytology slides rescreened
- autopsy rate (hospital/coroner's)
- national External Quality Assurance Scheme results.

Topic review

Subjects which lend themselves to occasional, systematic review include:

- Scope of tests available: volume of tests referred out, quality of low volume in-house tests.
- User satisfaction with service: patients' and clinicians' views.
- User response to reports: impact of advice on clinicians (and environmental health officers) — as well as patients. Of 1062 women who had a first report of abnormal cervical smear in 1981, 50 had either refused or not been offered a further smear by 1985.[7]
- Quality of specimens: collection, marking, transport and preparation. (This may relate to clinical technique: in one consecutive series of

15 pleural biopsies in a small general hospital over 18 months, only seven contained pleural tissue).

- Quality of examination: adherence to procedures for gross handling and examination. In one major study of large bowel resection specimens, the average number of nodes examined by each consultant ranged from 1.0 to 11.2, with an overall average of 5.25.[8]

- Quality of reports: delay between receipt and report; checking of automated analysis results (especially abnormals); description of specimens, accuracy of diagnosis and clinical appropriateness of advice.

- Agreement with clinical findings: e.g. consistency between gross surgical, histological and radiological findings in carcinoma of the colon.

- Particular conditions: e.g. Staph aureus bacteraemia, adult meningitis, liver abscess. One Australian reference laboratory reviewed all monoclonal proteins (90 patients) detected over two and a half years; there was no recorded follow-up in 9 per cent, and Bence-Jones proteinuria was not excluded in a further 12 per cent.[9]

- Accuracy of coding: e.g. Macartney et al reported coding errors of over 7 per cent in skin neoplasms — 1 per cent typographical, 3 per cent miscoding by pathologist and 3 per cent due to variations permitted by the SNOP system (which is much greater, for example, in hepatic lesions).[10]

Other methods

Inter-test comparisons: results of different tests on the same patients may be correlated, e.g. histology and cytology in carcinoma of the cervix, histology, cytology and radiology in breast lesions, haematology and histology in bone marrow.

Slide circulation: local or regional 'clubs' have been effective models for teaching when combined with educational seminars. Being smaller than

national schemes, these allow more detail. A histopathology scheme involving six general hospitals in the south west was described by Sherwood in 1984[11] and has since been extended.

Duplicate reporting: all microscopic material and histology reports sent to the army histopatholgy registry for archiving were independently reviewed over 19 months; disagreements in 4 per cent of cases were considered to have important clinical or pathological consequences, suggesting that non-selective review of completed cases may be valuable.[12]

Random sample analysis: 2 per cent of all biopsy specimens in a Liverpool hospital were analysed retrospectively with a standard proforma and numerical scoring system to evaluate the performance of pathologists, technicians, typists and the clinicians initiating the requests. This identified weaknesses among individual pathologists in clarity and content of microscopic and macroscopic reports and descriptions, and helped to increase uniformity and consistency.[13]

Diagnostic pattern analysis: Macartney et al describe a method of interlaboratory histologic evaluation (IHE), using epidemiological data to monitor diagnostic patterns rather than individual cases.[6] Comparisons include the ratios of reporting. Examples for three tracer pairs among similar laboratories are given in table 9.1.

Condition	*Mean ratio*	*Range*
Invasive: intraductal breast carcinoma	37.0	24.0 to 52.0
Non-Hodgkin's: Hodgkin's lymphoma	22.0	51.0 to 4.1
In-situ: invasive cervical cancer		
in UK centres	0.6	0.4 to 0.7
in United States	2.5	1.05 to 3.85

Table 9.1: Variations in histological reporting

These variations reflect case-mix (especially in referral centres) but can also identify different diagnostic criteria between centres and shifts within individual laboratories over time. Similarly, comparisons of relative

frequencies of reporting of, for example, individual CNS tumours or soft tissue sarcomas may show considerable discrepancies. Although described for histopathology, this approach may prove valuable as an audit method in other disciplines where diagnosis relies heavily on individual interpretation.

Transfusion committee: a joint medical and nursing group is recommended in each hospital to arrange and monitor transfusion policies;[2] since most common errors in blood transfusion are committed outside the laboratory, this subject is covered in chapter 3.

National programmes

National external quality assurance schemes to promote comparable results between laboratories now cover most aspects of work in the UK. Clinical chemistry and haematology are particularly suited to external quality assurance being largely numerical and permitting mathematical description in terms of deviance from a reference point. Also, it is relatively easy to supply and transport large numbers of standard specimens for testing in individual laboratories.

However, during the 1980s external quality assurance has extended into more interpretive comparisons which offer an adjunct to the internal assessment of medical performance in laboratories, such as by distributing stained blood films for morphological examination or simulated microbiological specimens for identification. The latter have led to concern at the regular reporting of pathogens isolated from specimens containing only commensals, in particular *salmonella* and *shigella* from faeces, *gonorrhoea* from urethral swabs, pathogenic *clostridia* from wound swabs and beta-haemolytic *streptococci* from throat swabs.[14]

DATA

Many pathology computer systems could produce more information of use both to pathologists and clinicians in medical audit, for example in providing profiles of individual clinician use of the service, if their capacity were fully

explored. Diagnostic data may be compared or combined with equivalent data from radiology, cancer registry or the main clinical data-capture system.

Derived Körner data may provide some basis for comparison between laboratories, but current health service indicators are unhelpful for audit purposes (with the possible exception of the use of postmortem examination — see chapter 3).

NATIONAL RESOURCES

Details of the laboratory accreditation scheme may be obtained from the secretary, Clinical Pathology Accreditation (UK) Ltd, Department of Haematology, The Children's Hospital, Sheffield S10 2TH. Tel. 0742 780428. Fax 0742 762289.

Copies of the annual report of the UK external quality assessment schemes may be obtained free of charge from the Department of Health, Room 417, Eileen House, 80 Newington Causeway, Elephant and Castle, London SE1 6EF.

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10 — MEDICINE AND RELATED SPECIALTIES

NATIONAL GUIDANCE

The first report of the Royal College of Physicians of London on medical audit was published in March 1989.[1] It was circulated to recipients of the College journal in April 1989. The aims of the document in introducing medical audit into clinical practice were:

- to ensure that individual doctors practice medicine to the highest acceptable standards
- to exploit the educational value of regular reviews of clinical practice
- to ensure that doctors use increasingly scarce resources in a sensible way.

The report emphasised the importance of clinical record keeping and the need to document communications with patients and relatives, as well as with medical and other staff.

National advice has been published by some individual medical specialties, including:

Dermatology: 'Medical audit for dermatologists: a practical guide' gives detailed advice on organisation, methods and resources and includes numerous practical examples.[2]

Genito-urinary medicine: the joint working party set up by the Specialist Advisory Committee in GUM and the GUM committee of the Royal College of Physicians (RCP) issued a report on medical audit in 1990.[3]

Rheumatology: the joint report of the RCP and the British Society for Rheumatology[4] developed a previous paper and this was submitted to the

Committee on Rheumatology in 1984.[5] It emphasised the need to link with other medical specialties such as orthopaedics, paediatrics and general practice, and with other professional groups such as therapists, nurses, social workers and appliance officers.

ORGANISATION

Most district hospitals have a critical mass of three consultants for audit of general medicine, but general physicians with an 'interest' may seek a supradistrict forum for specialist issues. The structure of audit locally also depends on how work is shared with, for example, haematologists and geriatricians. This chapter overlaps with paediatrics (chapter 12) and geriatrics (chapter 8).

The RCP recommends that each medical division should have one consultant nominated responsible for the organisation of audit meetings. College tutors also are expected to play an important role. Except in very large units, smaller medical specialties such as rheumatology, dermatology, neurology and genito-urinary medicine face particular problems in organising peer groups, clinical data and follow-through of audit. Such follow through often has to cross managerial boundaries of units and districts and is likely to need support from the regional specialty committee structure (some regions are better equipped than others to meet these needs). For these reasons, some regions have allocated to these specialties technical and clerical support at regional rather than district level, although data capture remains locally funded and organised. To reduce travelling, such region-wide specialty audit may take place for half a day each quarter — perhaps combined with a half-day business agenda. In addition to this, participants are also likely to be involved in district-based audit of relevant topics in other medical and surgical specialties.

Genito-urinary medicine illustrates some of the problems facing smaller specialties:

- Predominance of outpatient work (high volume of patients and minimal clinical data capture).

- Many single-handed and isolated consultants.
- Audit of the whole service is more relevant than specific medical activity.
- Public attitudes to self-referral underline need for good 'customer relations', which are vital to effective service.
- Difficulty of maintaining follow-up and measuring results.
- Confidentiality of data shared across a region, or linked to local hospital patient administration systems. GUM is covered by the NHS (VD) regulations (1974) which specifically prohibit the giving of information that will enable a patient to be identified, to any person (including medical practitioners) not involved in the treatment or management of the patient, or prevention and control.[3]

Yet smaller tertiary referral specialties, such as audiological or palliative medicine, may have to look nationally for a true peer group. However, for logistic reasons and to avoid professional isolation, they may explore the significant overlap with more prevalent local specialties such as ENT surgery and neurology or oncology and radiotherapy — and other non-medical disciplines.

METHODS

Review of adverse patient events

Events in general medicine which may qualify for automatic clinical review include:

- unplanned readmission within 30 days
- cardiac/respiratory arrest
- unplanned transfer to ITU/CCU

- transfusion/drug reaction
- hospital-acquired pressure sore
- patient staying over 30 days
- deaths from status epilepticus, diabetic ketoacidosis, extradural hæmatoma.

Monitoring of clinical indicators

Tracer measures which may be routinely collected for monitoring in general medicine include:

- Appropriateness: patients staying over 30 days
  % of investigations out of hours
  average stay (e.g. stroke, asthma)
  clinic reattendance rate
- Outcome: % recovery of cardiac arrest calls
  % recovery acute myocardial infarction
  % patients discharged to original source
- Records: % summaries dictated within two weeks
  % summaries typed within two weeks of discharge
- Efficiency tests per admission
  ward drug costs per inpatient day

Many medical specialties demand more emphasis on outpatients. The following measures have been suggested for a specialty such as dermatology: (see also British Association of Dermatologists guidelines[2]):

- Workload: new referrals (GP/consultant/other)
  patch tests
  other diagnostic procedures
  PUVA (new patients/treatments)

other therapeutic procedures
% biopsy reports received within five days

- Appropriateness: % patch tests negative
  % pigmented lesion biopsies non-melanomatous
  % biopsies sent for histology
  % new patients admitted
  % new patients having warts

- Outcome: deaths from malignant melanoma

- Records: % clinic attendances without record available
  % valid diagnoses coded two months after discharge
  % letters sent to GP with 14 days of discharge

- Efficiency: clinic visits per new referral
  % clinics starting within 15 minutes of schedule
  % clinics last patient seen within 30 minutes of appointments
  PUVA treatments per new patient
  average inpatient length of stay

Topic review

Fruitful subjects for review in general medicine include:

Acute conditions

Diabetic ketoacidosis
Gastrointestinal bleeding
Pulmonary embolism (PE): discussion might involve anaesthetists, surgeons and haematologists. Questions in one district general hospital included:

- Should all PEs be seen by a physician?

- Is Homan's sign diagnostically significant?

- How soon should a referred patient be seen and by whom?
- How frequently should heparinised patients be monitored?
- Who decides end of anticoagulation — consultant, junior or GP?

Possible criteria for screening records

Patient admitted for:	respiratory distress or failure to respond to therapy or septicaemia
Positive chest X-ray	
Sputum culture ordered within 24 hours of admission (unless previously on antibiotics)	
Sputum culture positive (note organism)	
Note antibiotic used	
Duration antibiotic therapy	
Repeat X-ray clear or improved	
Patient afebrile two days before discharge	
Length of stay	

Table 10.1. Criterion-based audit for pneumonia (ICD-9 480.6)

Bacterial pneumonia: for sample audit criteria (Canadian), see table 10.1.

Myocardial infarction: a 1983 study reported by Frengley and Corkhill[6] in New Zealand showed a 9 per cent in-hospital mortality. Overall, 30 per cent of cases were uncomplicated and had a mean length of stay of 8.6 days for general physicians (range 7.5 — 9.5), compared with 5.8 for cardiologists. The low rate of exercise ECGs (17 per cent) was attributed to limited access to facilities. The audit also showed a need for better communication with patients and between hospital and GPs.

Shared care

Asthma: a three-year study of asthma deaths in Birmingham, though now old, offers comparisons:[7] in-hospital deaths were associated with inadequate initial assessment (50 per cent), underuse of corticosteroids (93 per cent) and intravenous and nebulised bronchodilators (100 per cent), and failure to monitor treatment objectively (100 per cent).

