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Knowledge management

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This is the third in a series of papers on health informatics. Lewis (2002) and McClelland & Thomas (2002) have looked at information organisation and communication, and confidentiality. Future papers will consider knowledge management, audit, telemedicine, secondary uses of patient information and working clinical systems.

Knowledge management sounds superficially like yet another of those topical expressions describing something that has been developed outside medicine and is possibly ill-suited for application within the field, but offering an excuse for yet more change. However, one of the distinguishing features of every profession is that it applies a body of specialist knowledge and skills to a defined purpose. Knowledge in medicine is growing exponentially. In a recent survey of just 22 general practices, the practice guidelines identified weighed 28 kg (Hibble *et al*, 1998)! In psychiatry, about 5500 papers which potentially have clinical relevance are published annually. Keeping pace with knowledge as it grows is a major challenge for all clinicians. This is reflected in the National Health Service (NHS) information strategy, which identifies three specific needs of clinicians (NHS Executive, 1998). These are:

- fast, reliable and accurate information about patients in their care;
- access to knowledge to inform clinical practice;
- access to information to underpin evaluation of clinical practice, planning and research, clinical governance and continuing professional development.

All of these include an important element of knowledge management.

Data, information and knowledge

Knowledge is built up from data and information as well as prior knowledge.

Data have no meaning or significance in themselves. Examples include individual mental symptoms shown by a particular patient or items in a computer spreadsheet. Information is data which have meaning because of a relational connection. In other words, information is data which have been processed to be useful. Information aims to provide answers to the questions 'Who?', 'What?', 'Where?' and 'When?' It is worth noting that although information is intended to be useful, it is not necessarily so. Merely aggregating data and identifying relationships between variables does not guarantee utility. Knowledge is information to which a process has been applied, which may eventually become expertise (Liebowitz, 2000). It is 'the collation of information for a particular purpose, intended to be useful' (Bellinger *et al*, 1999). Knowledge aims to answer the question 'How?' Developing new knowledge from that which already exists to answer the question 'Why?' may be defined as understanding. However, while knowledge is a necessary prerequisite for understanding, the availability of appropriate knowledge does not guarantee understanding.

The relationships between data, information and knowledge are summarised in Fig. 1. However, this is not necessarily unidirectional, but is often circular or iterative. For example, individual items in a clinical data-set constitute data. When aggregated, they can yield information, which in turn can be

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appraised and interpreted to give knowledge. However, designing a clinical data-set includes making a decision about which items are needed and how they should be coded. These decisions are informed by existing knowledge, but they may need revision in the light of new knowledge developed from the use of the data-set. In the same way, reviewing the formulation of an individual patient's presenting problems (knowledge) may lead to a reappraisal of individual symptoms (data).

Figure 1 also aims to distinguish knowledge management from data management, information management and information technologies. Information technologies, as the term is used in everyday language, are tools which support the management of data, information and knowledge. They include computer hardware and software, storage, indexing and retrieval systems, and so on. Data management and the technologies available to support this are relatively simple. An example would be a simple spreadsheet. Aggregating and analysing data from such a spreadsheet using statistical software, or bringing data together from different sources using a relational database, illustrate information management. In practice, these technologies clearly overlap. However, this overlap has been exaggerated by conceptual confusion. For example, the main purpose of the NHS strategy defined in *Information for Health* (NHS Executive, 1998) appears to be to optimise knowledge management, even though the document focuses on information management and does not make a clear distinction between these two areas of activity. The distinction is important because it helps to highlight the central role in health care of methodologies and technologies supporting knowledge management.

