# Hospital information management: the need for clinical leadership

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On 12 July the Audit Commission published *For Your Information*, a well researched report about information and its management in acute hospitals in Britain, how and why it is failing, and steps that clinicians, managers, and the NHS should take to correct this. This article discusses why information management matters to clinicians and considers the problems identified by the Audit Commission—most of which will strike chords with doctors—and possible remedies. Finally, it decribes possible routes to adminsiter these remedies and the proposal, recently supported by the BMA Council, for a national centre for health informatics with the goals of educating. and enthusing clinicians about informatics, empowering them to participate in local and national information management decisions; exploring how information can be used to improve patient care and outcomes; and evaluating clinical information systems and helping to realise their benefits.

Clinical information and its management in hospitals

Although the Audit Commission states that "information is one of the most important resources that a hospital holds,"[1] information is also its least tangible resource. Information can be defined only by its function—"organised data or knowledge that provides a basis for decision-making"[2]—and consists of knowledge about how to achieve a goal and data about the starting point and the intervening terrain. When a clinician takes a patient management decision, these data consist of patient findings (history, observations, and test results), hypotheses (including assessments, such as the referral diagnosis, and plans), and previous actions taken.[3] However, when a decision is taken about a group of patients, a clinical service, a purchaser-provider contract, or a health care organisation, data about individual patients must be grouped and abstracted before being combined with data about staffing, facilities, and other resources. Thus, high quality patient data is the foundation for decisions at all levels in a health care system (figure).
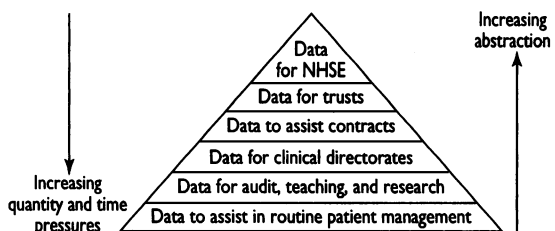
Pyramid of hospital data, showing how data used for routine patient management underlies that used by NHS Executive

With this central role in health care, it is hardly suprising that doctors and nurses spend a quarter of their time and hospitals spend 15% of their budget on gathering and using information.[1] Annually, British hospitals spend £220m on information systems, a median of 1·8% of a hospital's revenue (interquartile range 1·2-2·3%)—a similar percentage to other European countries but less than the United States. What is surprising is that the Audit Commission's survey of 166 acute hospitals revealed a fivefold variation in expenditure, with a maximum of 4·1%,[1] suggesting

that some institutions value information more highly than others. The commission does not condemn this, but recommends improving the efficiency of information production and exploitation to realise fully its benefits.[1]

Since information is necessary for all decisions, benefits of good information management are ubiquitous, affecting clinicians, patients, and managers alike (see box 1). "Good management of information . . . can improve the quality, effectiveness and efficiency of patient care,"[1] and may even allow clinical staff to spend more time with patients. Care must be taken, however, when using routinely collected data for research, and a common misconception is reflected in the report: "Routine patient care information is increasingly used for research into the best ways to treat specific conditions."[1] Many confounding factors, such as biases in the referral of cases, biased selection of patients for treatment, and drifts in disease and outcome definitions over time,[4] mean that such "outcomes research" can only suggest hypotheses for testing in rigorous randomised trials or cohort studies, not confirm them.[5]

As clinicians around the country would suspect and the report confirms, good management of information is not easy. There are many pressures, including the desire of clinicians practising evidence based medicine to access the exploding clinical literature[6]: increasing patient participation in decision making and self management; more extensive teams of professionals who manage patients using shared records; concerns over the confidentiality of patient data; and the complexity of the contracting process enforced by the purchaser-provider split.[1] Despite these pressures, spending more money on NHS information management is not the solution, since existing investments have often failed to benefit patient care,[1] largely because most money is spent on administrative systems. For example, during the five years of the resource management initiative, £125m a year was spent on managerial information systems at 260 sites,[7] while the current enthusiasm of the NHS Information Management Group for "person-based systems" is associated with an annual spend for the electronic patient record initiative of just £1·8m at two sites. Nearly all of this is for systems to process patient data not to disseminate evidence based knowledge. What is needed is a redistribution of resources, away from financial edifices built on sand towards clinical systems which help patients and provide sound data foundations to support solid managerial decisions.

Redistribution of resources, however, is not enough. The Audit Commission report describes six major areas of concern about hospital information management. These, together with suggestions for how they might be alleviated, are discussed in the remainder of this paper.