Diabetes: one district general hospital audit of diabetic clinic patients, based on the East Anglian Regional Health Authority's policy[8], confirmed that 100 per cent had HbA tested, but only 38 per cent had ever been seen by a chiropodist and only 46 per cent had had their feet examined by a consultant within 18 months.

Utilisation

Outpatient follow-up: in a survey by Stewart of patients' and doctors' views of clinic follow-up appointments, 24 per cent of patients thought that they were too frequent, and in 73 per cent of instances the doctors agreed.[9]

Emergency tests: a study of test ordering for acute medical admissions by Sandler[10] showed that of the 17 per cent abnormal test results about one third helped in treatment and less than one third in diagnosis. Of the most common tests (urea and electrolytes), only 7 per cent were abnormal and the tests were rarely of any help in either diagnosis or management.

Portable CXR in CCU: 164 portable X-rays were done (20 at night) on 241 consecutive admissions to a general hospital. Subsequently a policy was agreed to limit these to atypical chest pain or disproportionate dyspnoea.

Prescribing: indications, administration, monitoring, e.g. insulin, streptokinase, anticoagulants.

Examples of topics and issues explored in smaller medical specialties in Britain include:

	Topic	*Issues raised*
Genito-urinary	Chlamydial infection	screening criteria for males; dose/duration of tetracycline therapy; value of repeat testing
	Contact tracing	
	Cure rate	
	Review of K60 returns	
Dermatology		
High volume	Viral warts	need for referral; value of cryotherapy; when to abandon treatment
High risk	Pigmented lesions	duration of and responsibility for follow up of melanoma
High cost	Use of retinoids	clinical indications; use of initial pregnancy test; frequency and scope
Wide variation	Use of PUVA	(contra)indications; dosage/duration

An audit of 100 patients with psoriasis in two teaching hospitals showed that clinical records rarely mentioned the symptoms or disability described by the patient.[11] There was no evidence of consultant involvement in 42 per cent of cases. Patients not seen at the first visit by a consultant had a one in six chance of seeing one thereafter. The proportion of patients discharged to the GP within five clinic visits was 37 per cent in one centre and 65 per cent in the other.

Random case review

One of the audit methods suggested by the Royal College of Physicians is structured review of randomly selected records. A checklist for use by

College visitors is given in the College report, together with a form devised in Birmingham. Heath reports on the associated improvements in medical records (particularly in relation to information given to patients), in the reduction in discharge medications and more accurate discharge summaries.[12,13]

Topics suggested for review in dermatology include:

- appropriatness (e.g. of referrals, of domiciliary visits)
- appliance use and acceptability
- discharge arrangements
- mortality with cervical myelopathy.

DATA

Although some patient management systems have gained fairly wide acceptance in medical specialties (such as in renal medicine and diabetes), most clinicians have to rely on their own manually-held diagnostic listings or on the standard 'clinical data capture' (CDC) system which is linked to the hospital patient administration system. The accuracy of these data are unlikely to be satisfactory to clinicians unless they are involved in their capture. Also, clinical data on diagnosis and procedures are generally confined to inpatients and day cases.

Other sources of data may include:

- Death registrations: in a study of asthma deaths, Ormerod and Stapleforth[7] concluded that 10 per cent of deaths certified as due to asthma were actually caused by combinations of left ventricular failure, chronic bronchitis and emphysema. But a quarter of deaths under age 45 certified as due to other respiratory causes were actually due to asthma.

- Cancer registrations
- Hospital department systems
  - — radiology
  - — pathology
  - — ECG/EEG
  - — endoscopy
  - — pharmacy.

In addition to these, patient-dependency systems and in-house registers such as those for cardiac arrests may prove valuable.

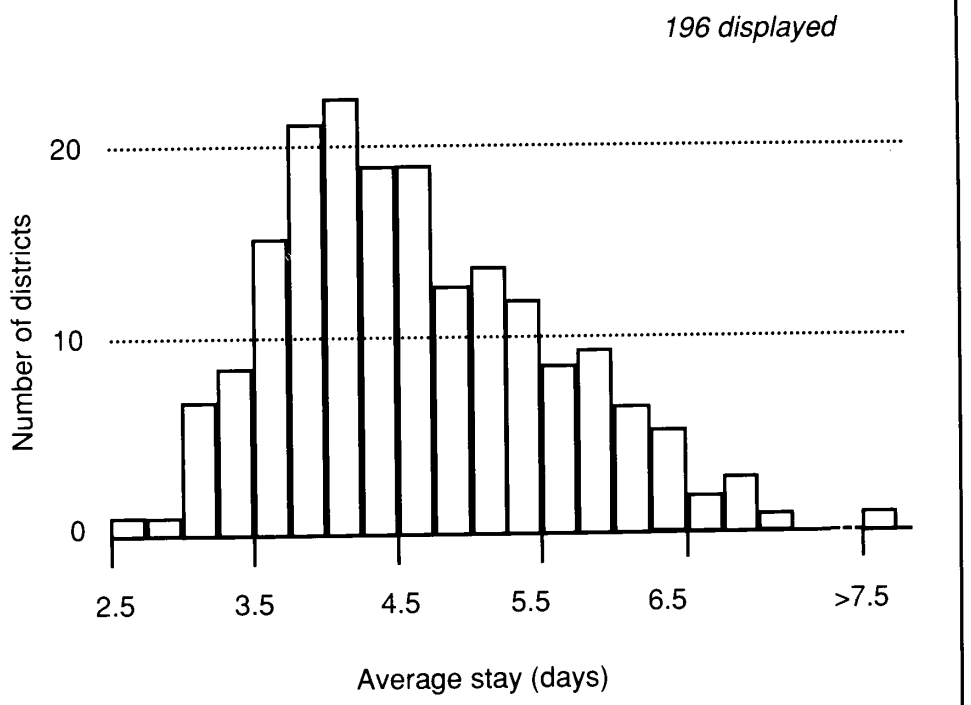
Health service indicators available for districts in England and Wales for 1989 which may be relevant to audit in general medicine include:

Screen	*HSI code*	*Indicator*
Avoidable deaths	ML61	Hypertensive disease SMR
	ML62	Asthma SMR
	ML62	Rheumatic heart disease SMR
	ML61	Myocardial infarction SMR
Policy tracers	HA42	Treatment rate, asthma, 16—64 years
	HA42	Treatment rate diabetes, 16—64 years
	LS43	Average stay, asthma, 16—64 years*
	LS43	Average stay, diabetes, 16—64 years
General medicine	HA62	% emergency admissions, 16—64 years
	CL51	% non-attendance rate clinic

(* See figure 10.1)

HEALTH SERVICE INDICATORS

Figure 10.1 Asthma, average hospital stay, age 16-64, 1989



Tracer conditions included in these indicators are asthma, diabetes, cerebrovascular accident, ischaemic heart disease, meninigitis and poisoning (including overdose). The value of such comparisons is determined mainly by the accuracy of the original clinical data capture, which may itself deserve local audit. Fewer clinical indicators are specified separately for cardiology, thoracic medicine, GUM, nephrology, neurology, and rheumatology.

NATIONAL RESOURCES

The Royal College of Physicians has established a Standing Advisory Committee on Audit to oversee the introduction of audit, and to monitor and refine procedures.

SPECIALTY MEDICAL AUDIT

The College's Research Unit is seeking to establish guidelines for clinical practice and for appropriate use of specific investigations and therapies. It also aims to develop measures to see whether such guidelines are followed. The main themes of the Unit's work are thus explanations for variations in practice, appropriateness of interventions, measures of illness severity and definition of outcomes.

Much of this work is in conjunction with societies and associations:

British Diabetic Association: to set up a pilot project in several sites coordinated from the Department of Medicine, University of Newcastle-on-Tyne, on the routine audit of diabetic care.

British Society of Haematology: to develop and test a draft protocol for the audit of blood transfusions on medical wards.

British Cardiac Society: to test a protocol to audit time to thrombolysis after myocardial infarction. Also to establish a confidential enquiry into the complications of cardiac catheterisation.

British Society of Gastroenterology: to audit the appropriateness and adverse outcomes of liver biopsy; to test audit measurements of guidelines in upper gastrointestinal haemorrhage; and, with the Royal College of Surgeons: to examine appropriateness and adverse outcomes in upper gastrointestinal endoscopy.

British Thoracic Society: to define guidelines for good practice in the management of asthma in adults (see published reports[14,15] and to test measures for monitoring them.

British Association for Palliative Medicine: to define and develop measures for good practice in palliative medicine.

British Association of Dermatologists: to define and develop measures for the appropriate management of psoriasis.

British Society of Rheumatology: as above for rheumatoid arthritis and acute inflammatory arthropathies

Spinal Injuries Association: as above for the care of people with physical disabilities admitted to hospital

Other current work of the Research Unit includes similar projects relating to:

- new medical clinic referrals
- anticoagulant treatment
- cost effectiveness of audit
- recurring genetic disorders
- epilepsy
- Parkinson's disease
- deaths from diabetic ketoacidosis.

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11 — OBSTETRICS AND GYNAECOLOGY

NATIONAL GUIDANCE

The Royal College of Obstetricians and Gynaecologists issued interim advice to members in 1990 with particular emphasis on using and improving existing sources of information to monitor the service.[1] A second bulletin issued by the Medical Audit Unit of the College in April 1991 focuses on the content of case records, letters and summaries and advises on choosing computer systems; it also emphasises that audit should focus on adopting procedures of known efficacy.[2]

ORGANISATION

In practice, audit of obstetrics is essentially multidisciplinary whereas audit in gynaecology is comparable with other surgical specialties (chapter 15). Departments with fewer than three consultants may join with nearby colleagues to form a group which can effectively audit issues specific to obstetrics and gynaecology. For many obstetric topics, an appropriate peer group may be found locally among midwives, anaesthetists, paediatricians, ultrasonographers and geneticists. In gynaecology, audit may involve anaesthetists, urologists, radiologists, oncologists and radiotherapists.

Local perinatal review meetings and confidential enquiries often examine individual cases and are usually well attended by various professional groups. Systematic audit of gynaecology is less common and, in both activities, further use could be made of numerical comparisons of patterns of care and outcomes between firms and hospitals.

METHODS

Adverse patient events

Obstetric events which may be appropriate for automatic review may include:

- eclampsia
- apgar score 3 or less at five minutes and birthweight >1500 grams
- maternal complication (defined locally) after normal delivery
- maternal readmission within 14 days of delivery
- third-degree laceration
- haemorrhage requiring transfusion
- unattended delivery
- unplanned return to delivery suite
- newborn injury
- neonatal convulsion within 48 hours
- stillbirth or death within unit.

Gynaecological events for review may include:

- return to theatre within 24 hours
- urinary tract injury
- bowel injury

- uterine perforation at suction termination
- post-operative deep-vein thrombosis
- wound dehiscence.

Clinical indicators

Many of the following, suggested by the RCOG, are available from existing routinely captured data; some may be collected from theatre and case records:

- Perinatal mortality rates (birth weight specific perinatal mortality rates for normally formed singletons).
- % rates of induction, Caesarian section, forceps, epidural, SCBU admission.
- % female sterilisations by laparoscopy.
- Ratio of new:return patients at obstetric, gynaecological and infertility clinics.
- Waiting time for routine/urgent appointments.
- Waiting time for elective surgery (for tracer procedures such as infertility laparoscopy, laparoscopic sterilisation, repair).
- Pre- and post-operative stay for elective surgery.
- % patients seen by SR/consultant.
- % operations done by SR/consultant.
- % operations done by juniors unsupervised.
- % operations (e.g. terminations) as outpatients.

Topic review

The American Joint Commission on the Accreditation of Healthcare Organizations commends a scheme for monitoring and evaluation which involves the definition of ten aspects of care and service which are high volume, high risk, or problem-prone; in obstetrics and gynaecology, they suggest:[3]

- prenatal care
- discharge planning and care for postpartum patients
- antepartum and intrapartum evaluation of the foetus
- induction and stimulation of labour
- management of hypertensive disorders of pregnancy
- use and performance of Caesarian section
- management of postdate pregnancy
- management of isoimmune disease in pregnancy
- use and performance of dilatation and curettage (current practice in Britain might replace this by endometrial biopsy)
- use and performance of hysterectomy.

For each of these ten aspects, the hospital medical and nursing staff identify clinical indicators for measurement and monitoring. They also define a threshold level above which detailed examination is required.