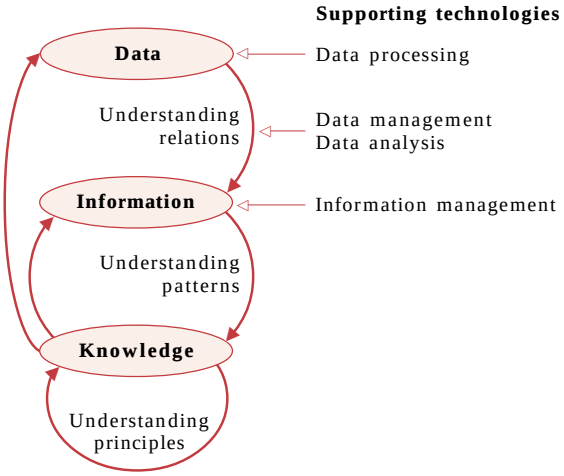

Fig. 1 Relationships between data, information and knowledge (after Bellinger *et al*, 1999)

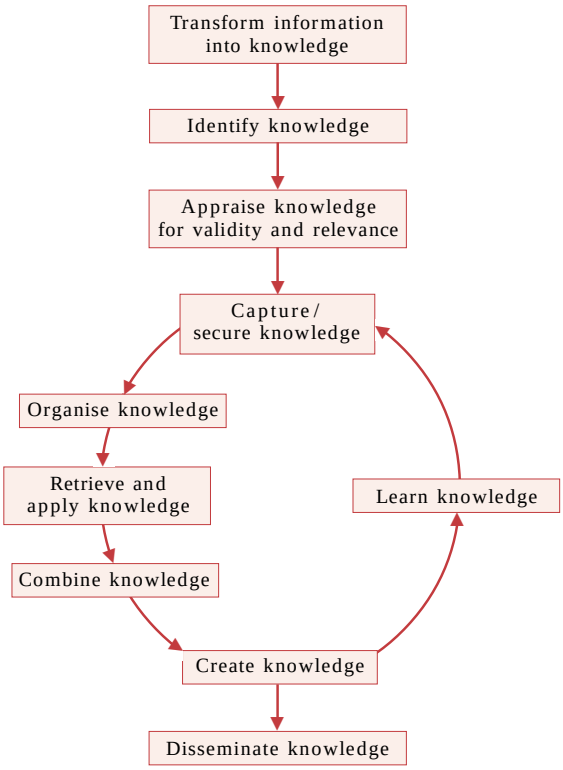

Fig. 2 Elements of knowledge management (after Liebowitz, 2000)

Knowledge management

A general definition of knowledge management, adapted from Macintosh (1997), is that it 'comprises the identification and analysis of available and required knowledge, and the subsequent planning and control of actions to develop knowledge assets so as to fulfil individual and/or organisational objectives'. The processes and outcomes of knowledge management are summarised in Fig. 2.

Within psychiatry, knowledge management can be defined as the creation, acquisition, analysis, maintenance and dissemination of knowledge for the benefit of patient care.

The nature of knowledge

To understand the knowledge needs of an individual or an organisation and how these might best be met, it is often helpful to distinguish between different types of knowledge. Knowledge-management experts

identify different types, each with its own properties and associated processes (Menzies, 1999). However, simpler classifications can be very useful.

A distinction is commonly made between tacit and explicit knowledge. Consider the scenario in which a consultant is phoned in the early hours of the morning by the on-call senior house officer (SHO) asking for guidance about risk assessment for someone presenting following an overdose. If the consultant merely elicits the key features of the case that are relevant to risk and then tells the trainee what to do, this would be the application of tacit knowledge. The knowledge rests with the individual in a form which cannot be transferred for use by others. Knowledge gained through personal experience is tacit knowledge. On the other hand, if the consultant reviews the application of the principles of risk assessment in this particular case with the trainee and helps her to form her own judgement, this would be the transfer of explicit knowledge. If staff in the trust concerned had developed guidance notes on risk management of deliberate self-harm, these would also be an example of tacit knowledge, explicitly stated and readily accessible to anyone who requires it. In the literature about knowledge management, it is commonly assumed that in order to use or otherwise manage knowledge, it must be converted, where necessary, from tacit to explicit. This conversion is a major challenge to organisations, especially where expert knowledge is carried by individuals. Although these principles have been identified as pertinent to commercial organisations, they probably also apply to a large extent to medicine in general. They are also applicable in psychiatry, although there may be some exceptions such as some processes in psychotherapy supervision.

