10. Management of explicit and tacit knowledge

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Knowledge can be classified broadly as either explicit or tacit[1]. Explicit knowledge consists of facts, rules, relationships and policies that can be faithfully codified in paper or electronic form and shared without need for discussion. By contrast, tacit knowledge (or intuition) defies recording. This kind of knowledge underlies personal skill, and its transfer requires face-to-face contact or even apprenticeship.

Over time, some tacit knowledge does become amenable to analysis and decomposition, allowing recording in explicit form. An example is the evidence-based interpretation of diagnostic tests, in which the emphasis is on prior probabilities and likelihood ratios[2] rather than intuitive judgment. But we still hear the argument that by making tacit knowledge explicit we destroy it, or that most knowledge exists in the work of effective teams—'knowledge in action'[3]. Clearly I disagree. Much of the medical progress in modern times has been attributable to an evolution from tacit to explicit knowledge, and its sharing by other groups including patients and the public.

In a key paper Hansen *et al.*[4] match the two kinds of knowledge to two kinds of problem, two kinds of professional and two knowledge-management strategies. The strategies are codification and personalization. Codification means identifying, capturing, indexing and making available explicit knowledge to professionals who are team players, willing and able to apply the knowledge in solution of everyday problems. Personalization means providing creative problem solvers—individuals with the tacit knowledge to solve one-off problems—with the means to identify and communicate effectively with other experts. The distinctions between and implications of these two strategies are explored in Table 1.

KNOWLEDGE MANAGEMENT STRATEGIES FOR THE NATIONAL HEALTH SERVICE

One of the challenges of healthcare is that routine questions and tasks are intermingled with one-off, ill-formed, strategic dilemmas. This means that both strategies for knowledge management are needed, in ratios that will differ between functional units. Thus a unit that deals largely with routine cases might wish to expend 80% of its knowledge management resources on the codification strategy, while a unit in which most patients require creative solutions might devote 80% to the personalization strategy. By definition, routine patient management problems occur most frequently in front-line clinical units such as NHS Direct and general practice, and in district hospitals services that deal with a chronic disease affecting a single body system, such as asthma, ischaemic heart disease or epilepsy.

Examples of knowledge codification strategies adopted by the NHS for routine problem areas include the National Service Frameworks, guidelines from the National Institute for Clinical Excellence (NICE), care pathways and the triage algorithms used in the NHS Direct decision support system. The aim is to disseminate a standard approach based on best NHS practice, to move toward uniform reliable patient management and support systems and to raise performance to that of the best units. Such an approach should also help to simplify the organization of services, reduce anomalies such as postcode prescribing, reduce errors, contain costs and simplify clinical governance.

However, the NHS still has a long way to go to achieve the goal of providing ready access to and regular use of codified knowledge to solve most common problems. One reason is that many clinicians are highly educated analytical thinkers with an individual streak, reluctant to share their own knowledge or to apply codified knowledge developed by others in the cause of greater uniformity and better organizational performance. This is not our fault: at school and university we were rewarded for keeping our knowledge to ourselves and taught that to copy others was cheating[5]. As doctors we tend to look for differences between patients and for rare problems rather than applying well-worn solutions. We still select medical students from high academic achievers and train doctors to invent solutions by teaching them basic sciences and encouraging them to do research. We also use one-to-one clinical mentoring even though staff more readily apply uniform strategies for routine problems when they are trained in multiprofessional teams[4]. We certainly do not yet have a library of policies and procedures, standard data collection forms or risk assessment tools accessible from all parts of the organization, even if we have recently employed a handful of clinicians working to the organization's agenda to develop these (see Table 1).

A further obstacle arises from our failure to invest in the technology and infrastructure required by the codification

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Table 1: **Comparison of strategies to manage explicit and tacit knowledge, based on Hansen (Ref. 4)**

	Codification for explicit knowledge (people to documents)	***Personalization for tacit knowledge (people to people)***
Intended result for organization	Uniform, high quality solutions to most problems; contain current risks and costs	Unique, appropriate, creative solutions to strategic problems; exploit opportunities and contain future costs and risks
Type of problem targeted and solution preferred	Routine, short-term, low-risk problem for which a good-enough solution is available but is not usually applied	One-off, medium to long-term, high-risk, strategic problem with no precedent needing a novel, customized solution
Knowledge management goal	Re-use of explicit knowledge by capturing, codifying, classifying and making available knowledge to support routine problem solving	Sharing of tacit knowledge by helping staff to identify relevant experts and enhance conversations to create novel solutions
Lego analogy	Re-using Lego bricks to build a range of models	Creating a new Lego product, e.g. Mindstorms control system
Type of professionals targeted	Implementers: bright graduate team players, trained in groups, willing to apply methods developed by others	Highly paid inventors: creative analytical thinkers trained one to one by mentors
Primary user questions	What problem is this, how does the organization usually respond?	What form might a solution take, who might know about this?
Typical knowledge management tools and techniques used	Library of procedure and policy documents, guidelines, data collection forms, typical cases, risk assessment tools accessible from all parts of the organization	Online CV, list of skills and publications for staff and external experts; e-mail discussion lists; regular case meetings, workshops and road shows; video-conferencing; co-locate staff, provide coffee area, staff secondments
Source of the knowledge being managed	Professional analysts working to the organization's agenda	Creative experts, whether internal or external, working to the problem owner's agenda
Level of IT and knowledge management investment	Intensive investment, justified by multiple knowledge re-use	Modest investment, justified by improved frequency and quality of communications
Staff incentives to encourage system use	Reward the use of and contributions to document databases; recognize staff adherence to policies	Reward direct communication with or being contacted by others; recognize experts and original solutions
Typical commercial organization	Service industry, provider of customized goods	Strategic consultancy, research, e.g. Hewlett Packard product development team
Matching NHS organizations	NHS Direct, primary care, PCG, health authority, NHS trust, NHS Supplies	Tertiary care centre, NHS Executive, NHS Estates

strategy. High-quality knowledge must be available quickly enough to be useful. Compare what happens in business. Ernst and Young's Centre for Business Knowledge employs 250 well-qualified professionals, with a further forty in each practice area (equivalent to a clinical specialty) to identify, capture, codify and disseminate good practice from company documents[4]. The NHS, with twenty times as many professional staff and a much greater problem throughput, can boast five professional staff in the National Electronic Library for Health together with two dozen employed by NICE and the National Service Framework authoring process.