Data capture and encoding

Realistically, many of the benefits of information can be achieved only through the use of computers, and for this the data must be organised and structured,[1 8] not captured as free text. The principal source of health care data is the medical record—which is often

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obscured by illegible writing; complex, disorganised notes; and free text descriptions that include synonyms or abbreviations, thwarting computerisation.[1] There are currently two approaches to capturing data to facilitate decision making higher up the pyramid: ask clinicians to fill out administrative forms or employ clerks to abstract the data from notes. While clinicians find it onerous to fill out forms, it is probably even harder for clerks to mine the data nuggets from the clinical record gold mine: "Abstraction of data is consequently laborious, costly and inaccurate."[1] In one hospital, clinicians take responsibility for the quality and coding of clinical data by meeting with coding clerks,[1] but the evidence probably favours coding of data by clinicians.[9]

Technical solutions

The future alternative is for clinical staff to use forms or computers directly during patient care, ensuring that key data items are suitably coded. Indeed, the Audit Commission envisages that "the focus must be . . . particularly on those systems which record data about patients at source," which requires that all staff receive a "perceived or tangible benefit"[1] in return for data collection.[8] Data capture can be simplified by novel technologies such as bar codes and point and click interfaces.[8] To ensure that data are coded, a comprehensive "controlled thesaurus" such as the Read clinical coding system has been developed,[10] but may prove hard to use in practice since "navigation through the Read codes . . . is not a trivial task . . . and needs to be simplified."[1] One medical informatics expert even doubts if a comprehensive clinical coding system can be assembled without intensive research, or easily maintained.[11]

A more practical problem is that, since patients with common conditions such as myocardial infarction may be seen by 25 professionals during their stay, in various locations often several metres from a desk, it is hard to provide each professional with an accessible workstation. Pen based, pocketable, or hand held terminals which link to central systems by a wireless network are available and used in some clinical trials,[12] but they are expensive and heavy; the batteries fade rapidly; and they do not yet have the computing power necessary to acquire and display complex clinical data.

This all assumes that hardware is the solution to data capture, whereas software is probably more important. With error rates of 4% for keyboard entry,[13] programs are needed to detect and control data errors,[8] while time considerations suggest that clincians should be prompted for relevant data once the clinical problem is known.[14] Such approaches seem vital to clinical acceptance, but they remain in development.

ORGANISATIONAL SOLUTIONS

Changes to the organisation of care may assist data entry. One possible "solution" would be simply to require that clinicians enter data in a form suitable for both clinical and managerial decision making: "Clinical staff are the best placed to collect some data items . . . this can be addressed by ensuring that individual consultants accept a degree of managerial responsibility for the success of their clinical unit."[1] An alternative is to arrange that data capture is shared between all concerned, including nurses, medical secretaries (as part of typing clinic letters and summaries), and patients. Patient interviewing systems encourage participation by the one person who has intimate understanding of the disease process and time on their hands; they have been used successfully for years.[15]

Finally, two important insights about data capture are that "Well managed information is based on data that have been validated through day-to-day use"[1] and "all data must be collected for a purpose."[1]

Organisational and cultural issues

As hinted earlier, a recurrent problem with information management systems is excessive emphasis on trangible hardware and software artefacts—and much less concern over abstract informatics and organisational issues such as training.[16] Psychological concerns can also threaten projects, if clinicians fear that their lack of keyboard skills will show them up in front of juniors, or if they suspect that managers will be able to monitor their performance. Cultural issues, such as the attitudes and training of information systems staff and users, are also significant: "The main obstacle to getting better value out of information is that staff seldom understand its value or potential . . . it is vital not to lose sight of what the information is needed for and how the hospital uses it."[1] Once again, the report emphasises clinical users: "Systems must be . . . primarily designed to improve the delivery of patient care, rather than support finance and administration."[1]

As we already know in the NHS, clinicians live in an era of constant change, and information is used both to initiate and to monitor this. Thus, "information needs are not static,"[1] and successful systems are in constant evolution.[17] Equally, no hospital is an island: "hospital information must be integrated with information in other parts of the health care system"[1]—which often means negotiation and respect for alternative standards and views.