It can sometimes help to divide knowledge into that which is superficial and that which is deep. Following a simple management plan dictated by a protocol requires only superficial knowledge. Understanding the principles underlying the protocol requires deeper knowledge.

A distinction between catalogue knowledge, process knowledge and cultural knowledge may also be helpful. Catalogue knowledge is the simplest form and requires the least specialist input into its development. It is possibly the easiest form to measure. An example would be knowledge about a general psychiatry service's access to specialist services, and their relative merits. (Note that a list of addresses and telephone numbers on its own constitutes information rather than knowledge.) Process knowledge is exemplified by clinical practice guidelines, protocols and care pathways. Cultural knowledge relates to the application of the two other types in a specific setting.

These classifications of knowledge are not mutually exclusive. For example, the range of interventions used within the Care Programme Approach (CPA) by a particular community mental health team, which have to some extent been defined by the team's expertise and resources, involves cultural as well as process knowledge. The former will, in most instances, be tacit, while the latter may be explicit to some degree, depending on the extent to which the team follows care pathways or guidelines. If the team is, for example, following prescribing guidelines, the psychiatrist(s) in the team would be expected to have deep knowledge about their contents, while other team members would only need more superficial knowledge.

It becomes apparent that breaking knowledge down into its components may help to identify training as well as information needs. Conversely, by investigating knowledge itself, can we expect to gain a better understanding of its application and management in clinical practice? Knowledge and its properties have been the focus of much attention in philosophy. Other disciplines, notably anthropology, also provide valuable insights into the common features of knowledge applied in different settings (D'Andrade, 1995).

Knowledge management and the individual clinician

The example above suggests that, although few clinicians receive formal training in this area, they have to develop sophisticated knowledge management skills in order to practise effectively. A psychiatric trainee moving from one post to another has to acquire new knowledge, much of it tacit, at all levels: catalogue, process and cultural. It could be speculated that explicitly recognising this as part of clinical practice would not only assist in the development of appropriate training, but also help to provide a better understanding of problems when they occur.

More generally, the need for personal knowledge management skills underlies the widespread acknowledgement that now, more than ever before, it is impossible for a clinician to acquire sufficient knowledge during training to equip him or her for the duration of a professional career. This is reflected not only in the importance attached to continuing professional development, but also in the change in emphasis during undergraduate medical training from the acquisition of facts to the development of skills needed for lifelong learning.

Perhaps the most obvious application of individual knowledge management is evidence-based practice.

Box 1 Components of evidence-based practice (after Sackett *et al*, 1997)

Convert information needs into answerable questions
Efficiently find the best evidence available to answer the questions
Critically appraise the evidence for its validity and its applicability to clinical practice
Apply the results, where appropriate, to the original question
Evaluate the outcome

Evidence-based medicine has been defined as a process of lifelong self-directed learning in which caring for our patients creates the need for clinically important information (Sackett *et al*, 1997). The process of evidence-based practice involves several steps (Box 1) which closely mirror those identified as contributing to knowledge management. This is hardly surprising, since evidence-based practice is, in effect, a systematic method of identifying and managing specific gaps in knowledge.

The application of evidence-based practice to individual patients offers two important lessons about knowledge management. First, a great deal can be learned from individual cases. Second, whether or not knowledge is gained in this way depends heavily on the skills and processes applied. If inadequate attention is paid to these, commonly little or no knowledge is gained. For example, before conducting a literature search, the question must be formulated in a way which will optimise the chances of finding relevant material (the so-called four-part question) (Richardson *et al*, 1995). This is a specific skill which can be acquired by training and practice. Using predefined search terms or filters can also considerably increase the efficiency and productivity of the search. In essence, these filters are technologies supporting the search for evidence. Without these skills and technologies, literature searching often proves unproductive and, in some instances, completely unsuccessful. Other methodologies are also available to enhance learning from single cases (Box 2).