Possible indicators for hysterectomy are given in table 11.1.[3]

Indicator	*Threshold*
1. The pre-operative and pathologic diagnoses are consistent	92 per cent
2. Hysterectomies are performed on the basis of at least one of the following indications: — severe dysplasia of the cervix — stage 1 cancer endometrium — leiomyomata of the uterus >400 grams or > 12 weeks gestational size — chronic salpingo-oophoritis — uterine descensus with or without stress urinary incontinence — moderate to severe endometriosis with chronic pelvic pain — excessive uterine bleeding with Hb <10 not responding to hormonal management or D and C	100 per cent
3 Excessive intraoperative bleeding identified by the transfusion of one or more units of blood or a second day of a postoperative Hb <10 grams	0 per cent
4. Unplanned injury of an organ	0 per cent
5. Postoperative wound infection abdominal hysterectomy vaginal hysterectomy	 8 per cent 5 per cent
6. Urinary tract infection abdominal hysterectomy vaginal hysterectomy	 4 per cent 5 per cent
7. Cardiopulmonary complications within 48 hours after surgery	0 per cent
8. Wound dehiscence	0 per cent

Table 11.1. Possible indicators for use and performance of hysterectomy

The RCOG recommends that audit should focus on measuring adherence to procedures of known efficacy such as:[2]

Obstetrics: screening and treatment for bacteriuria
corticosteroids prior to preterm delivery
ventouse as first choice for instrumental delivery
policy of trial of labour after previous CS
coninuous suture for perineum.

Gynaecology: antibiotic prophylaxis for major surgery
thromboembolic prophylaxis
hormone replacement therapy for premature menopause
rubella screening after miscarriage or termination
use of outpatient or day case facilities where available.

Published examples of audit include:

Cervical smears: an audit of new patients attending a women's hospital in Australia measured the adequacy of cervical smears.[4] Adequacy was inferred from the presence of endocervical cells. Of 1330 new patients, 37 per cent had no smear (generally for good reasons); of those tested, 25 per cent had endocervical cells (compared with an expected minimum of 50 per cent), 14 per cent had incomplete pathology reports, and the majority had no cells. Of the latter, 6 per cent were done by registrars, 16 per cent by housemen and 70 per cent by consultants. Following some individual counselling and a general education programme, the positive rate rose from 25 to 39 per cent on a repeat audit.

Caesarian section: the Caesarian section rate in a Scottish maternity hospital had risen from 4.4 to 13 per cent over ten years to 1981.[5] The rate began to fall during discussion and introduction of a prospective study of the clinical indications for section.

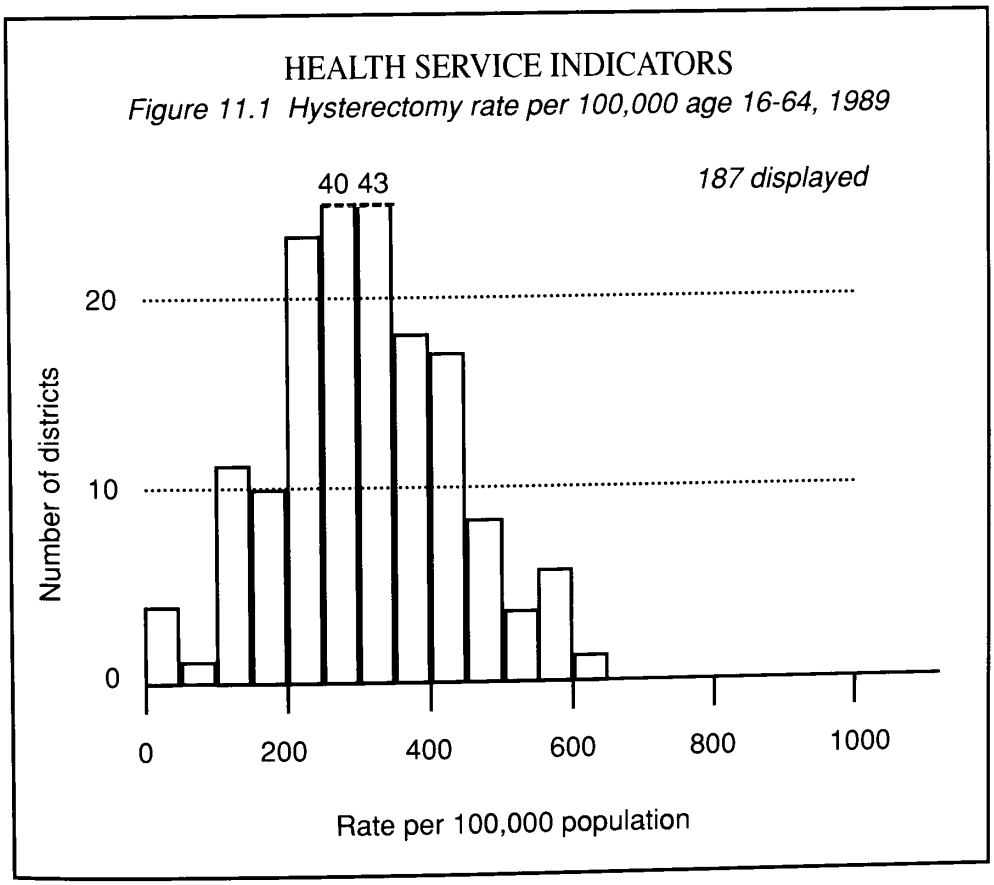
Blood usage: a three month review of blood used for obstetrics and gynaecology in an Edinburgh hospital showed 566 requests for 1402 units cross-matched, of which 246 were transfused to 84 patients.[6] A policy was proposed to reduce cross-matching by 65 per cent without detriment to patient safety.

Other methods

Variations in operating rates have been widely described internationally in gynaecology, particularly with reference to hysterectomy. Two-fold variation occurs in England.[7] In Saskatchewan the number of operations increased by 72 per cent (1964—71) while the female population over 15 increased only 7.6 per cent. Following definition and review by the provincial college of physicians and surgeons of the indications for surgery in individual hospitals, the number of hysterectomies fell 33 per cent (1970—74).[8] (The introduction of endometrial ablation/resection will inevitably increase the variation in incidence of hysterectomy.)

HEALTH SERVICE INDICATORS

Figure 11.1 Hysterectomy rate per 100,000 age 16-64, 1989



National audit

The latest report of the confidential enquiry into maternal death set up in England in 1952 but now covering the United Kingdom, was published in 1991 for the years 1985—87.[9] From April 1991, each English region has been expected by the Department of Health to set up a regional confidential enquiry into perinatal and infant deaths.

Gynaecology is included in the National Confidential Enquiry into Perioperative Deaths (NCEPOD) but contributed relatively few deaths.[10]

DATA

Sources

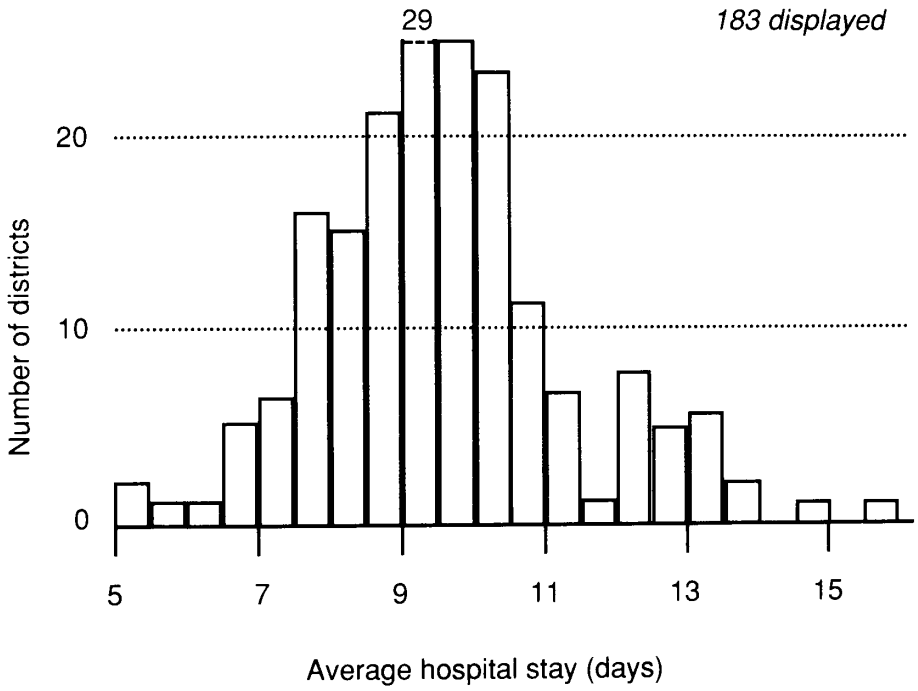
Main systems: routine surgical and maternity data in hospitals and child health systems in the community differ widely in their capacity to support audit. Their most valuable contribution is the identification and tracing of patients having common features of problems, diagnoses, treatments or results. But that does not in itself provide audit. A retrospective study of 130 specific enquiries (1983—88) of the regional referral hospital's data base in Oxford suggested that most of these had aimed at describing current activity and trends rather than relating to explicit standards of practice.[11] Some maternity information systems are common to many hospitals. Especially when standard throughout a region (such as the St Mary's Hospital system in North West Thames), they enable pooling of data for comparison.

Pathology/radiology systems: departmental computers may be able to identify relevant patients by investigation or by diagnosis.

Management information: routine Körner and SMR1 returns provide reports on hospital use in clinics, wards and theatres. In Scotland, obstetric data are on SMR 2 and neonatal on SMR 11. Since Körner data refer to consultant episodes rather than maternities, hospitals now have more difficulty in calculating denominators.

HEALTH SERVICE INDICATORS

Figure 11.2 Prolapse repair, average hospital stay, age 65, 1989



Manual sources: theatre and delivery registers, personal logbooks, annual returns to RCOG hospital recognition committee and individual patient records.

National and regional comparisons: national figures on perinatal services, abortions, malformations, malignancies are compiled for England and Wales by the Office of Population Censenuses and Surveys (OPCS).

Health service indicators available for English districts in 1989/90 include:

Screen no.	*HSI no.*	*Indicator*
Maternity	NB64	Perinatal mortality rate
Maternity	NB65	Neonatal emergency admission
Policy tracer	NT41	Average stay prolapse repair age 65+
Policy tracer	HA42	Hysterectomy rate age 16—64 (see figure 11.1)
Mortality	ML61	Carcinoma of cervix (SMR)
Gynaecology	HA63	% day admission
	CL51	% clinic non-attendance
	TH52	% theatre cases out of hours
Community	SS41	Cervical smear rate age 35-64
	FP45	Termination of pregnancy under age 20

NATIONAL RESOURCES

Consensus statements on good practice (e.g. in pre-term labour, urinary incontinence, hormone replacement therapy) are issued by RCOG study groups; joint statements with other colleges include cervical cytology (Royal College of Pathologists) and ultrasound (Royal College of Radiologists).

With three years' funding from the Department of Health, the College has set up a medical audit unit in St Mary's Hospital, Manchester.[12] This is under the general direction of the College audit committee which reports to the Council. The Unit will establish a database, to which fellows and members are encouraged to contribute, of successful audit protocols from the UK and overseas, including measures of case mix and outcome. Guidelines for audit of clinical records, evaluations of effective procedures, advice on computers in audit and an audit checklist for hospital recognition will be made available. Longer-term projects include collaborative search and consultation on complex topics:

- Prenatal diagnosis (also collaborating with the Royal College of Physicians study of recurring genetic disorders).
- Fetal/infant outcomes (with British Paediatric Association).

- Identification of low risk in obstetrics (with Royal College of Midwives and Royal College of General Practitioners).

- Dysfunctional uterine haemorrhage.

- Infertility (with RCOG fertility subcommittee).

Further details of the work from the Director of the Medical Audit Unit, St Mary's Hospital, Whitworth Park, Manchester M13 0JH. Tel. 061-267 6300. Fax 061-276 6311.

Details of the St Mary's Maternity Information System from the Department of Obstetrics, St Mary's Hospital Medical School, Norfolk Place, Paddington, London W2 1PG. Tel. 071-725 1050. Fax 071-724 7349.

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12 — PAEDIATRICS

NATIONAL GUIDANCE

The general advice issued by the Royal College of Physicians (RCP)[1] in March 1989 may be applied to paediatrics. This has been developed by Primavezi and MacFaul.[2]

ORGANISATION

Since many smaller districts have not the critical audit mass of three consultants in paediatrics, they may join with neighbouring districts or with regional groups. Maximal attendance cannot thus be expected if cover is to be maintained, especially on split sites. But many relevant topics would logically include more local staff in other specialties (such as general medicine, obstetrics, and general practice). Community paediatricians and clinical medical officers are usually linked to hospital services for the purpose of audit.

