

Information in practice

Soft networks for bridging the gap between research and practice: illuminative evaluation of CHAIN

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Abstract

Objectives To explore the process of knowledge exchange in an informal email network for evidence based health care, to illuminate the value of the service and its critical success factors, and to identify areas for improvement.

Design Illuminative evaluation.

Setting Targeted email and networking service for UK healthcare practitioners and researchers.

Participants 2800 members of a networking service.

Main outcome measures Tracking of email messages, interviews with core staff, and a qualitative analysis of messages, postings from focus groups, and invited and unsolicited feedback to the service.

Results The informal email network helped to bridge the gap between research and practice by serving as a rich source of information, providing access to members' experiences, suggestions, and ideas, facilitating cross boundary collaboration, and enabling participation in networking at a variety of levels. Ad hoc groupings and communities of practice emerged spontaneously as members discovered common areas of interest.

Conclusion This study illuminated how knowledge for evidence based health care can be targeted, personalised, and made meaningful through informal social processes. Critical success factors include a broad based membership from both the research and service communities; a loose and fluid network structure; tight targeting of messages based on members' interests; the presence of a strong network identity and culture of reciprocity; and the opportunity for new members to learn through passive participation.

Introduction

Although there is widespread support for the concept of evidence based health care, a large gap remains between research and practice.¹⁻³ Various research and development initiatives have sought to close this gap, but their success has been limited.⁴⁻⁶ Insights from knowledge utilisation research (how individuals and teams acquire, construct, synthesise, share, and apply knowledge) have shown that getting evidence into practice requires both explicit and tacit knowledge (box 1).⁷ Explicit knowledge is only converted to actionable knowledge when it is linked meaningfully with knowledge and when shared meanings are constructed through social interaction and dialogue.⁷⁻¹¹

Box 1: Explicit and tacit knowledge

Human knowledge has been classified as:

- Explicit or codified—knowledge that is transmittable in formal, systematic language
- Tacit—knowledge that has a personal quality, making it hard to formalise and codify.¹² This knowledge is rooted in action and involvement in a specific context but does not transmit easily between people or organisations.^{13 14} It is generally acquired by experience, apprenticeship, and informal discussion with experienced practitioners

These terms have been interpreted and extended by many authors and now carry a variety of meanings. We defined tacit knowledge as informal and context specific “know-how” that draws on people's own experiences, perceptions, and insights. We contrast this “soft” knowledge with formal, explicit knowledge, which is systematically codified and accessible through indexing services such as Medline, the Cochrane Library, and the National Electronic Library for Health. Explicit knowledge is easily transferred between people and organisations but may have little meaning for them and not be readily actionable.

In 1997 the NHS research and development programme established CHAIN (Contact, Help, Advice and Information Network for Effective Health Care www.nhsu.nhs.uk/chain/), an informal email network for people working in health care with an interest in evidence based health care. Membership is free and voluntary. CHAIN aims to remove barriers between research and practice, facilitate multiprofessional and interorganisational collaboration, and widen access to knowledge by facilitating and enabling the informal processes through which members identify new contacts, exchange expertise, and provide mutual support.

We aimed to determine the important features and critical processes of CHAIN through an evaluation. In designing the study, we built upon a preliminary evaluation of CHAIN by the King's Fund¹⁵ and our experiences as members of the network. We were careful not to adopt an oversimplistic, linear model of the evidence into practice sequence, but instead attempted to engage with the complexity of the process, and recognised that CHAIN's role was likely to be diffuse, long term, and subtle rather than specific, immediate, and readily auditable.

Methods

Illuminative evaluation is a form of naturalistic inquiry.¹⁶⁻¹⁸ It uses a range of qualitative methods to explore an initiative as a whole and has been characterised as concerned with description and

 Examples of request to network messages are on bmj.com

interpretation rather than measurement and prediction.¹⁹ We adopted an open ended and collaborative approach, exploring perceptions and experiences and working with stakeholders to progressively clarify and agree CHAIN's critical processes. In particular we sought to document the types of knowledge exchanged, the social processes by which knowledge is exchanged, and how the knowledge began to help health professionals address the research-practice gap in their own work.