Expert systems to support decision-making are another example of knowledge management which have found application in other medical specialities more than in psychiatry. A decision-making algorithm is developed which takes account of the key independent variables. The clinician enters the values of the independent variables for the patient concerned and the algorithm is applied to present the best decision. Such expert systems would be extremely useful, for example, in the prediction of risk, and it is interesting that no such system is yet in common use. A key reason is that, to date, it has not proved possible to develop reliable mathematical models for important decisions, such as the probability of a patient harming someone else. This may be because the models required are extremely complex. A more radical view is that common assumptions regarding decision-making, which also underlie the development of the algorithms, are actually wrong and cannot adequately reflect real-life decision-making. Decision-making is usually modelled using Bayes' Theorem, but there is evidence that, in real life, both clinicians and lay people tend to make at least some decisions using simpler mechanisms (Gigerenzer *et al*, 1999).

Box 2 Examples of methodologies to enhance learning from single cases

Technique	*Comments*	*Reference*
Clinical supervision	The most widely used methodology at postgraduate level, but not always systematically applied	Kilminster & Jolly (2000)
Log books or 'progress files'	Can be effective in enhancing learning, including self-reflection	Pee *et al* (2000)
Critical incident analysis	Developed as a method of acquiring specific knowledge and skills – applied to date in other specialities (e.g. anaesthetics) more than in psychiatry	Flanagan (1954)
Case-based reasoning	Application to current instances of precedents from known cases – developed by information technologists but not yet widely applied	Watson (1999)

Why case-based knowledge management is under-utilised

As with knowledge management in general, evidence-based medicine can be optimally applied only if it is integrated into everyday clinical practice as fully as possible. Many clinicians who have received no training in critical appraisal or the other components of evidence-based practice (Box 1) are unaware that they lack the requisite skills. Without training, their skills in this area are often not comprehensive and even when the individual makes the effort to search for and appraise evidence, lack of success and / or the excessive time taken rapidly discourage further progress. Some clinicians are wary of admitting to patients that they have gaps in their knowledge. Personal experience suggests that, far from being disconcerted, patients actually value the fact that their doctor is making the effort to seek the latest and most robust information available to contribute to their management. Telling patients that you are going to do this also acts as a powerful incentive to follow the action through, because they will usually want to know the outcome of the search at their next appointment.

Knowledge acquired from individual cases is subject to numerous pitfalls, which can discourage clinicians from pursuing this further. Perhaps the most striking example in psychiatry is the knowledge gained from independent inquiries into homicides, suicides and other serious incidents. Clinicians, like lay people, are susceptible to substantial bias in the retrospective interpretation of events. When examining the origins of a serious incident, there is a common tendency to assume that the incident was inevitable, rather than to ask the clinically pertinent question: how likely was it that this incident would occur, based on prior available information plus existing knowledge? This error, which can sometimes have very wide-ranging repercussions, is due to a specific inadequacy in knowledge management skills. Much more common is the tendency shown by some experienced clinicians to apply anecdotal evidence from past cases to current clinical problems. The problem here, as often also applies in independent inquiries, is that the most memorable cases are often the most atypical, and thus the least likely to yield knowledge that can be generalised.

Perhaps the most challenging problem facing clinicians trying to learn from individual cases is to disengage the process of learning from mistakes, from the admission of failure. This applies to other professions as much as to doctors (Argyris, 1998). Solving this problem requires organisational as well as individual changes and it is discussed below.