METHODS

Adverse patient events

Perinatal mortality is the commonest topic for review, usually together with obstetric, nursing and midwifery staff. Many regions now have confidential enquiries into all perinatal deaths, the results of which are available in general terms for national comparison and in detail for participating districts.

Other adverse events for automatic review might include:

- Readmission for seizures within one week.

- Transfer to SCBU after 24 hours of age.

Monitoring of clinical indicators

Outcome measurements linked to explicit service policies for child health have been proposed by the Community Paediatric Group of the British Paediatric Association.[3] These include for a district:

- Death: perinatal mortality rate.
- Disability and chronic illness: average age diagnosis of congenital deafness.
- Adverse consequence of disability: mentally handicapped children in care.
- Psychological disturbance: under 13s on non-paediatric wards.
- Lifestyle: pregnancies in girls under 16.
- Optimal development: rates of breastfeeding at six weeks.
- Inequalities: (enumeration) ward-to-ward variation in birthweight.

Indicators for evaluating health surveillance of pre-school children in Northumberland have been described by Colver.[4]

Another report by the BPA[5] offers equivalent indicators for hospital paediatrics including:

- Rate of congenital dislocation of hip diagnosed after six months.
- Admission for diabetes mellitus.
- Asthma admissions lasting over 72 hours.

- Proportion of operations as day cases
  — hernia
  — squint.

Logan has warned of difficulty in interpreting some of these indicators, particularly on account of random variations in incidence of rare events (e.g. congenital hypothroidism) or of demonstrating causal links between service provision and health outcome (e.g. neonatal mortality).[6]

Selected topic audit

Criterion-based audit (chapter 4) may be applied to issues which are common, risky, expensive — or which show wide variation or cause concern locally. The BPA and RCP are developing consensus statements on the management of some of these conditions such as urinary tract infection in childhood.[7] Common topics for audit in paediatrics include:

- Asthma
- Gastroenteritis
- Prescribing, e.g. growth hormone
- Febrile convulsions
- Urinary tract infections
- Bed wetting.

Diagnosis-specific measurements may include:

- Admission rates per population
- A & E admissions/attendance per population
- Length of stay

- Outpatient reattendance rate
- Time lost from school
- Use of paramedical staff.

Topics for inter-specialty meetings include:

- Surgery: pyloric stenosis, inguinal hernia repair, orchidopexy
- Neurosurgery: post haemorrhagic hydrocephalus
- Radiology: use of skull and chest X-rays
- Accident and emergency: non-accidental injury
- Laboratory medicine: jejunal biopsy.

Deo and Dawson have reported a review of 52 patients under age 14 having peripheral lymph node biopsies over a six year period in Chirstchurch, New Zealand.[8] They concluded that documentation and follow-up should be improved, such as by copying reports to one person (e.g. for specialists in infectious diseases).

Review of selected patient records

Randomly chosen records may be reviewed against checklists modified (e.g. from those published in the Royal College of Physicians' guidelines[1]). Additional paediatric parameters may include recording of head circumference/weight/height percentile, parental occupation and child's development.

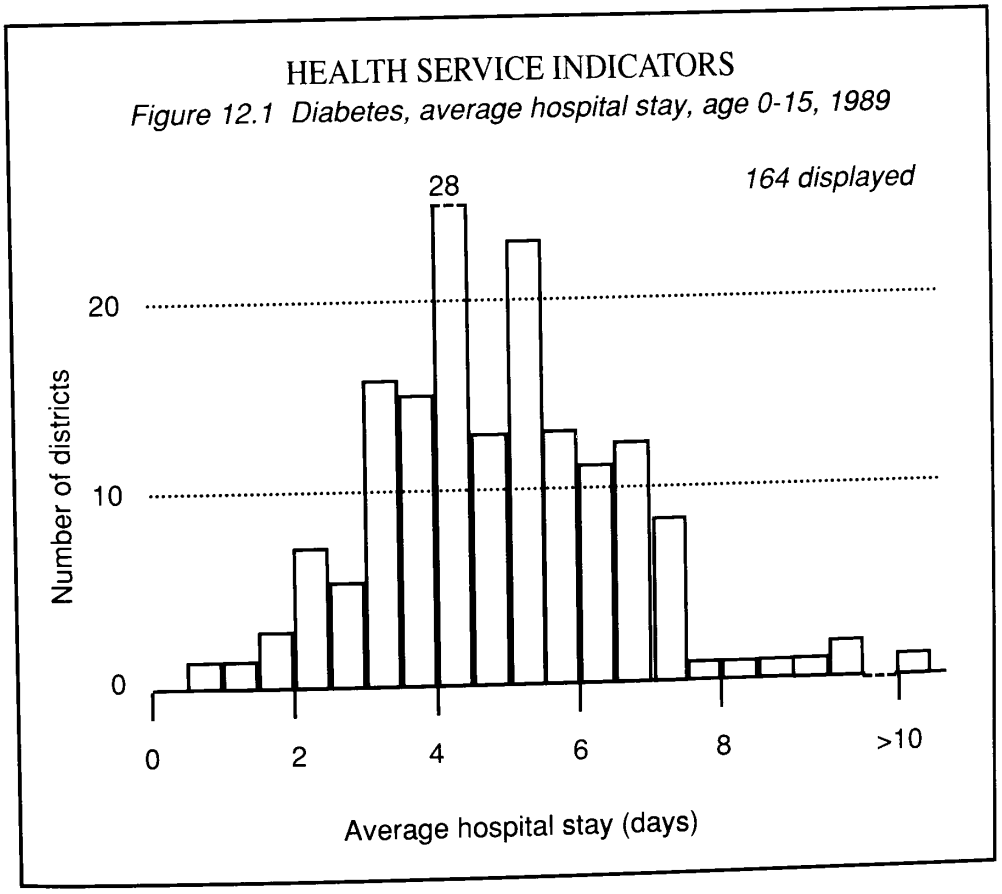
Many departments (such as Southmead, Bristol) meet weekly for one hour and vary the audit format between analysis of data, joint meetings with other specialties and examination of common inpatient and outpatient conditions for which local guidelines have been defined.[2]

DATA

Sources

In addition to the usual potential sources of hospital data, paediatricians may consider hospital maternity databases (neonates), the local child health computer (community) and registration data (e.g. on malformation terminations). As for many medical specialties with a large outpatient workload, paediatric departments generally suffer from a lack of comprehensive information on case-mix and from inadequacy of the current (ICD-9) classification.

National comparators are available from registration data such as those for perinatal and infant mortality, and (of variable quality) of incidence for



congenital malformation and infectious diseases. Relevant health service indicators for children include:

Code	*Indicator*
NB64	Perinatal mortality rate
HR41	Admission rate
CL61	% Non-attendence (new referrals)
LS43	Average stay, asthma
HA42	Treatment rate, diabetes*
ML61	Standardised mortality ratio

(*See figure 12.1.)

Classification

The British Paediatric Association has published booklets of perinatal and paediatric codes compatible with ICD9,[9] but more sensitive to outpatient work.

The relatively short inpatient stay for common paediatric conditions has prompted a suggested expansion of neonatal diagnosis related groups (DRGs) from seven to 46.[10]

NATIONAL RESOURCES

Further specialty advice is available from the secretary of the Audit Advisory Committee of the BPA, 5 St Andrew's Place, Regent's Park, London NW1 4LB. Tel. 071-486 6151. Fax 071-486 6009.

The Research Unit of the Royal College of Physicians is working with various specialty organisations to define guidelines for good practice and indicators by which they may be audited. These include:

- Neonatal respiratory distress syndrome, with the British Association of Perinatal Medicine.

- Convulsions in children with fever, with the British Paediatric Association.

- Paediatric neurology, with the British Paediatric Neurology Association.

Details from the Research Unit, Royal College of Physicians, St Andrews Place, Regents Park, London NW1. Tel. 071-935 1174. Fax 071 487 5218.

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13 — PSYCHIATRY

NATIONAL GUIDANCE

Preliminary advice was issued by the Royal College of Psychiatrists in the Psychiatric Bulletin in 1989.[1] This emphasises that audit in psychiatry should be clinical (including disciplines other than medicine), and reviews the common terminology and definitions.

ORGANISATION

In most districts there are enough psychiatrists to run effective local audit on general issues. But for specialist topics in psychogeriatrics, mental handicap, child/adolescent or forensic psychiatry or substance abuse a (sub)regional forum may be appropriate. The nature of mental health services particularly commends multidisciplinary clinical audit for some topics. Other medical specialties such as accident and emergency and general medicine may be included for selected topics.

METHODS

Glover has described many of the conceptual and methodological difficulties of audit in psychiatry and outlined some solutions.[2] He also emphasised the need to audit the care of patients not often seen by senior medical staff, such as chronic patients usually managed by community psychiatric nurses, and patients seen in casualty departments and not referred for treatment.

Review of adverse events

Events in psychiatry (variously called 'disasters' or 'critical incidents') which may qualify for automatic clinical review include:

- attempted or completed suicide
- use of seclusion or restraint
- assaults by inpatients
- self-discharge or absconding
- formal complaints
- serious drug interactions.

Monitoring of clinical indicators

In addition to these adverse events and the general indicators listed in chapter 3, the following have been suggested in psychiatry:

Workload:	inpatient and outpatient attendances
Access:	outpatient attendance failures
Appropriateness:	length of stay use of statutory sections (especially emergency procedures)
	use of ECT
Outcome:	readmission rate
	absconding
Records:	discharges with no psychiatric diagnosis
Efficiency:	laboratory/X-ray tests per inpatient
	drug costs per clinical team
	sedative costs (e.g., per 1000 inpatient days)
	case-mix adjusted bed usage[3]

Topic review

A variety of common topics have been suggested, including:

patients on:	droperidol
	three or more drugs

benzodiazepines in admission ward
lithium
seniority of doctors managing clinical crises
management of self-poisoning; alcoholism; personality disorder; admissions from A&E department
use of diagnostic CT Scan; Mental Health Act; psychotherapy
discharge letters to general practitioners.

Published examples of such audit include:

ECT: an Australian study of 486 cases suggested that many patients were on contraindicated drugs.[4] A national survey in the United Kingdom in 1980 showed unacceptable variations in criteria for selection, technique of application and maintenance of equipment.[5]

Topics especially relevant to mental handicap services include:

patients on more than one anticonvulsant drug
screening of patients for Down's syndrome
admissions to general hospital from unit
annual physical examinations
monitoring of anticonvulsant levels

One audit group in Britain, while discussing the possibilities of criterion-based audit, identified the following items which might be expected to appear in records of new referrals for schizophrenia:

Referral
1. Referral in writing if elective.
2. Days delay between referral and patient seen.
3. Seen by consultant within three clinic visits.
History
4. Family history (or absence) recorded.
5. Psychiatric history (or absence) recorded.
6. Employment status recorded (unless retired).
Examination
7. Relatives interviewed (or to be arranged).

8. Reference to current mental state.

Treatment

9. Written plan defined setting (outpatient, day inpatient, etc).
10. Major tranquilliser prescribed unless contraindication stated.
11. If admitted, initial stay was ..... days.
12. If admitted, patient discharged as planned.
13. Assessment by social worker recorded.

Follow-up

14. Later contacts with team at least twice.

Outcome

15. Social status noted on final consultation.
16. If so, status noted as improved.

Communication

17. Letter to GP within seven days of first consultation.
18. Letter to GP includes: diagnosis.
19. Letter to GP includes: follow-up arrangements.
20. Letter to GP includes: medications.
21. Letter to GP includes: prognosis.
22. Letter to GP includes: assessment of risk.
23. Letter to GP includes: what patient/relatives told.

Clinical record audit

This can be a valuable starting point, helping to identify minimum data requirements and to develop agreed contents of checklists. These can then be used for more structured and quantified analysis of case records which may be selected randomly or by type of case. Special attention may be given to the presence and use of care plans (which are now expected by the Mental Health Act Commission).