Data collection

We sought the cooperation of all members of CHAIN by email. We collected and classified the 102 messages posted over three months; tracked the 22 "request to network" messages (for example, a call for help with solving a particular problem, a request for a specific piece of information, an invitation to share experiences or collaborate) sent out by CHAIN over two months and replies from the initial posting to conclusion; interviewed the two core staff of CHAIN (face to face and by telephone) and the members whose messages we had tracked; observed the network in operation; ran three virtual, asynchronous focus group discussions using private email groups; and collated all feedback (invited and unsolicited) to CHAIN's central office during 2002. (Each focus group comprised 15 members randomly selected from 104 members who responded to an invitation to participate. Over one week we facilitated discussion on what members valued about CHAIN, how they thought CHAIN could be improved, and how it compared to other sources of support for evidence based health care.) These methods are described elsewhere.²⁰

Data analysis

The researchers independently read the email messages, interview transcripts, and focus group discussions, and identified, discussed, and agreed emerging themes. We shared our preliminary analysis with intended users of the evaluation and engaged in a process of further analysis and interpretation, progressively focusing on key themes and triangulating our sources of data.¹⁸ We drew on the literature on use of knowledge to help set the findings within a broader explanatory context.²¹ The role of the illuminative evaluator at this stage is to "sharpen discussion, disentangle complexities, isolate the significant from the trivial, and to raise the level of sophistication of debate."¹⁹

Results

CHAIN is open to anyone working in the NHS "family of organisations" who is willing to share information and experience with other members of the network. At the time of our study, between April 2002 and January 2003, CHAIN had 2800 members. Members contact each other either through the database (which includes searchable fields of members' interests and expertise) or by asking CHAIN's staff to send out on their behalf an email message targeted to a relevant subgroup of members. The originators of CHAIN initially saw the network as a tool for people interested in evidence based health care to make connections themselves. As the network has developed, however, the role of staff in brokering the contact between members has become increasingly prominent, and targeting emails is now the most important part of CHAIN. This became the focus of our evaluation.

CHAIN is run by a head of development, a manager, and an administrative officer. Information for dissemination comes from two sources: that circulated by staff about jobs, studentships, courses, conferences, funding opportunities, and key publications (a horizon scanning service); and that from

CHAIN members which is checked, edited, and targeted by staff. Messages may be offers of information or requests to network (see bmj.com).

Targeting by staff ensures that email is only received by a subset of members (typically 50 to 100) with matching interests. This process is labour intensive and requires expert judgment and skill in database searching (box 2). Targeting also depends on an up to date database to accurately and sensitively capture members' interests. CHAIN aims to keep records that are no more than six months out of date, and has a rolling programme to contact members for updates. Staff and members, however, identified this area as one for improvement.

A potential drawback of targeting is that members may fail to receive potentially useful messages. Overall, members commented positively on targeting and compared it favourably with electronic bulletin boards and other email lists to which they belonged. A few respondents thought they might be missing out on potentially interesting information.

A notable feature of CHAIN was the willingness and generosity of members' responses to requests to network—we defined this as "reciprocity." Members were typically "overwhelmed by the generosity of responses."

CHAIN helps people in practice in four key ways: by providing a rich source of relevant, useful information; by providing access to both information and people with know-how; by enabling collaboration across boundaries; and by enabling participation in networking at a variety of levels.

A rich source of relevant, useful information

CHAIN members perceived the targeted email service as a valuable source of information about such things as conferences, training events, research calls, funding opportunities, and new publications. This was commonly identified as information they would not otherwise have heard about. A view expressed by several respondents was that "CHAIN is my lifeline to what is going on out there!" Members also acted as a rich source of research evidence and this was commonly identified as evidence that members had not been aware of from formal literature searches. An area identified for future improvement, both by members and staff, was for this horizon scanning service to be extended, possibly by linking up with other, more systematic research and development scanning services.

Access to people with know-how

Overwhelmingly, members found the opportunity CHAIN provided to tap into other members' experiences, suggestions, and ideas most valuable. Through CHAIN, people are able to make contact with others working on similar initiatives or trying to solve similar problems. Many messages related wholly or partly

Box 2: Example of targeting messages

CHAIN received information about a Cochrane meeting on schizophrenia from one of its members, which it wanted to disseminate to interested members. Firstly, it needed to decide on a relevant subgroup. Searching the database with various keywords identified differing numbers of people: "schizophrenia," 25 people; "mental health," 591 people; "researcher" and "mental health," 317 people (this could be reduced to 120 by searching only for those who are part of the Health Service Research Network—a specialist subgroup within CHAIN). Having identified these options, staff made contact with the organiser of the meeting to clarify whether the priority was to have a narrowly focused meeting or a wide audience. The final decision was based on this process.