Box 3 Auditing information management in an organisation (Liebowitz, 2000)

Identify the information needs of the organisation and of individuals working in it
Identify information created within the organisation and attempt to assess its value
Identify expertise and knowledge assets
Identify information gaps
Review current use of internal and external information sources
Map information flows and identify bottlenecks
Develop a knowledge map of the organisation, indicating appropriate connections

Knowledge management in organisations

Many types of knowledge can help organisations fulfil their objectives more successfully. One problem with the current enthusiasm for research evidence is that randomised controlled trials, rather than being perceived as the gold standard among a host of different types of valid evidence, are sometimes considered to be the only acceptable form of evidence. Virtually all the information collected by an organisation may be useful in developing knowledge. For example, practice-based evidence, derived from systematic collection of comprehensive outcome data, is likely to contribute to the development of psychotherapy services (Margison *et al*, 2000) as well as other mental health services.

What often works against the productive collection and application of clinical information in many NHS trusts is that their information systems are poorly integrated with clinical practice. Either the information system has been designed to meet very limited objectives (such as gathering purely administrative data) or it functions in parallel with routine clinical practice rather than being properly integrated with it. However, it follows that many clinicians are not as familiar as they should be with the sources of information available to them as starting points for knowledge. An essential prerequisite of knowledge management within an organisation is to audit the way in which information is processed (Box 3). Beyond this, a set of factors can be defined which describe how effectively an organisation manages its knowledge. Numerous descriptions of these factors are available on the internet and in 'hard copy' form. Box 4 offers one example. These factors can be grouped into values, behaviours and processes supported by appropriate technologies.

Box 4 Tests of organisational knowledge management (Webb, 1998)

Can we transfer knowledge easily to new staff?
Is ours an information/knowledge-sharing culture?
Do we know what and where our knowledge assets are?
Is knowledge organised and easy to find?
Do we capture and share best practice?
Do we learn from mistakes?
Do we reward knowledge-sharing?
Are we exploiting knowledge effectively and strategically?
Does our knowledge walk out of the door as staff leave?

Learning organisations

It could be argued that knowledge only realises its true value when it is integrated into learning by an individual, a team or an organisation. Learning organisations possess two characteristics (Garvin, 1998). First, the organisation is skilled at creating, acquiring and transferring knowledge. In other words, it has effective knowledge management. Second, it can demonstrate changes in its behaviour in the light of new knowledge. The same two sets of characteristics apply equally to learning individuals or teams. Of these characteristics, the absolute prerequisite is the potential to show change in behaviour. Learning can be exhibited without effective knowledge management, but then it is likely to be haphazard. In practice, knowledge management and learning organisations should be closely linked.

Different levels of learning can be differentiated. At the basic level, an audit might reveal unsatisfactory performance against predefined standards, and practice is consequently changed in an attempt to improve performance. Because it resembles a simple feedback loop, this is sometimes called single-loop learning (Argyris, 1998). Using new knowledge to develop a totally new practice reflects a more sophisticated form of learning. Organisations will also find it helpful to examine when and how they can achieve optimal learning conditions, and what barriers exist within the organisation that impede learning. This is termed meta-learning (Davies & Nutley, 2000).

In essence, a learning organisation is one that values knowledge and recognises it as central to organisational development. Individuals' knowledge is nurtured, but it is understood that the organisation should be able to develop this into corporate knowledge.

Barriers to applying knowledge management

Although failures in knowledge management are commonly blamed on inadequate resources, the main barrier is likely to be the culture within an organisation, with other barriers commonly cited being lack of time and lack of ownership of the problem (Webb, 1998). The cultural values which underpin learning organisations (Davies & Nutley, 2000) are precisely those likely to yield positive answers to the questions in Box 4. These include trust, openness and a tolerance of mistakes. These values need to be reflected throughout any organisation. Within NHS trusts, it is particularly important that clinical teams share these values, since most work is done within teams and the need for knowledge and learning is particularly important within these groups. Very few clinical teams or organisations have come close to the successful development of the 'no-blame' culture which is the cornerstone of the learning organisation and hence also of the successful application of knowledge management. Having a chief knowledge officer within an organisation (Gray, 1998) may well be very helpful in ensuring the development of the processes and technologies necessary to support knowledge management. Although this is certainly a prerequisite for effective knowledge management, on its own it is unlikely to ensure that the organisation uses this skill to its full advantage.