Fortunately, many cultural issues, particularly the lack of interest of clinicians about information and information technology, are resolving—helped by conferences on medical informatics sponsored by the BMA and royal colleges, articles in major medical journals, a recommendation by the General Medical

Council that medical informatics should be taught in medical schools,[18] and recognition by the Cabinet Office that this is a priority area for research and development.[19]

Lack of communication between systems

It is generally accepted that the more data that are available from one workstation, the more useful that workstation will be. However, one hospital visited by the Audit Commission had 40 separate audit systems, not one of which communicated with any other system. This contrasts with the finding in an Information Management Group survey of 1993 that a quarter of 1455 administrative systems were linked, and suggests that the clinicians responsible either wanted to avoid linking their audit system—because of confidentiality, perhaps—or could not see the benefits. In another hospital, basic patient details were sometimes recorded 13 times, showing the potential for sharing demographic data. This raises the need for standards to bridge between islands of automation: technical standards for data interchange between computers and "semantic standards" which should ensure that "asthma" on my system does not translate to "bronchitis" on your system. Unfortunately, clinicians can mean different things despite using the same words, even in the same department: a study of how endoscopists described the size of gastric ulcers showed that a "medium" ulcer could range from 2 mm to 50 mm, and that 31% described as "small" an ulcer which another classed as "large."[20] Further work is needed to define areas in which most doctors agree on the meaning of terms most of the time.

One way of reducing the technical problems of interconnecting disparate systems is to purchase or develop an integrated "solution." However, this approach is seldom successful, usually costs around £10m, and takes a median of eight years. It can do nothing to reduce semantic differences, nor will it help in establishing links with the world outside the hospital.

Confidentiality

While it is true that computerised information is "much more readily accessible to outsiders than the same information in filing cabinets,"[1] current concern focuses on insiders.[21] In Australia and the United States, insiders readily gain access to confidential computerised data, either as voyeurs or because they are commissioned by private detectives. The current NHS approach does not seem to take this threat seriously, so a BMA working party is exploring the issues in advance of the national contract clearing house being set up, as the contract minimum dataset includes diagnosis and other sensitive data. One possible solution to this problem within an institution is provided by "monitored notes," in which a log is kept of every person who accesses sensitive data[17]; this mechanism is already used in one British hospital.

Poor quality systems

In many hospitals, the "official" information systems are of almost no value to clinicians; for example, 70% of nurses were doubtful of the benefits of care planning systems.[1] In one system tested by the Audit Commission, doctors had to navigate six screens before they reached clinical data. As the Commission states, "There has been a bias towards administrative and financial systems . . . and failure to involve users, especially clinical professionals, has meant that commitment is lost . . . they have been forced to acquire their own systems."[1] Hospital systems are also very old: the modal age of 166 patient administration

systems was 9 years (range 1-17 years). This causes inflexibility and high running costs, makes them harder to learn, and leads to "technology lock out," making it impossible to interface them to desktop workstations.

The solution here is to focus on useful information and clinical functions, not computer artefacts.[16] "Computers and IT must not be allowed to drive the process of information management, only to serve it"[1]—this means developing usable workstations which delivery immediate benefits to clinicians.[1 22] Although some successes have been reported,[23 24] it will be hard work to develop robust, useful clinical applications which link to hospital and community systems and can be installed on workstations anywhere in the NHS.

Improving the use of data

One mystery surrounding clinical information is that much is collected but never used, despite the obvious costs in time and money of such "stamp collecting."[25] The report on hospital information management makes several suggestions about improving the use of data, such as assuring its quality, providing decision makers with a catalogue of what data exist and where, training them to select data relevant to a decision, and providing them with data in a suitable form (avoiding excessive detail) in time to affect their decisions.[1] Timeliness may be a key problem for the NHS: an Audit Commission study of medical records found that only 40% of patient data were coded within four weeks of discharge.[25] Another suggestion for enhancing use is that we should extract the information we need from raw data, but this implies investments in skills and hardware, especially desktop terminals.[1] In British hospitals, terminals are in short supply, especially for clinical staff, with a median of seven clinical staff (interquartile range 5-11) and four (3-5) administrative members of staff per terminal; neither figure is adequate to avoid queues at peak periods.

Following up these suggestions will provide only part of the solution. The bald facts are that we do not currently know which clinical data are relevant or how they should be presented to ensure a balanced impact on clinical decisions.[3] There is even fear that those who develop or sponsor information systems may unduly bias decisions made by users—for example, deliberately manipulating the prescription of drugs or inadvertently swamping laboratories with requests for certain tests because they are easier to order electronically [G Hayes, personal communication]. Preliminary studies have shown that this problem does exist: for example, obstetricians can be manipulated to intervene in normal labour by merely changing the scale or origin of graphs of cervical dilatation versus time.[26] This problem points again to an urgent need for better understanding about how to summarise and present clinical data to improve decision making and avoid bias, whether deliberate or accidental.