to the uncodifiable know-how required to obtain or action evidence (see bmj.com). Such information was often requested in the form of contextualised stories (local lessons) embellished with operational details, warnings, troubleshooting advice, humour, and other personalising devices. CHAIN members emphasised the value of this support:

[A colleague] and I are doing a health needs assessment of sex workers in one area, and we asked CHAIN for help. We had 6 replies from people working on similar studies or those who had done similar studies already, and some of them sent us references we could check out straight away. That must have saved us at least a week's work of trawling the net and libraries, and it was very useful because some of the people who responded were happy to talk through some of the issues with us. I can't think of a more direct way to reach people than via CHAIN (unsolicited feedback from a specialist in public health)

Other characteristics of this support identified as important by CHAIN members were its availability when required and its boost to both motivation and confidence because the support was perceived to come from like minded people who were more knowledgeable or experienced. Responses to a networking message often included an invitation to liaise further (box 3). Links were forged between two people or sometimes a wider group of people who had responded to a message:

Last year we were successful in obtaining funding for a project on falls. We received critical input and advice from CHAIN members prior to submission and after our first reject. CHAIN members were very valuable in discussing ideas and indeed making links. CHAIN members are now on our project contact list for information of the outcome of our work—so it can be used to develop falls services elsewhere (feedback from consultant doctor)

Box 3: Soft networking in practice

A member of CHAIN sought help from other members: "I have been asked to document the primary care clinical audit criteria (including milestones) for each of the National Service Frameworks. This seems a big job to tackle on my own and I wondered if any CHAIN members had already done this work and would be willing to share it."

As part of our tracking of the history of a sample of messages we asked this member to keep us informed of her responses. She sent the following summary of the five responses she received

- (1) Contained a useful web link and shared the department's strategy for prioritising audits, which was also useful
 - (2) Was a request for further clarification of what I wanted
 - (3) Sent a copy of a data collection tool and report they had produced when conducting a CHD [coronary heart disease] baseline audit, it wasn't what I was looking for, but it was nice they had taken the trouble
 - (4) Had gathered all the relevant information together into a couple of documents with references, etc. This was close to what I was interested in and a useful resource. They also offered further support should I need it and were open and supportive
 - (5) Asked that if I received what I was looking for would I share it with them as they too thought such a piece of work was useful and had made several unsuccessful attempts to produce it themselves. I intend to seek permission from the originators before forwarding the documents and references above
- In her feedback to us, she wrote: "I was overwhelmed by people's support and kindness. The query was quite straightforward, but I'm fairly new to audit, and a complete stranger to primary care audit, and this was a pretty big piece of work with a tight deadline. I would certainly use CHAIN again and have in fact spoken about the progress of my query to a colleague who has since registered with CHAIN."

Diversity of members' backgrounds, expertise, and experience

Many respondents explicitly commented on how the network enabled them to access others from different organisations and professional groups:

My personal network tends to be limited to people in similar fields to me [public health]. I don't tend to know nurses, academics, or social researchers, whereas CHAIN has all of them as members (unsolicited feedback from a specialist in public health)

A particular advantage identified by respondents was that researchers were able to communicate directly with practitioners in the service sector and vice versa:

CHAIN allows links to be made between researchers and clinical governance leads or practitioners on the ground, and this has the potential to harness and direct research capacity on the one hand, and aid implementation of new findings in the health service on the other (clinical governance facilitator, focus group 3 discussion)

The value of this cross boundary networking for our focus group respondents was that it encouraged them to look outside their usual profession or organisation; it prompted them to reconceptualise their problems and therefore produce new potential solutions; it enabled the sharing of innovation and good practice between individuals, professions, and organisations; and it opened up possibilities for research agendas to be directly informed by day to day service needs. Some respondents suggested that an additional benefit of the virtual medium was that it bridged the gap between novice and expert:

The informality and professionalism are well combined in CHAIN... I have met with many excellent people at conferences, and have tried to maintain links via email. But people are not very responsive to this, unless you are someone who has written a good book or given the conference presentation. Whereas in CHAIN, I have found that you can be anybody and anyone will reply. It is sort of more equal in status (PhD student in focus group 1 discussion)