LIMITS OF THE CODIFICATION STRATEGY

It is not only clinical care that sometimes demands a creative approach and exchange of tacit knowledge. Creative problem-solving is also needed to advance healthcare development, which Sir Michael Peckham defines as the process in which 'innovative use is made of knowledge and information to turn ideas and technologies into the provision of better, affordable health care'[6]. We do have modest informal networks and other methods for tapping the intuition of clinical and strategy experts in the NHS, industry, medical schools and elsewhere, but much more could be done, with the techniques suggested in Table 1, to implement this personalization strategy. However, most problems—whether in patient care, health promotion, service delivery or performance management—are by definition routine, and acceptable solutions can usually be assembled from existing evidence[7], guidelines or expert consensus. What is more, since routine problems occur frequently, a learning organization can enhance its codified knowledge by monitoring adverse outcomes and investing in quality improvement[8].

An alternative view of medicine is that every patient and encounter is unique, so that each poses the clinician with a different dilemma requiring a creative individual solution. However, it is unwise and impractical for every clinician to indulge in creative problem solving for every patient—or even a substantial minority. If every management plan has to be created from the ground up, with all its uncertainties, this risks reinvention, ignores existing knowledge, and abdicates our professional responsibility to manage patients according to what society can afford. Treating common problems with widely agreed and carefully validated solutions is also faster and less likely to introduce error, misunderstanding and inequalities, and should be more efficient. This is not the same as saying that the NHS should offer only one therapy for each disease. It could follow the example of the personal computer manufacturer Dell, which applies a knowledge codification strategy and offers its customers 40 000 validated alternative products[9].

MANAGEMENT OF TACIT KNOWLEDGE

Previous articles in this series have discussed evidence for the effectiveness of techniques for managing codified knowledge such as practice guidelines (article 3), decision support systems (article 9), tools for empowering patient choice (article 6), access to reference databases (article 5) and the Internet (article 8). Few research groups have explored techniques for managing tacit knowledge in healthcare. Einbinder *et al.*[9] targeted referrals, developing a map of the process of selecting consultants and populating this with patient and provider preferences, to assist better informed choice based on a wider range of criteria. O'Brien *et al.*[10] expended much effort simply obtaining up-to-date information about consultant specialties and other services from NHS organizations. They then incorporated these data into a comprehensive electronic directory, which they provided to nineteen GPs. The GPs who used the directory rated it easy to use and fast to learn from and preferred it to paper-based information for use during consultations. Evidence that members of a clinical specialty do exchange and accumulate tacit knowledge comes from a systematic review of studies examining knowledge, practices and practice outcomes of cardiologists and others[9]. Cardiologists were more knowledgeable than other clinicians about the investigation and management of ischaemic heart disease but not, surprisingly, about the use of angiotensin converting enzyme inhibitors for heart failure. Patients with ischaemic heart disease or heart failure were more likely to receive evidence-based care and have good outcomes when managed by cardiologists than when managed by generalists. The advantage of specialist care has also been shown for asthma patients managed by UK chest physicians[12].

CONCLUSIONS

The future of knowledge management in health is bright. We already have adequate technology in the shape of the Internet and a good intellectual framework in evidence-based health, which are being used to improve each other[13]. We also have many health librarians who are knowledge management professionals[14]. Computer tools for helping health professionals manage explicit knowledge, developed in the 1980s, have been greatly refined[15].

Recognizing that knowledge and knowledge workers are the key asset of any health system, the NHS has already started a programme of knowledge codification to inform routine problem solving. This includes developing a National Electronic Library of Health and appointing a senior library policy maker as a regional director of knowledge management and research and development. However, more needs to be done[16], including clarifying the two strategies described above, and linking these strategies with those for human resources, clinical governance, quality improvement, risk management and patient participation. Knowledge is every professional's concern, so the best policy may be to appoint specialty knowledge advisers or champions, rather than a chief knowledge officer in every NHS trust as proposed by Gray[17]. An economic analysis indicates that, when specialties and health organizations collaborate and share explicit knowledge in this way, each gains more than it invests[18].

Turning to tacit knowledge, we do already have some informal networks and a few tools to assist in the identification of and communication with experts. The personalization strategy for knowledge management does need to be developed, but not at the expense of distracting clinicians, policy makers and funders from the key task of making agreed explicit knowledge readily available in suitable forms. Finally, a key lesson from industry is that knowledge management programmes must not be confined to departments such as human resources or information technology but linked closely with strategic decisions made by senior professionals and policy makers[5]. Let me close with what Matheson[14] said in 1995:

> 'The overarching informatics grand challenge facing society is the creation of knowledge management systems that can acquire, conserve, organise, retrieve, display and distribute what is known today in a manner that informs and educates, facilitates the discovery of new knowledge and contributes to the health and welfare of the planet.'

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