One New Zealand study demonstrated divergence between what was agreed to be required and what was actually recorded.[6] Consistent with other studies, it also showed that non-medical staff kept better records. Therapeutic plans were recorded in 59 per cent and mental status in 60 per cent of cases. A similar audit of 128 case records in Southampton found principal criticisms involved notekeeping (21 per cent), clerical omissions (14 per cent), follow-up and continuity of care (9 per cent), social assessment (6 per cent) and liaison between staff (4 per cent).[7]

Outcome audit

The main challenges in outcome are in agreeing comparable measurements of need and global indicators of health, and in choosing whose viewpoint should prevail — patient, provider, support team, or society. Many mental illnesses are also disabilities; chronic mental disorder is akin to physical diseases such as diabetes mellitus, wherein audit of process may be more realistic than ultimate outcome. One model for routine assessment of outcome in mental health service is offered by McDonald et al.[8]

Consumer survey

A routine system for evaluating patients' views on accommodation and care has been proposed by Fenton et al, who also suggested a framework for overall quality assurance in mental health (figure 13.1).[9]

DATA

Sources

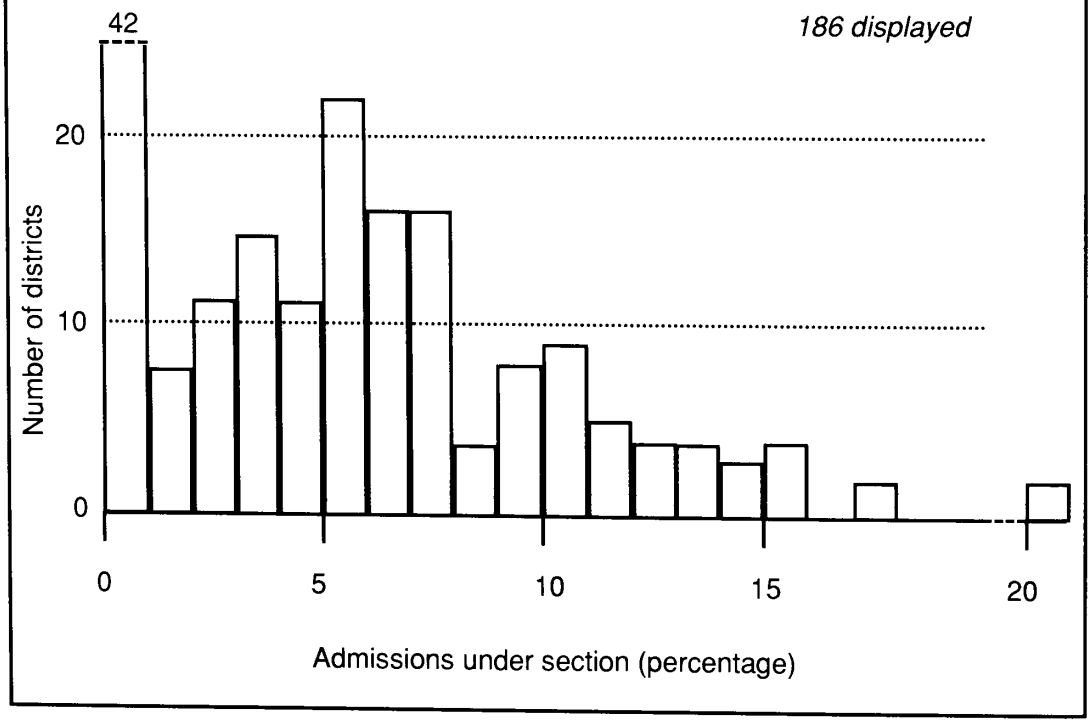
Routinely captured Körner data include administrative items such as source of referrals, waiting time, clinic attendance (and non-attendance) and to where patients were discharged. The quality of routinely captured data on diagnosis, treatments and clinical outcomes much depends on the clinicians. Other hospital-based systems such as pharmacy (e.g., prescribing) and laboratory (e.g. lithium assays) may also offer data for audit.

Health service indicators available for each district which may be of particular interest in psychiatry include:

HSI No	*Indicator*
CL56	Clinic attendance per adult population 0-19 years
CL66	Clinic attendance per adult population
DD62	Mental handicap: discharge home related to numbers in hospital age 1-5 years
HA46	Pyschogeriatric admissions per population
HA48	Psychiatric patients in hospital per population
HA72	Percentage patients admitted statutorily
HA75	Percentage first admissions (children)
LS66	Percentage psychogeriatric admissions staying over one year
ML62	Substance abuse mortality 15-64 years
HA58	Emergency admissions for self-injury

HEALTH SERVICE INDICATORS

Figure 13.1 Percentage admissions under Mental Health Act section, 1989



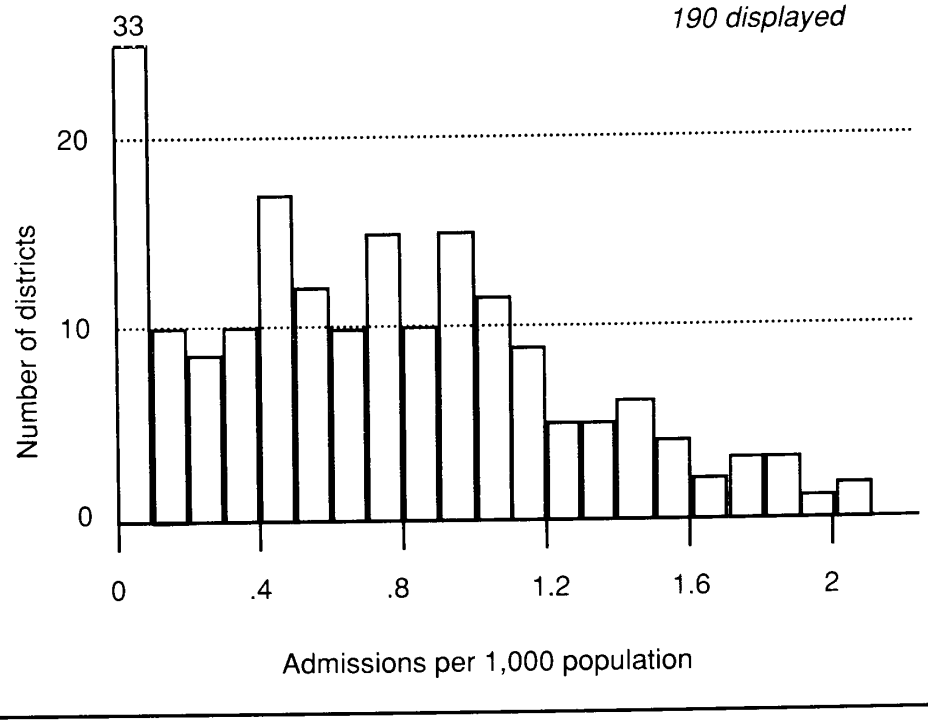
'New long-stay' accumulation is closely associated with population dynamics and socio-economic indices.[10] These may also be found in health service indicators.

Coding and classification

Many psychiatrists prefer DSM III R to the current ICD-9 classification of disease. The nature of psychiatry requires a system which can code a succession of problems and episodes (even during a single admission) to allow for change of diagnosis and long-term follow-up. The ICD-10 will be substantially more sympathetic to audit and research than its forerunner has been.

HEALTH SERVICE INDICATORS

Figure 13.2 Emergency admission rate per 1,000 for self-injury, 1989



NATIONAL RESOURCES

The Royal College of Psychiatrists has set up a Research Unit and an audit working party which is investigating, inter alia, computer systems for clinical audit. The Unit also aims to develop standards for clinical records, guidelines on service structure, methods of local data capture, standards of clinical practice, and a central database on audit literature and information. Contact the Director, Research Unit, Royal College of Psychiatrists, 17 Belgrave Square, London SW1X 8PG. Tel. 071-235 2351. Fax 071-245 1231.

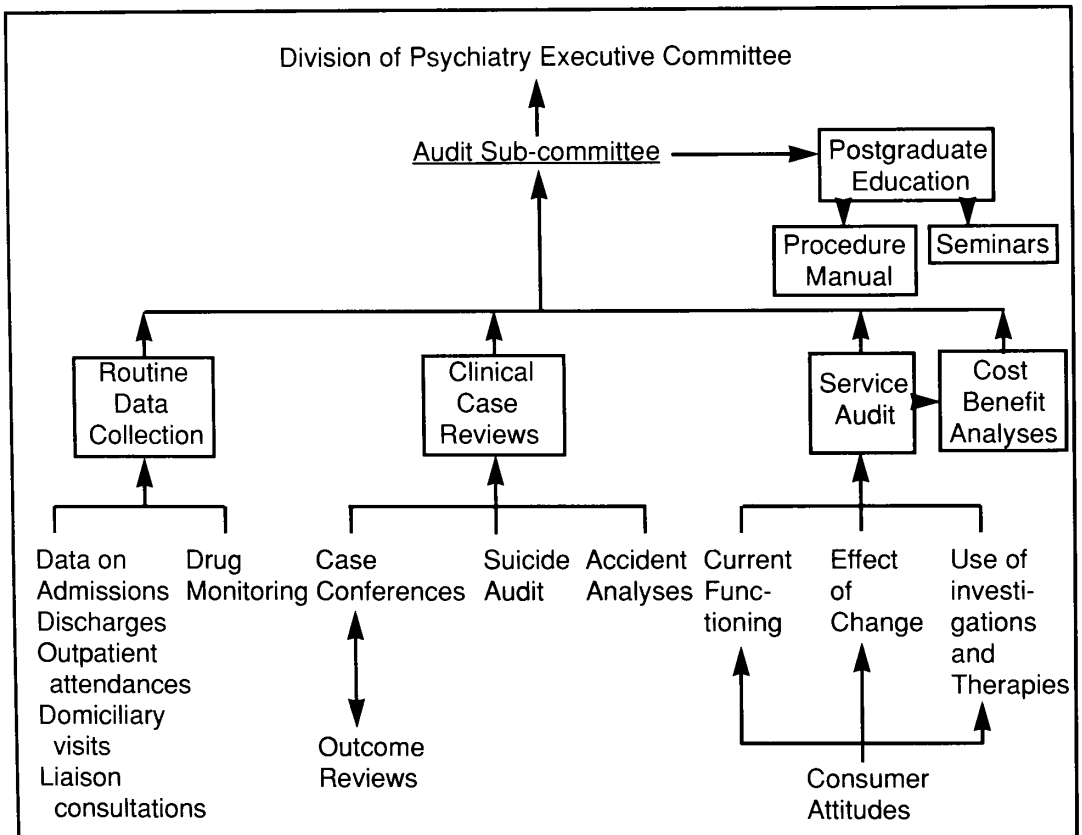


Figure 13.3 Medical Audit Process

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14 — RADIOLOGY

NATIONAL GUIDANCE

Preliminary advice on audit in diagnostic radiology was issued by the Royal College of Radiologists in June 1989[1] and supplemented in Putting audit into action in March 1990 and a third report in May 1991. These guidelines include:

- Setting and maintaining standards (including diagnostic protocols).
- Education (especially in departments with trainees).
- Investigation of errors.
- Organisation and use of facilities (which may be judged from the view point of the 'customer'. Externally, this is the patient, internally, it is the referring doctor).

Recommendations from the Joint Working Party of the RCR and the National Radiological Protection Board were published in 1990 on the reduction of patient dose in diagnostic radiology.[2] These include reduction in the requests for examinations by clinicians (with special reference to the RCR guidelines on appropriate investigation[3] — see chapter 3 'Diagnostic Investigations' section), as well as factors within the radiology department itself.

ORGANISATION

In most district hospitals there are enough consultants in general radiology to provide an effective forum for wholly internal audit of general work. However, many of these may have special interests requiring a supra-district forum. This may be best organised through a regional specialty sub-committee, for example, in nuclear medicine, mammography and interventional work. The Royal College recommends the designation of a

local co-ordinator to schedule, document and follow up review activity. But it emphasises that all radiologists should participate.

Any specialty which uses the services of radiology may invite the department to be represented in that specialty's own audit. Unless this is selective, according to the topic under discussion, and co-ordinated by the local audit committee it can become excessively time-consuming. Similarly, radiologists may invite other specialists such as chest physicians and orthopaedic surgeons to their own meetings.

Audit in radiology is primarily about the clinical practice of radiologists; it overlaps with, but should be differentiated from other quality assurance mechanisms such as radiation protection, machine safety, patient satisfaction and the demands placed on the service by other doctors. 'Utilisation review' is discussed in chapter 4.

METHODS

Adverse patient events

Errors in general fall into four categories:

- choice of investigation and sequence
- performance of investigation
- reporting (perceptive or interpretive error)
- service delivery.

Specific events which may trigger automatic review include:

- lost films/reports
- unplanned repeat pre-operative films

- missed diagnoses (false positive or negative)
- complications of invasive procedures
- reactions to contrast media.