Flexibility to participate at different levels

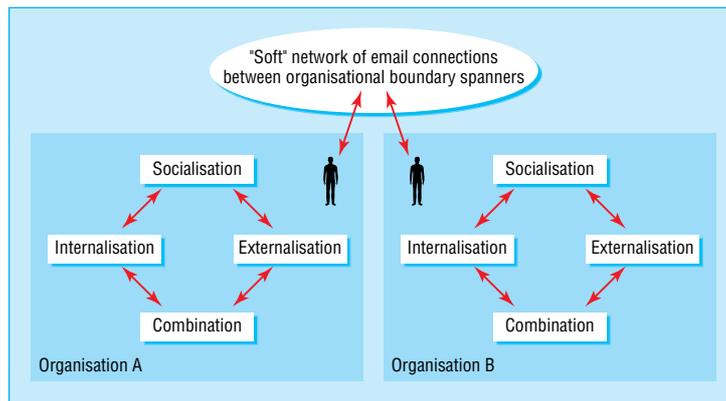
The most intangible benefit of CHAIN identified by respondents was the value that many attached to just knowing it was there and that it could be used if need be:

I have not used CHAIN much but it is a security blanket! I am a novice researcher and not a natural one! Knowing there are a bunch of people out there who would if I asked and if they could share their expertise with me is comforting (general practitioner in focus group 2 discussion)

The virtual medium of CHAIN was seen as allowing members to choose to be passive rather than active but to still feel connected to the network and benefiting from it. A minority of respondents were less keen on the virtual medium.

Discussion

Official strategies to bridge the gap between research and practice have until recently focused almost exclusively on the production, presentation, and distribution of codified knowledge—the evidence itself and codified information on how to get evidence into practice.^{4 5} It has been argued that evidence based health care is a "contact sport"—that is, a social process involving the exchange and negotiation of knowledge between individuals and groups—and that it is misleading to describe it as a technical process devoid of human interaction.²² A few recent studies have attempted to explore the complex informal social



Diagrammatic representation of how boundary spanners can contribute to knowledge creation within their own organisations through exchange and personalisation of knowledge within soft networks

interactions and networks that support or inhibit the process of research into practice.^{23 24} Our study has produced additional findings on the process of knowledge sharing from a dimension of informal space (email networking) that has been largely unexplored by those researching the research-practice gap in health care, and it has raised some important methodological issues.

CHAIN provides an example of how knowledge can be targeted, personalised, and made meaningful through informal social processes. It offers a mechanism for people to span the divisions between organisations and professional groups, to capture obscure items of codified knowledge, to share and shape the know-how and know-what of implementing evidence, and to link novices with experienced practitioners who are motivated to help them solve problems.

Nonaka and Takeuchi suggest that the creation of complex knowledge within an organisation occurs as a result of a dynamic interchange between explicit and tacit forms of knowledge.^{9 13} They identified four modes of knowledge creation: socialisation (tacit knowledge exchanged through the sharing of experiences); externalisation (tacit knowledge articulated into explicit concepts through successive rounds of meaningful dialogue); combination (explicit knowledge systematised and documented into a wider knowledge system); and internalisation (explicit knowledge embodied into tacit operational knowledge).

CHAIN has examples of each of these modes. CHAIN provides a mechanism for socialisation—for members simply to make contact with each other or to listen in on others' exchanges and be reassured that there are others with whom they can share experiences. CHAIN also provides a mechanism for the complementary modes of externalisation and internalisation enabling dialogue through which members articulate their own perspectives and reveal tacit knowledge that is otherwise hard to communicate. Others' tacit knowledge can then be internalised and applied to local circumstances. CHAIN also enables the transfer of formal knowledge, with members recommending publications and exchanging protocols and guidelines.

Our application of Nonaka and Takeuchi's theoretical model of knowledge creation to the processes within CHAIN illuminates the importance of the interplay between tacit and explicit knowledge and the role of social interaction and informal dialogue in getting evidence into practice. The transfer of complex knowledge between organisations can link to different points in the knowledge creation cycle, but it critically depends on the individual boundary spanner—that is, someone from one organisation who networks with people from other organisations (figure). According to this model, soft networking

occurs when such individuals identify the type of knowledge they need as missing and draw effectively on the network to fill the gap.

Critical success factors

Increasing interest has been shown in the use of networks within the NHS, and our study suggests certain critical success factors for such networks to flourish.^{11 25–27} Firstly, the skilled staff at the centre of CHAIN help establish, maintain, and develop the networking processes. They perform four key functions: ensuring that the database of members is up to date; targeting messages to appropriate subgroups based on members' interests; reminding members of the opportunities for networking; and affirming the principle of reciprocity. Fenton and coworkers also found that successful networks have strong central cultures.²⁶ They describe the centre's role as creating values for members, galvanising interest, setting rules for behaviour, and building capability by linking individuals and groups with opportunities and resources for learning.