How can we implement these suggestions?

The current position is that various parts of the Department of Health take an active role in developing standards and guidelines for information systems,[27] and the Information Management Group assembles and disseminates these materials.[1] Unfortunately, this approach can lead to a system being judged by compliance with the due process and standards, not by its impact on patients.[1 28] Thus, in the case of procurement decisions there are numerous long and cumbersome documents; the Audit Commission notes that "whether or not the system meets real needs has ceased to be an issue; it is the probity of the process that is used

Box 2—Some concerns and issues in health informatics

Generic issues

Assessing clinical information needs
Reliability and safety of systems
How to design and develop systems
Evaluation and realisation of benefits
How much to computerise
How to link systems

Clinical data systems

Confidentiality of patient data
Error control and correction
Clinically useful data input methods
Time oriented, problem oriented views
Maintaining data integrity

Structure of health care records
Minimum data sets
How to display clinical data
Clinical terms and coding

Clinical knowledge systems

Passive v active decision support
Protocol directed care systems
Linking the literature to patient problems
Context sensitive display of knowledge
Acquiring clinical knowledge
Representing clinical knowledge
Representing uncertainty
Maintaining clinical knowledge

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to judge the success of the project."[1] It suggests that "project managers should set goals, motivate and activate staff, and evaluate achievements," but also notes that "these are not prominent features of most projects."

A key issue is who should lead hospital information projects, since "projects are currently managed by an information technologist, often with no knowledge of healthcare or organisational behaviour. Users are involved too late . . . and are thereby alienated." The clinical viewpoint is now being sought, and the Audit Commission is clear that "the person who leads the implementation should ideally be a clinician" and that "users must be involved from the very beginning . . . the whole process must be owned by senior management [and] involve experts from the NHS Supplies Authority who can draw on their experience."[1] If it is acted on, this is exciting news for health informatics, patients, and the NHS—but few hospital clinicians are enthusiastic about information and its management.

THE NEED FOR AN INDEPENDENT NATIONAL CENTRE FOR HEALTH INFORMATICS

Gaining the enthusiastic collaboration and commitment of clinicians to improving the capture, processing, and distribution of information in hospitals will take time, but it also needs a programme of ongoing education and training. The goal of such courses must be to familiarise clinicians with the generic, enduring issues which comprise health informatics, (box 2)[3 8 22] not with fleeting trends in computer hardware and software.

Equally, it is vital that we explore clinical information needs and sources, how to structure patient data in electronic records,[29] how to summarise and present data to avoid inadvertently manipulating decisions, and how to store, maintain, and disseminate clinical knowledge. Some academic centres already work in these areas but tend to be weighted towards computer science, so few can pursue realistic clinical agendas. Thus, before we can develop robust workstations that benefit clinicians and the NHS alike, a large amount of clinical research and development needs to be completed,[30] and this is currently no one's responsibility.

Evaluation too is an activity which academics find unrewarding, generating a lot of work but few publications. A variety of methods need to be applied, from ethnographic approaches[31] and "user-centred design" workshops, in which clinicians test the ability of prototype systems to help them achieve simulated tasks, to full scale randomsied trials.[28] Whichever techniques are used, evaluation is central to establishing the way forward—or to finding that one has started from the wrong place.

Coordinating this agenda of education, exploration, and evaluation over the coming decades will be a

challenge, especially since there are a dozen clinical computing and informatics groups in the United Kingdom. The Royal College of Physicians' information technology committee and BMA's council have recently given support to a proposal for a national centre for health informatics with this remit, which will be seeking funds from various sources including the Department of Health and research councils. However, the most important factors determining the success of the centre will not be funding but high calibre staff, relevance to the clinical agenda, and a sense of ownership by the clinical profession. Suspicion by clinicians that the centre is connected with resource management or that the coding of data for administrative purposes will lead to failure because of doubts over who is master.

In conclusion, it is exciting to see the statement "While there are important benefits to be gained immediately, the future potential for information backed by good information technology is enormous" appearing not in the exuberant editorial of a computer magazine but in the considered report of the impartial Audit Commission.[1] Given the right balance of clinical education, exploration, and evaluation focused by a national centre for health informatics, only a Luddite could disagree.

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