Auditing knowledge management and organisational learning

Any audit must begin with a clear conceptualisation of the process to be assessed and the generation of measurable (usually operationalised) outcomes based on defined standards. The previous discussion of knowledge may assist in conceptualisation, and many of the points in Boxes 3 and 4 can be put into operation, allowing them to be audited. At present, very few NHS trusts are likely to score well in such audits. However, this is perhaps not surprising, given that for the vast majority, it appears unlikely that they have attempted to evaluate their working practices in terms of knowledge management, or even as learning organisations.

A simple audit for an NHS trust (or other organisation) wishing to examine the extent to which it has

developed a learning environment is to ask staff members to identify one change in practice in the preceding 12 months that resulted from new knowledge, and to summarise that knowledge. If the audit also asked staff to identify the sources of the knowledge which proved useful, the data collected would yield information about the trust's knowledge management resources, going some way towards answering the points in Box 3.

Clinical governance: the context of knowledge management

All health care staff are keenly interested in providing the best care for their patients. Clinical governance represents a systematic approach to fulfilling this aim. As with knowledge management, clinical governance needs to be integrated into clinical work at every level. With piecemeal development there is the risk that conspicuous gaps will be left and idiosyncratic policies and procedures will develop. It is impossible for a trust or clinical service to meet the objectives of clinical governance without valid and reliable information and effective knowledge management. To optimise the effectiveness of patient care, including responding as necessary to new developments in health care and the changing environment in which it operates, an organisation must have a learning culture plus good knowledge management. An NHS trust which can endorse the points in Boxes 3 and 4 will have come a long way towards fulfilling its clinical governance objectives. Conversely, it is difficult to see how clinical governance could be pursued effectively in the absence of well-developed knowledge management systems. It could even be argued that clinical governance is no more than a specific application of knowledge management. Although this may be a provocative view, seeing clinical governance in terms of knowledge management helps to stress the vital importance of appropriate methodologies and technologies, rather than seeing these as luxuries or 'add-ons'. As it has been expressed by one knowledge management expert, 'knowledge management is expensive … but so is stupidity' (Davenport, 1998).

A personal reflection

Preparing this paper has itself been a useful personal experience of knowledge management. Much of the literature I found was from unfamiliar sources and it was striking that, despite the clear importance of knowledge management to medicine, most of the literature referred to business settings. In appraising this literature, I found it very difficult to apply the standard methods used in evidence-based medicine. Two main factors influenced the decisions about what to include in the paper. First, some concepts and / or authors were cited in multiple sources, suggesting that they had been appraised as useful and relevant. Second, and even more important, it was possible to identify examples from psychiatric practice, indicating that they at least had face value. This process has certainly given me new knowledge. In preparing this paper, I aimed to determine how far I could gain access to sources of appropriate information and knowledge without leaving my desk. This paper has been written entirely in this way. I identified relevant books from Amazon (www.amazon.co.uk), an internet source which includes commentaries on their contents, and then searched the on-line library catalogues of the British Medical Association (http://www.bma.org.uk/ap.nsf/content/_Hub+library) and the Royal Society of Medicine (http://rsm-hp.roysocmed.ac.uk/uhtbin/cgisirsi/) to check their availability and arrange to borrow them. All the journal articles cited (and many more) were also accessible on the internet in full-text format (including *Advances in Psychiatric Treatment*, at http//apt.rcpsych.org, and *The British Journal of Psychiatry*, at http//bjp.rcpsych.org), demonstrating the value of this resource. Several journals are currently available free of charge in full-text form on the internet. A more comprehensive list of on-line medical journals can be found at http://www.freemedicaljournals.com. I had access to a wider range of journals through an academic library than through NHS sources, highlighting the continuing need to strive to make such resources more widely available within the NHS. Websites on knowledge management and information management and technology are listed in Table 1.