Key indicators

In addition to the general items listed previously (chapter 4), measures which might be routinely aggregated and provided to radiologists for monitoring include:

- waiting time for appointments (e.g. for plain films, for standard contrast studies, for complex inpatient procedures)
- waiting time in department (e.g. for booked cases, for immediate outpatient or accident cases)
- non-attendance rate
- cancellations of appointments by hospital
- delay from examination to report
- examination repeat/film reject rate[3]
- screening
- films per examination
- percentage of films available at clinic attendance
- percentage of chest X-rays 'routines'
- percentage of confinements having ultrasound examination.

Topic review

General subjects for review include choice, sequence and performance of investigations, reporting, and consistency between radiological and pathological diagnosis. Specific examples include:

Intravenous urogram for haematuria: a pilot study in a UK district hospital of all referrals within a two-month period highlighted unexpected variations between radiologists in radiation dosages (average film usage per examination 5.0—9.0), choice of contrast medium (despite an 'agreed' local policy) and delay in reporting (1—9 days). Clinical grounds for 'haematuria' also varied, suggesting records failed to include patient's age, allergies, batch/date of contrast medium. Overall the audit occupied one and a half hours for the consultants to set the original screening criteria, three to four hours (computer programming) to generate a list of IVUs, three hours (clerical) to retrieve records and a half hour of consultant time to abstract the details from the records (seven minutes each) and tabulate and analyse the results. Sadly, the audit was not pursued thereafter.

Barium enema: an Australian study found that in retrospect 97 per cent of colonic carcinomas were disclosed on barium enema but in practice 77 per cent were diagnosed at the time.[5] This was due largely to perceptual errors, compounded by technical problems. Recommendations included the improvement of bowel preparation, double reading of films (including the requesting doctor), better use of spot films, honest reporting of inadequate films and a repeat audit of 10 cases every three months. A similar study in the Netherlands found the value of barium enema investigation to be limited by inadequate preparation, inappropriate use and insufficiency of clinical information as a basis for reporting.[6]

Patient dose reduction: in addition to reducing unhelpful examinations (see chapter 3), departments may also examine their own compliance with procedures and dosage recommended in the Joint Working Party report.

Other methods

Film review

Inter-observer variation in interpretation is a recognised challenge in radiology (e.g. in sacroiliac and duodenal ulcer films.[7,8]) Experience from America suggests that 'no-nonsense' reporters are brief but have a high false negative rate; 'meticulous' reporters are lengthy and have a high false positive rate. Errors are generally due to poor film quality, missing or misinterpreting the lesion, or failure to communicate results.

Error review

Some departments keep a book listing mistakes, giving the procedure and outcome, which can be reviewed quarterly for patterns of avoidable causes.[9]

Case review

Review of randomly selected cases may be multidisciplinary and include:

- Imaging: correct projections, positioning, exposure, labelling.
- Reporting: relevance and accuracy of observations, deductions, diagnosis, comments and recommendations.
- Procedure: appropriateness, technical success, recording of materials (especially contrast media) used, consent, information given to patient before and after procedure, ward visit prior to complex procedure, complications.

National studies

A national programme is being co-ordinated from Northwick Park Hospital under the mantle of the Royal College to examine the use, process and results of interventional radiology. This primarily concerns percutaneous procedures and includes biopsies, drainage, stone management, dilatation, management

of thrombi and embolisation procedures. It aims eventually to collect data to compare results of individual radiologist and of selected procedures, but is limited initially to angioplasty. Results will be analysed and published nationally, but results of individual hospitals will be available only to themselves.

DATA

In addition to Körner data routinely generated within the department, useful figures may also be obtained from other specialty systems such as pharmacy/CSSD (drug and equipment issues for special procedures), pathology (histological diagnosis) and the accident unit (referrals to X-ray). Many radiology departments keep a 'reactions book' which may provide a basis for review, perhaps in conjunctions with nursing records for inpatients with reference to later symptoms such as nausea or headache.

For the purpose of systematic audit of patterns of radiological management involving large numbers of patients, an index of procedures, diagnoses and complications is essential. It is unfortunately common that departmental computer systems either cannot support this or are inadequately resourced to capture the data and generate reports.

Health service indicators are of limited value in audit of diagnostic radiology; some interest may be found in 'clinical and scientific services' for 1989/91:

Screen No	*HSI No*	*Indicator*
47	RD21	Consultant radiologists per weighted request
47	RD22	Medical staff per weighted request

NATIONAL RESOURCES

The Royal College of Radiologists has set up an Audit Office to assist with organisational and medical audit, and to share local experience and guidelines. There is also a medical audit working group of the College.

Details from 38 Portland Place, London W1N 3DG. Tel. 071-636 4432. Direct line 071- 436 4251. Fax 071- 323 3100.

Details of the interventional radiology study from Department of Radiology, Northwick Park Hospital, Watford Road, Harrow, Middlesex HA1 3UJ. Tel. 081-864 5311. Fax 081-423 0046.

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15 — SURGERY AND RELATED SPECIALTIES

NATIONAL GUIDANCE

General guidance on audit was issued by the Royal College of Surgeons of England in 1989.[1] This emphasised the importance of professional leadership of audit and the role of the College in seeking, during inspection of hospitals, evidence that:

- Effective audit meetings have taken place.
- All surgical staff have attended.
- Recommendations arising from audit have been implemented.
- Appropriate records have been kept.

In a position paper issued in 1989, the Royal College of Surgeons of Edinburgh also confirmed that audit would be included in the syllabus for fellowship examination from 1990, and would be a requirement for recognition of training posts.[2]

The Royal College of Physicians and Surgeons of Glasgow issued guidelines to audit groups in Scotland in 1990.[3] The English College also published minimum standards for the clinical and administrative management of patient records in 1990 — advice which could be equally valuable to other specialties.[4]

The College of Ophthalmologists issued preliminary comments on medical audit in June 1989[5] and further notes in February 1990. These confirmed that College and Specialist Advisory Committee visitors would seek evidence of regular audit meetings and would inspect hospital notes, as recommended by the Royal College of Physicians.[6] The College of Ophthalmologists would encourage discussion of the management of common ophthalmic disorders and initiate the development of outcome indicators.

Advice to individual surgical specialties includes:

ENT surgery: the British Association of Otolarygologists (BAOL) working party on audit suggests that one or two full sessions a month be devoted to audit, perhaps including joint meetings with nearby units. Appropriate methods include review of workload, statistical accuracy, complications and randomly selected case records.

Oral and dental surgery: the Faculty of Dental Surgery of the Royal College of Surgeons published general advice on the organisation and methods of audit applicable in dental specialties.[7] This emphasised the different organisation required in small DGHs, compared with specialist dental hospitals, but the advice confirmed common principles of having one elected convenor, a staggered timetable arranged well in advance and a priority for audit over all other local commitments.

Plastic surgery: the June 1990 report of the medical audit working party of the British Association of Plastic Surgeons gives advice on coding (recommending the Read classification), software (including how to choose, and contact names of users of various systems), hardware and audit.[8]

ORGANISATION

Although there are enough consultants in most general hospitals to make an effective peer group for audit in general surgery and trauma and orthopaedics, smaller specialties and surgeons with special interests tend to gather into subregional or regional groups. Apart from tertiary referral services, the latter often include urology, vascular surgery and gastroenterology. General surgeons 'with an interest' are thus drawn into audit on two fronts which is more time consuming.

But there are also significant areas of common interest between specialties which lend themselves to audit within the general hospital. There is at least enough to support joint meetings perhaps quarterly. These may be between surgeons who are anatomically related (such as the supraclavicular specialties) or functionally related (such as trauma and the accident and

emergency department). Selected topics may also involve physicians (e.g. surgery for complications of medical conditions, in the elderly, or gastroenterology).

Many hospitals who initially included specialties such as ENT and oral surgery within general audit in the division of surgery have abandoned this in favour of specialty-based audit which provides greater interest and relevance.

Few systematic discussions on the appropriateness, process or outcome of surgery can be complete without the contribution of at least one anaesthetist. With this in mind, many hospitals have designated a common half day every month for audit in surgery and anaesthesia. This usually alternates between morning and afternoon and rotates around the days of the week in a semblance of equality. Some omit Fridays and Mondays, already weakened by the weekend and prey to the public holiday.

The Royal College of Surgeons recommends that the surgical tutor should normally be responsible for ensuring that audit programmes are developed and that one consultant is nominated to organise audit within each individual department.

METHODS

Adverse patient events

Circumstances which may warrant automatic review by surgeons might include:

- peri-operative deaths
- admissions to intensive care
- unplanned second operations
- unplanned readmissions.

Key indicators

Statistical measures which should be available from routine administrative or clinical data systems and which may prove useful for routine monitoring of surgical services include parameters published by Jones:[9]

1. Process — Access to service

Policy: Patients should be provided care with the minimum delay and optimum equity appropriate to their clinical and social condition.

Indicators: Waiting time for clinic appointment

— non-urgent/urgent waiting time for admission
— non-urgent/urgent cancellations
— hospital deferred admissions
— patient deferred admissions
— operations cancelled.

2. Process — Workload

Policy: Every consultant should know the volume and trend of his or her surgical workload in order to plan for future development.

Indicators: Outpatients
— new/follow-up
— non-attendance rate
— average visits per patient
— procedures performed.

admissions
— day cases
— inpatients (emergency/elective).

operations
— emergency (day/night)
— elective.

3. Process — Appropriateness of care

Policy: Surgical care should be provided by staff with appropriate skills, training and supervision and should avoid unnecessary risk to the patient.

Indicators: Specialist surgery by non-specialists
— urological procedures
— vascular procedures
— biliary obstruction emergency surgery
— operations by unsupervised juniors
— % prostatectomies by transurethral resection
— % cataract operations by lens implantation
Case-selection
— admissions from day surgery
— negative laparotomies
— femoro-popliteal grafts amputated within one month.

4. Process — Medical records

Policy: Case notes should provide an accurate, complete and up-to-date record of individual patients as a basis for clinical care, communication and service management.

Indicators: Discharge summaries not sent within one week
Discharges not having a diagnosis coded within one month.

Concordance of data from patient administration (PAS) and clinical data capture (CDC) systems.

5. Outcome

Policy: Surgical management should combine optimal chance of clinical benefit to the patient with minimum risk of adverse results.

Indicators: Unplanned events.
- — readmission with related problems within one month
- — unscheduled return to theatre
- — unscheduled transfer to intensive care

Complications
- — Operative complications within 30 days
  - — wound infection
  - — haemorrhage
  - — anastomotic leak
- — Other complications
  - — pulmonary embolism
  - — cardio-repiratory arrest
  - — delayed discharge

Mortality
- — emergency aortic aneurysms
- — perioperative deaths.

6 Resource utilisation

Policy: Available resources should be used efficiently in order to provide optimum benefit to the population.

Indicators: Theatres
- — % allocated sessions used
- — % allocated hours used
- — % lost sessions, by cause.

length of stay for selected procedures
— inguinal hernia
— cholecystectomy
— appendicectomy
— prostatectomy
— cystoscopy.

clinics
— attendance per new patient.

day surgery
— % all operations as day cases.

investigations per 1000 admissions/outpatients
— X-rays
— laboratory tests.

In theory, such a list of indicators could be agreed (together with detailed definitions) for comparison within a unit or region. In practice, this requires agreement on underlying assumptions about clinical practice such as:

- categories of 'urgency' for clinic appointments
- definition of 'emergency' surgery
- minimum workload needed to maintain 'specialist' skills
- criteria for timing and content of discharge summaries
- definition of wound infection
- definition of 'consultant supervision'.

Topic review

The Royal College of Surgeons of Edinburgh has suggested that each specialty in Scotland should audit four indicator operations and present the results to the College when seeking recognition for training posts. The suggested operations are:

Paediatric surgery:	orchidopexy repair of oesophageal atresia definitive surgery for Hirschsprung's disease surgery for small bowel obstruction.
Surgical neurology:	aneurysms (excluding hindbrain) tumour meningioma (excluding glioma) discs — lumbar head injury — extradural haematoma.
Obstetrics and gynaecology:	bladder neck suspension reversal of sterilisation abdominal hysterectomy vaginal hysterectomy.
Orthopaedic surgery:	fractured neck of femur total hip replacement internal fixation of ankle fractures Keller's arthroplasty.
Urological surgery:	transurethral resection for prostatic hypertrophy cystectomy nephrectomy endoscopic management of bladder tumours.
Ophthalmology:	cataract squint glaucoma procedures primary retinal detachment operations.