Secondly, the nature of CHAIN's communication by simple email enables its members to draw on what one author has called "the strength of weak ties."²⁸ This is the notion that people who have little in common have more potential to exchange information. For this reason, the best source of new ideas is often a stranger or, even better, a friend of a friend. Weak ties become evident in CHAIN when, for example, its members forward messages to colleagues or acquaintances who are not themselves members of CHAIN, producing a highly targeted extension of the boundary spanning facility.

Thirdly, CHAIN provides both the medium and the impetus for small groups of people to come together and set about making sense of a common problem. These spontaneous groupings can be thought of as emergent virtual communities of practice.²⁹ According to social network theory, successful networks are those that maintain a balance between weak ties and stronger ties and identities forged between more focused subgroups.²⁸

A final critical success factor for CHAIN is silent or passive participation, known as "lurking"—reading the email postings to a group without posting a reply.³⁰ Our respondents, especially those who were newcomers to evidence based health care, seemed to place great value on the network even when they made little active contribution to it. One study describes how "legitimate peripheral participation" encultures novices to general discourses and forms of practice.³¹ In other words, CHAIN members can begin to learn about evidence based health care and acquire the skills of knowledge sharing by

What is already known on this topic

The volume and complexity of evidence from research makes it inaccessible to busy practitioners, who often lack sophisticated search and appraisal skills

Evidence is usually only available for part of the sequence of decisions and actions in real life clinical problems

Evidence might indicate what works but not how to do it, and it cannot take account of local context, resources, and politics

What this study adds

Bringing researchers and practitioners under the same “virtual roof” in an accessible, low technology email forum can help bridge the gap between research and practice

Soft networking enables knowledge for evidence based health care to be personalised and made meaningful through informal social interaction

Skilled staff can encourage a strong culture of support and reciprocity within the network and can target messages to individuals with matching interests

observing others from a peripheral position. This illustrates why, when evaluating electronic soft networks, researchers must not simply quantify the number of messages or the proportion of members who post them but should also explore the more intangible benefits perceived by members.

Our evaluation suggests that, with additional resources, CHAIN might further develop the central support service for a soft network—for example, by providing a more systematic horizon scanning service, making available an archive of collated responses to email inquires, and providing more proactive facilitation of research collaborations. A fine balance, however, exists between a strong centre that enables, facilitates, and supports and one that stifles the energy of networking by too much control.¹¹

Those involved with developing strategies for knowledge transfer and learning within the specialty of health show a growing interest in the CHAIN model. CHAIN Canada is about to be launched (www.epoc.uottawa.ca/CHAINCanada/index.htm), and the NHS University, as well as providing future funding for CHAIN, is extending the model to bring together other interest groups in health and social care.

We strongly recommend that these and other future networking initiatives take note of the established literature on knowledge sharing and of the critical success factors for soft networks. We would also note that for such networks to flourish and for their potential benefits to be realised, healthcare organisations will need to provide an enabling environment for participation. Because of the informality of networking, particularly virtual networking by email, there can be a danger that it is perceived as, at best, a marginal activity to be squeezed in if time permits rather than an integral component of the evidence into practice cycle (see figure).

Both the methods for evaluation and the critical success factors hypothesised from this preliminary study might prove generalisable to other electronic support networks with similar aims. Further research is needed on how electronic networks support soft social networks; how such facilitated networks can be

provided cost effectively; and the implementation dimension (how individuals make use of the knowledge they gain from informal networking, how it feeds into their practice, and how soft networking by individuals contributes to wider team and organisational learning).^{32 33}