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Table 1 Some resources for knowledge management and related topics on the internet

Knowledge management	
The Knowledge Management Center	http://www.kmresource.com/exp.htm
Sveiby Knowledge Management Library	http://www.sveiby.com.au
Virtual Library on Knowledge Management	http://www.brint.com/km/
Open Directory – Reference: Knowledge Management	http://dmoz.org/Reference/Knowledge_Management
Financial Times – Knowledge Management	http://www.ft.com/ftit/bsskm.htm
Information management and technology	
NHS Information Authority	http://www.nhsia.nhs.uk
Information for Health	http://www.nhsia.nhs.uk/def/pages/info4health/contents.asp
Working Together for Health Information (NHS Executive)	http://www.nhsia.nhs.uk/ppt/hc2000/etd.ppt
Introduction to Health Informatics for Hospital Doctors	http://www.schin.ncl.ac.uk/hicourse
National electronic Library for Health	http://www.nelh.nhs.uk

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Multiple choice questions

1. Knowledge includes:
   a aggregated data
   b disaggregated information
   c all available information
   d appraised information
   e personal experience.

2. Knowledge management:
   a is synonymous with information management
   b refers to a particular application of information technology
   c is predominantly an organisational activity
   d is mostly dependent on valid and reliable data processing
   e is usually difficult to audit.

3. The following are essential features of effective knowledge management:
   a appraising information
   b having ready access to a library
   c having experts available who can undertake this task for the organisation
   d appraising existing knowledge
   e disseminating knowledge.

4. The following statements are correct:
   a tacit knowledge is difficult to disseminate
   b within a clinical team, where knowledge is required on a particular topic, all members should strive for deep rather than superficial knowledge
   c process knowledge is always explicit
   d cultural knowledge is more important than process knowledge
   e clinical practice guidelines are examples of explicit process knowledge.

5. In an organisation effectively geared towards learning:
   a there are mechanisms to transfer knowledge from individuals to the organisation

b there will usually be evidence of effective knowledge management
c there is always someone senior within the organisation in charge of knowledge management
d there will usually be evidence of effective sharing and dissemination of knowledge
e the importance and value of knowledge is shared by all staff, not just those in senior positions.

MCQ answers

1	2	3	4	5
a T	a F	a T	a T	a T
b F	b F	b F	b F	b T
c F	c F	c F	c F	c F
d T	d F	d T	d F	d T
e T	e F	e T	e T	e T

Commentary

Paul Booton

'Knowledge management' is not a term which makes the pulse race. It smacks of a combination of dull facts and bureaucracy. It could almost be something from a European Commission (EC) directive on the training of taxicab drivers. Neither Bellinger *et al*'s (1999) definition of knowledge ('the collation of information for a particular purpose, intended to be useful') nor Sensky's (2002, this issue) own definition of knowledge management make it sound much more exciting.

This dryness does the subject no favours. The key issue here is not about some anodyne or trendy new management tool, nor a further extension of bureaucracy into our working lives, but rather about how we make the best of the knowledge base that defines our disciplines, in an age where such knowledge arrives through the post by the kilogram and down the wires by the megabyte. The methods we devise to cope creatively with new information are at the heart of knowledge management, and the volume of new knowledge only enhances the importance of the process.

There is a danger in this of seeming to reinvent the wheel, or at any rate the cycle: the knowledge management cycle is to all intents identical to the learning cycles found in adult-learning literature, which again look very like the audit cycle. This is not surprising: they are simply different ways of expressing the same concepts from differing needs and viewpoints.