Otolaryngology:	radical neck dissection myringoplasty septal surgery laryngectomy.
Cardiothoracic surgery:	coronary artery bypass grafting thoracotomy for bronchial carcinoma repair of tetralogy of Fallot resection of oesophageal carcinoma.
Oral and maxillo-facial surgery:	fractures of mandible treated by bone plating fractures of malar bone temporo-mandibular joint arthroplasty excision of carcinoma of floor of mouth with neck dissection and reconstruction.
General surgery:	colonic resection cholecystectomy inguinal hernia repair femoro-popliteal bypass.
Plastic surgery:	excision of malignant melanoma cleft palate repair burns: full thickness over 10 per cent body surface area hypospadias.

Published examples of audit of individual procedures include:

Carotid surgery: a study of carotid thromboendarterectomy on 700 patients in seven Australian teaching hospitals showed wide variations in indications (transient ischaemic attacks ranged between 39 and 72 per cent among the hospitals), but outcomes were not significantly different in terms of death or major stroke.[10]

Orchidopexy: a review of 1285 boys undergoing orchidopexy in British hospitals suggested that only 32 per cent were done by the recommended age

of five years, and the number of operations was four times greater than the incidence of undescended testis, implying that 75 per cent received unnecessary surgery.[11]

Appendicectomy: of 200 consecutive appendicectomies at a Sydney teaching hospital, the clinical indication in 130 was suspected acute appendicitis. Of these 64 per cent showed acute inflammation pathologically. Recorded results of rectal and/or vaginal examination were absent in two thirds of the patients whose appendix was later shown to be normal, but only in 9 per cent of those with pathologically confirmed appendicitis.[12]

Mastectomy: some 128 women who had undergone simple mastectomy in an English DGH more than nine months previously were interviewed. Thirteen claimed they were unaware of the likelihood of mastectomy until they woke up without their breast. They had all signed (apparently) valid consent forms for mastectomy.[13]

Cholecystectomy: a criterion-based audit of 200 patients having cholecystectomy demonstrated the benefits of making statistical comparisons. Despite the existence of all the usual mechanisms for scrutiny of surgical practice, this method proved neither trivial nor redundant.[14]

Non-operative topics for audit include general issues such as waiting lists, autopsies, pulmonary embolism, antibiotic prophylaxis in surgery, clinic management of patients for hearing aids, temporo-mandibular joint referrals, information given to patients generally, and the recording of observations by medical staff. In one unpublished study of a specialist eye hospital, clinic records showed no comment on discs (39 per cent), intraocular pressure (9 per cent), and fields (63 per cent).

Even a cursory review of the literature reveals a wide variety of measurements of process and outcome in surgical services, many of which could be translated into non-surgical specialties. Some examples are given in table 15.1. These measure the status quo but do not constitute audit until follow-up measurement demonstrates an improvement in practice or results.

Patient administration	*Sample*
% new outpatients seen by consultant general surgery 44 orthopaedics 59 ENT 71 (after 9 months, one in three still not seen by consultant)	All outpatients over one month, city general hospital (Manchester)[15]
Delayed discharge 8.9% inpatients stayed three weeks; of these 42% were due to home or social reasons	All discharges over one year in a DGH (general surgery)(Whipps Cross)[16]
Diagnosis Pulmonary embolism (PE) accounted for 10% all deaths; autopsy showed 83% of these had a DVT — 81% of which were asymptomatic before death	All autopsies over 5 years in a DGH[17]
Solitary brain tumour Confirmation of CT diagnosis was sought in 47%; among these 'glioma' was incorrect in7% and'solitary metastasis' in 50%	All 142 solitary brain tumours diagnosed by CT referred in one year to a neurosurgical unit in Scotland[18]
Post-mortem rates Perioperative deaths 35% Other surgical deaths 22% All hospital deaths 30% (cp 11.7% all N Ireland)	600 consecutive deaths in Northern Ireland teaching hospital[19]

Table 15.1: Some quantified examples in surgical practice

Appropriateness of care		
Coronary artery by-pass surgery According to pre-agreed consensus criteria, 55% of cases were entirely appropriate, 16% were inappropriate operations		707 patients over one year in an English region[20]
Crossmatch:transfusion ratio		
laminectomy	135.0	84 cases in Scottish orthopaedic hospital[21]
total mastectomy	14.5	Scottish regional blood transfusion service over four months[22]
hysterectomy	11.6	
fem-pop bypass	15.4	
cholecystectomy	7.7	
prostatectomy	7.6	
Crohn's resection	3.5	100 cases in English DGH over 11 years[23]
Prophylactic antibiotics 7.2% of patients with agreed indications did not receive prophylaxis; 50.7% of patients without indications did receive		Collaborative prospective study of 104 Belgian acute hospitals over one week; 3112 surgical patients with post-operative stay three or more days[24]
Wound infection rates		
abdominal surgery	3.7%	3100 operations over 10 years, Scotland[25]
hip prosthesis	9.0%	7 months' operations in two American hospitals[26]
breast cancer	3.6%	385 cases, Sweden[27]
large bowel, emergency		
primary resection	7.3%	153 cases in 7 years, Scotland[28]
anastomosis	8.7%	
large bowel, elective		
anastomosis	2.0%	204 cases in 8 years, Scotland[29]

Table 15.1: Some quantified examples in surgical practice (contd.)

Mortality		
large bowel, emergency		
primary resection	12.2%	153 cases in 7 years[28]
anastomosis	8.7%	
large bowel, elective	1.5%	204 cases in 8 years[29]
colorectal cancer, curative resection, age over 70	7.0%	2510 cases in multicentre UK study over 5 years[30]
peptic ulcer surgery		713 patients over 13 years
elective	2.5%	in English DGH[31]
emergency	8.6%	
cholecystectomy (30 day)		1000 cases over 5 years in
jaundiced	7.7%	DGH, England[32]
not jaundiced	0.7%	
aortic aneurysm, unruptured		309 cases over 10 years,
asymptomatic elective	1.1%	Edinburgh[33]
symptomatic elective	3.6%	
emergency	4.0%	

Table 15.1: Some quantified examples in surgical practice (contd.)

Epidemiological review

Rates of surgical procedures, even when accurately recorded and related to a defined catchment population, often show wide variations. These may be attributed to difference in disease incidence, in patient expectations, in surgeon preference or in reimbursement systems. But the widest variations are seen in procedures where there is general clinical uncertainty about the benefits of intervention. Local variations in operative rates have therefore been used to raise discussion, largely among epidemiologists, of the appropriateness of and indications for surgery.[34–37] Examples include:

- tonsillectomy
- appendicectomy
- coronary artery bypass surgery

- cholecystectomy
- prostatectomy
- insertion of grommets
- radical mastectomy.

National audit studies

Nationally organised data collection and analysis have identified various patterns which may indicate opportunities for the improvement of the organisation, process and outcomes of surgery. These often reinforce the 'volume-outcome link': teams which carry out large volumes of specific procedures tend to obtain better results. National studies in the UK include cardiothoracic surgery[38] and perioperative death.[39,40] A national trauma outcome study in Britain will compare results in participating hospitals with data on 120,000 similar patients in the United States.[41] The Scottish Mortality Survey was established in 1989 to analyse surgical deaths, initially in Lothian, but extending into Borders, Fife, Forth Valley, Greater Glasgow and Grampian. A report has been published of the first two years.[42]

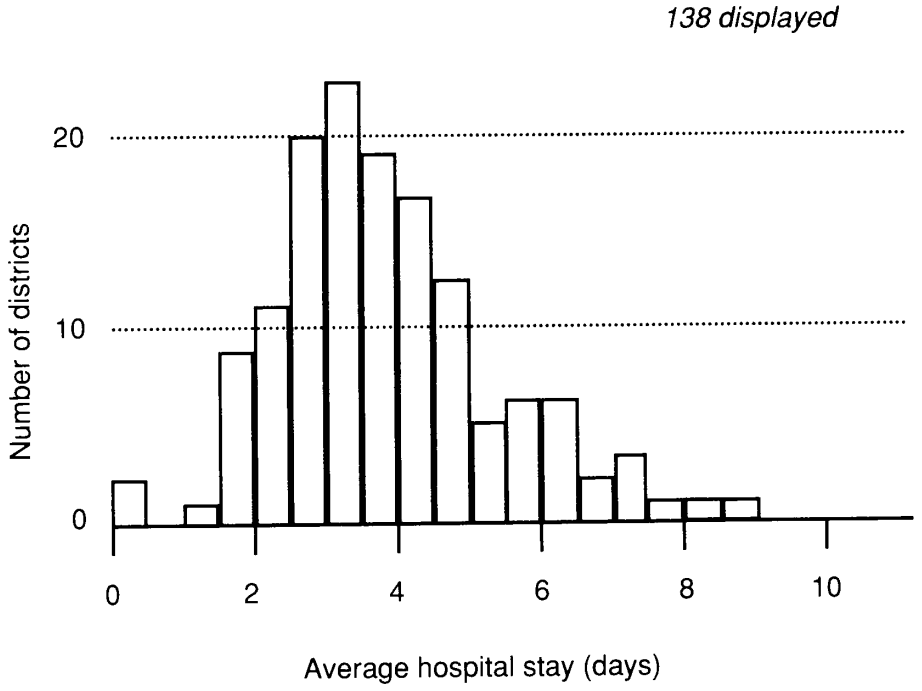
DATA

Sources

Every NHS hospital has the capacity to generate lists of patients who had a given diagnosis, complication or procedure; in practice these lists are often incomplete, inaccurate, delayed and difficult to retrieve, encouraging many surgeons to set up their own manual or computer systems. In addition, many laboratory and X-ray department systems can identify lists of patients from a given firm with a given diagnosis. Theatre management and patient dependency systems should also be explored as local sources of data for surgical audit. Manual sources include the traditional theatre register and accident unit admission book.

HEALTH SERVICE INDICATORS

Figure 15.1 Cataract surgery, average hospital stay, age 16-64, 1989



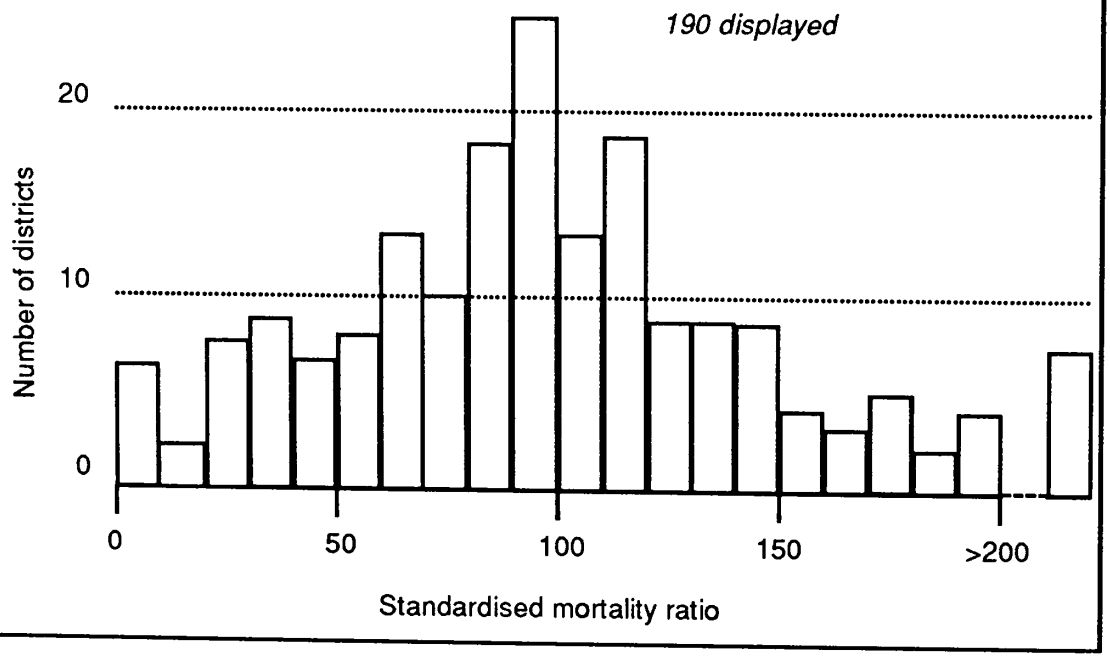
Comparative data may be obtained from published literature, from ad hoc regional or national studies or from routinely collected health service indicators (HSIs — previously called 'performance indicators', PIs). The accuracy of the latter, generally available on floppy disc from unit or district information officers, reflects the accuracy of the local data capture and can be improved by regular feedback and by clinical attention to the data from which they are derived. They are available for general surgery, urology, dental, trauma/orthopaedics, otolaryngology, ophthalmology, neurosurgery, plastic, cardiothoracic and paediatric surgery. They cover manpower, operating theatres, waiting lists, admission rates and length of stay. Surgical tracer conditions are appendicectomy, inguinal hernia repair, varicose vein operation, cholecystectomy, mastectomy, prostatectomy, fractured femur, hip/knee replacement, tonsillectomy, adenoidectomy, correction of strabismus and cataract surgery. Indicators which may be of value in

comparing between districts in England and Wales and in stimulating surgical audit locally include:

Series	*Code*	*Indicator*
Policy tracer	LS43	length of stay, by age, by procedure, e.g. cataract surgery, age 16—64 (figure 15.1)
Access	HR48	admission rate, by age, by procedure, e.g. coronary artery bypass graft, age 45 plus
Mortality	ML62	standardised mortality ratios from inguinal hernia, appendicitis, cholecystitis (figure 15.2)
Surgical specialty	HA63	% operations as day cases
	CL51	% outpatients not attending
	LS45	Average pre-operative stay
	TH41	% theatre sessions cancelled
	TH52	% theatre cases done out of hours (figure 15.3)

HEALTH SERVICE INDICATORS

Figure 15.2 Standardised mortality ratio from appendicitis, inguinal hernia and cholecystitis, 1989



Coding and classification

The standard classifications used in the UK are ICD-9 for diagnoses and OPCS-4 for procedures. Some specialists find these insufficiently sensitive to rapidly changing techniques. For example, the British Orthopaedic Association is working towards a modified Read classification which could be used by all orthopaedic units. Classification of surgical, anaesthetic and medical complications can be dealt with under ICD codes 996-999, but are rarely recorded by the clinical data capture (CDC) system without direct clinical supervision. Many abbreviated lists of complications have been developed for commercial and personal stand-alone computer systems. These should, at least, share national standard definitions to allow comparisons and be able to map onto ICD-9 to allow DRG and other aggregations.