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- 1 Bero LA, Grilli R, Grimshaw JM, Harvey E, Oxman AD, Thomson MA. Closing the gap between research and practice: an overview of systematic reviews of interventions to promote the implementation of research findings. *The Cochrane Effective Practice and Organisation of Care Review Group. BMJ* 1998;317:465-8.
- 2 Grol R. Improving the quality of medical care. Building bridges among professional pride, payer profit and patient satisfaction. *JAMA* 2001;286:2578-85.
- 3 Needham G. Research and practice: making a difference. In: Gomm R, ed. *Using evidence in health and social care*. London: Sage, 2000.
- 4 Dopson S, Locock L, Chambers D, Gabbay J. Implementation of evidence-based medicine: evaluation of the promoting action on clinical effectiveness programme. *J Health Serv Res Policy* 2001;6:23-31.
- 5 Dunning M, Abi-Aad G, Gilbert D. *Experience, evidence and everyday practice: creating systems for delivering effective health care*. London: King's Fund, 1999.
- 6 Evans D, Haines A. *Implementing changes in evidence-based health care*. Oxford: Radcliffe, 2000.
- 7 Wyatt JC. Management of explicit and tacit knowledge. *J R Soc Med* 2001;94:6-9.
- 8 Eraut M. Non-formal learning, implicit learning and tacit knowledge. In: Coldfield F, ed. *Informal learning*. Bristol: Policy Press, 1999.
- 9 Nonaka I, Takeuchi H. *The knowledge creation company: how Japanese companies create the dynamics of innovation*. New York: Oxford, 1995.
- 10 Brown JS, Duguid KP. *The social life of information*. Boston, MA: Harvard University Press, 2000.
- 11 Bate SP, Robert G. Knowledge management and communities of practice in the private sector: lessons for modernizing the NHS in England and Wales. *Public Admin* 2002;80:643-63.
- 12 Polanyi M. *The tacit dimension*. New York: Anchor Day, 1962.
- 13 Nonaka I. A dynamic theory of organizational knowledge creation. *Organ Sci* 1994;5:14-37.
- 14 Hippel EV. “Sticky information” and the locus of problem solving. *Manage Sci* 1991;44:429-39.
- 15 Saffron L, Wye L, McLenahan J. *The future of CHAIN. An evaluation of CHAIN's first three years with suggestions for development*. London: King's Fund, 2000.
- 16 Guba E, Lincoln Y. *Fourth generation evaluation*. London: Sage, 1989.
- 17 Kushner S. The limits of constructivism in evaluation. *Evaluation* 1996;2:189-200.
- 18 Patton M. *Utilization-focused evaluation*. London: Sage, 1997.
- 19 Parlett M, Hamilton D. Evaluation as illumination: a new approach to the study of innovative programmes. In: Hamilton D, ed. *Beyond the numbers game: a reader in educational evaluation*. London: Macmillan, 1972.
- 20 Russell J, Boynton P, Greenhalgh T, Rigby M. C.H.A.I.N. evaluation report. London: University College London, 2003. www.nhs.uk/chain/ (accessed 1 April 2004).
- 21 Spencer L, Ritchie J, Lewis J, Dillon L. *Quality in qualitative evaluation: a framework for assessing research evidence*. London: Cabinet Office, 2003.
- 22 Lomas J. *Improving research dissemination and uptake in the health sector: beyond the sound of one hand clapping. Policy Commentary C97-1*. McMaster University, Canada: Centre for Health Economics and Policy Analysis, 1997.
- 23 Ferlie E, Gabbay J, Fitzgerald L, Locock L, Dopson S. Evidence-based medicine and organisational change: an overview of some recent qualitative research. In: Ashburner L, ed. *Organisational behaviour and organisational studies in health care: reflections on the future*. Basingstoke: Palgrave, 2001.
- 24 West E, Barron D, Dowsett J, Newton J. Hierarchies and cliques in the social networks of health care professionals: implications for the design of dissemination strategies. *Soc Sci Med* 1999;48:633-46.
- 25 Edwards N. *Clinical networks: a discussion paper*. London: NHS Federation, 2001.
- 26 Fenton E, Harvey J, Griffiths F, Wild A, Sturt J. Reflections from organization science on the development of primary health care research networks. *Fam Pract* 2001;18:540-4.
- 27 Urquhart C, Yeoman A, Sharp S. NeLH communities of practice evaluation report, 2002. Department of Information Studies, University of Wales Aberystwyth. www.nhsia.nhs.uk/nelh/pages/documents/cop.doc
- 28 Granovetter M. The strength of weak ties. *Am J Sociol* 1973;78:1360-80.
- 29 Wenger E. *Communities of practice: learning, meaning and identity*. Cambridge: Cambridge University Press, 1996.
- 30 Nonnecke B, Preece J. Silent participants: getting to know lurkers better. In: Lueg C, Fisher D, eds. *From Usenet to CoWebs: interacting with social information spaces*. London: Springer, 2002.
- 31 Lave J, Wenger E. *Cognition in practice: mind, mathematics and culture in everyday life*. Cambridge: Cambridge University Press, 1988.
- 32 Wellman B. An electronic group is virtually a social network. In: Kiesler S, ed. *Culture of the internet*. Hillsdale, New NJ: Lawrence Erlbaum, 1997.
- 33 Garvin DA. Building a learning organization. *Harvard Business Review* 1993;71:78-92. (Accepted 2 April 2004)

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