It seems to me that there are three reasons for developing our knowledge management skills. The first is personal: we need to have a strategy which makes sense of a burgeoning knowledge load for our own good practice and professional satisfaction. The second is for our teams, to allow them to use and understand best practice at whatever level they are working in our organisations and, by doing so, to improve their professional competencies and make their work more fulfilling on a personal level. The third reason is that, by organising and aggregating knowledge in ways that give it meaning and context, we provide the foundations on which our own understanding can be progressively elaborated and deepened and on which the next generation of clinicians can build.

I still shrink from the term 'knowledge management'. There are other, more venerable words which perhaps feel strange when applied personally. It may feel uncomfortable saying 'I am an expert' (try it in

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front of the mirror) even though this is in fact a perfectly accurate descriptive statement of one's abilities. The educational wisdom of the 1970s was that levels of generic 'thinking skills' defined personal expertise. Knowledge was the neutral substrate to which such skills were applied. We now realise that this badly undervalued the role of knowledge to the extent that the most important factor in determining expertise is now believed to be in the quantity and quality of knowledge possessed by an individual. So, good knowledge management links directly to emerging levels of expertise and is thus a critical part of personal intellectual development.

It is naïve to think that such expertise comes easily, or that all can be equally good at it. It is similarly naïve to think that it can be written down in easy steps, but to attempt to express it is crucial. Education experts have long been aware that nothing focuses our understanding more than having to give it expression. It is not that by expressing it we prove that we have the understanding, but rather that the very act of expression forces us to systematise and make sense of an issue. It goes without saying that although this is essential for us as individuals, it is also important as we try to ensure that members of our teams have access to this wisdom in a form that each can access and use. Not all will be experts, but for all there is the opportunity to improve personal levels of understanding and ability.

Notwithstanding the importance of knowledge to the development of expertise, knowing facts is not synonymous with being an expert. The expert is a person who makes a good judgement where others may make a less good one. It is not always clear what informs such good judgement; knowledge is obviously an important aspect, but not the only one. Sensky comments on the orthodox teaching of clinical decision-making based on Bayes' Theorem, in other words of probabilistic decision-making based on our prior knowledge and experience. But real life is not so elegant. Georges Bordage, the Canadian medical educationalist, has found that expert clinicians do not use a probabilistic model of problem-solving, but rather carry with them something more like a series of templates (Bordage & Zacks, 1984). Diagnoses for them are not the painfully slow process of working through probabilistic algorithms, but they emerge swiftly after a few well-chosen questions. Literature about thinking in the general psychological world is emerging to support this: solutions to problems often arise not through any logical deductive process but when the brain is apparently switched off or concentrating on something else. Although knowledge informs such a process, the way it does so is anything but clear. However, the fact that we are unable to systematise all expertise does not mean that it is not there. None of this makes the task of disseminating wisdom or managing knowledge easier, but neither does it make it less important. For their own sakes as well as that of others, experts need to open up their thinking processes as far as they are able, making them 'explicit'. If they fail to do so, they risk making opaque judgements unknowingly coloured by prejudice.

The old concept of clinical freedom which doctors enjoyed has all but vanished. Is it a coincidence that the new doctrine of patient-centredness has arisen as the other has fallen? I think not. Clinical freedom was about doctor-centredness: the right of a doctor to treat his [*sic*] patients the way he thought best. It was a doctrine that valued personal prejudice above clinical knowledge. It spoke of the omniscience of the doctor and his lack of need to justify decisions to either patient or colleague. Patient-centredness requires decisions based on the best available evidence, managed by an informed team and negotiated with patients in ways which allow them to be active participants. The philosophies underpinning knowledge management are near the heart of patient-centred care and team-based practice. They require us to sift the evidence, synthesise the knowledge and articulate it in appropriate ways to patients and team members alike.

Knowledge management is perhaps to the 21st century what alchemy was to the 12th. Alchemists aspired to turn base metals into gold; knowledge management experts aspire to turn basic data into wisdom. Let us hope that our success is the greater.

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