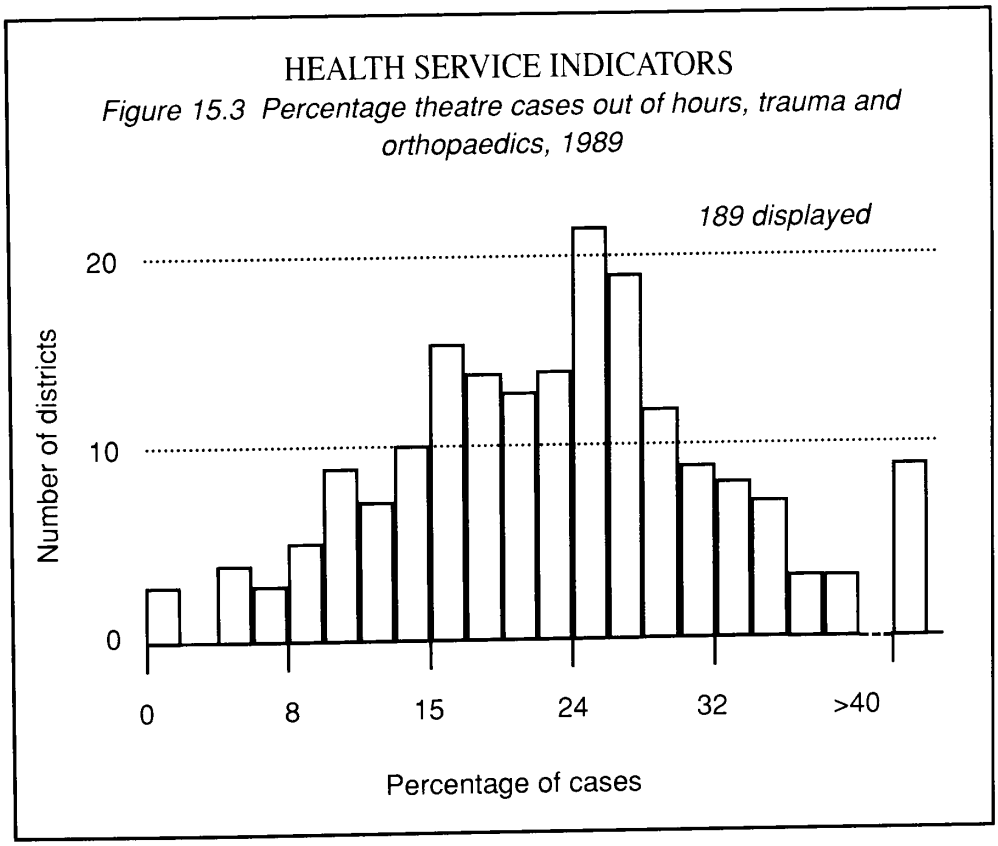


Figure 15.3 Percentage theatre cases out of hours, trauma and orthopaedics, 1989

Likewise the British Association of Otolaryngologists has published a subset of Read codes for operations and diagnoses applicable to audit. For the purpose of measuring case-mix and relative risks of patients in surgical care, it is essential to record secondary diagnoses and co-morbidity; medical diagnoses are frequently omitted from surgical discharge summaries, thus obscuring key predictors of patient outcome. This makes audit more difficult and will increasingly compromise the funding of surgical units based on case-mix. Specialty risk scoring systems such as the trauma injury severity score (TRISS),[43] validated overseas and in the UK, rely heavily on accurate and complete clinical input. Many surgeons (and the national CEPOD study) use the ASA (American Society of Anesthesiologists) grading as a measure of operative risk. A succinct review of trauma scoring methods was published in 1990.[44] Operative complexity has been quantified in terms of 'intermediate equivalents'.[45]

Minimum data sets

Inevitably views differ between and within surgical specialties on what data are essential for routine capture and computer storage. Early enthusiasts spent up to three-quarters of an hour per patient, keying in data on discharge; they fairly soon reduced this to a minimum set which takes less than ten minutes but provides basic information for:

- Listing patients having common clinical features, for retrieval of the original records for detailed audit.
- Description of clinical activity for costing and management.
- Monitoring selected variables, such as supervision and training of junior staff.

Advice on computing specific to surgical audit has been issued by the Royal College of Surgeons.[46] This includes general requirements, features of software and hardware, criteria for choosing a system and a helpful glossary. It also lists a minimum data set of 59 items which should be collected by audit software. In general, such data fall under the following headings:

Patient: Identification, name, age, address, postcode, GP (available from PAS).

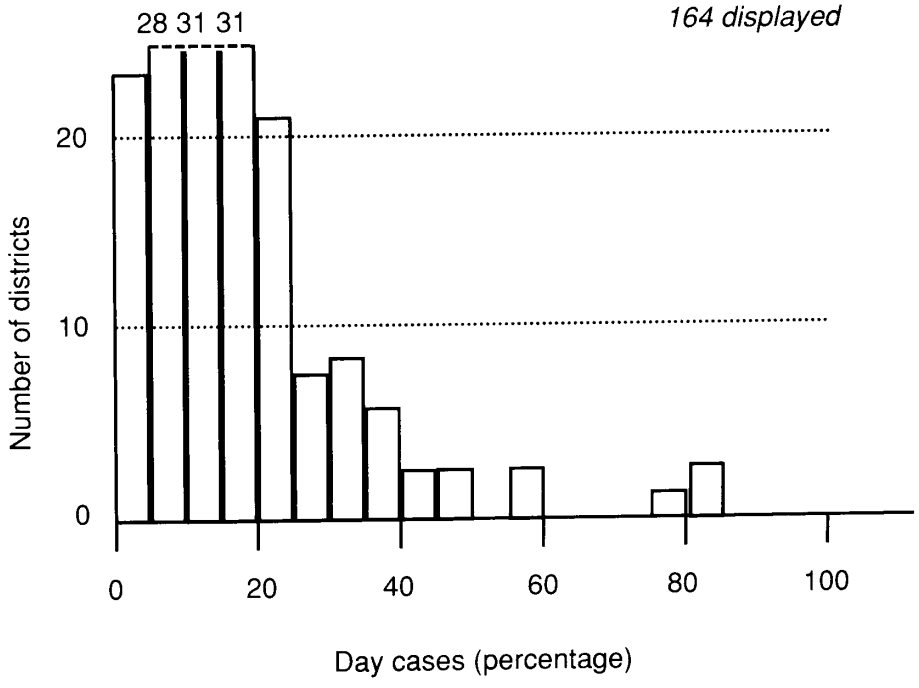
Admission: Date, time, hospital, ward, consultant, source, type (available from PAS).

Diagnosis: Final primary, secondary, complications, co-morbidity (optional: admitting diagnosis); in some cases, such as major trauma, 'secondary' diagnoses may be more accurately listed as subsidiary.

Procedure: Procedure(s), date, time, anaesthetist, surgeon (operating/ supervising), (optional: duration of operation/ anaesthetic, type of anaesthesia).

HEALTH SERVICE INDICATORS

Figure 15.4 Percentage of operations as day cases, ENT, 1989



Discharge: Date, destination, drugs (name, dose, frequency, duration), follow-up arranged (free field: information given to patient; general comments).

To these may be added longer term outcome, particularly the results of follow-up in malignant disease, in gastrointestinal surgery and in orthopaedics.[47]

NATIONAL RESOURCES

The Royal College of Surgeons of England has established a clinical audit and quality assurance committee. Its surgical audit unit is collaborating with the surgical specialist associations in several national projects, each overseen by a steering group, supported by a clinical research fellow and funded by the Department of Health:

Upper gastrointestinal endoscopy: with the Royal College of Physicians, Association of Surgeons, British Society of Gastroenterology and Royal College of Anaesthetists.

Management of ankle fractures: with the British Orthopaedic Association, Casualty Surgeons' Association and British Association of Plastic Surgeons.

Management of cleft lip and palate: with the Faculty of Dental Surgery, British Association of Plastic Surgeons, British Association of Paediatric Surgeons, British Association of Oral and Maxillofacial Surgery and Cleft Lip and Palate Association.

Audit of prostatectomy: with British Association of Urological Surgeons and Association of Surgeons.

Management of colorectal carcinoma: with the Association of Coloproctology and Association of Surgeons.

The Surgical Audit Unit is also running a multidisciplinary three-year study of patient satisfaction. This is investigating how far surgical services meet patients' needs and expectations as measured by their perceptions. These will

then be compared with clinical outcomes in a limited number of surgical interventions.

In response to requests from surgeons, the Unit has set up a confidential comparative audit service, to which consultants may submit audit data anonymously and have them compared with the pooled data of other surgeons in the same specialty. Data may include resources, workload, procedures, case-mix and outcomes.

Details from the Surgical Audit Unit, Royal College of Surgeons of England, 35 Lincoln's Inn Fields, London WC2A 3PN. Tel. 071-404 3474. Fax 071-831 9438.

The College has issued guidelines on a number of issues which could be subject to audit, including the management of waiting lists[48] and, with the Royal College of Pathologists, autopsies.[49]

The Faculty of Dental Surgery has set up a standing audit committee with aims including the definition of national data sets for dental disease and operative codes, the establishment of a central database on hospital facilities, workload and trainees, the definition of educational requirements for audit, and the provision of advice to dental specialties. Joint working parties have produced interim advice circulated in 1990 to consultants in restorative dentistry,[50] paediatric dentistry,[51] orthodontics,[52] and oral and maxillo-facial surgery.[53]

The Royal College of Surgeons of Physicians and Surgeons of Glasgow has set up an advisory committee on medical audit to help local organisation, give advice, establish standards for audit and to initiate relevant research. Contact the College at 234 St Vincent Street, Glasgow G2 5BL. Tel 041-221 6072. Fax 041-221 1804.

The Royal College of Surgeons of Edinburgh houses the Scottish Mortality Study and has set up a standing advisory committee to advise on methods of audit and interpretation of results. Contact the College, Nicholson Street, Edinburgh EH8 9DW. Tel 031-556 6206. Fax 031-557 6406.

The College of Ophthalmologists has set up an audit unit which includes the development of practical audit methods, particularly in cataract surgery, postoperative infections and eye trauma. Contact the College of Ophthalmologists, Bramber Court, 2 Bramber Road, London W14 9PQ. Tel 071-385 6281. Fax 071-381 1799.

Details of the UK Major Trauma Outcome Study (MTOS) can be obtained from North Western Injury Research Centre, Stopford Building, Oxford Road, Manchester M13 9PT. Tel. 061-789 1421. Fax 061-787 7432.

Information on audit in otolaryngology may be obtained from the Sussex Throat and Ear Department, Royal Sussex County Hospital, Eastern Road, Brighton BN2 5BE. Tel. 0273 696955.

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