EXPLORING KNOWLEDGE WORK AND LEADERSHIP IN ONLINE MIDWIFERY COMMUNICATION

ABSTRACT

Aim

The aim of this paper is to explore knowledge work in situ, in order to develop a grounded understanding of both the production of midwifery knowledge in a practice setting, decision-making interactions and the potential of information technologies to support knowledge work in health systems.

Background

Globally the demand for quality led and innovative service delivery requires that nurses and midwives must shift from 'information workers', passive receivers of managerial and organisational decisions, to become 'knowledge workers', able to create, lead and communicate service innovation and practice development. New communication technologies may offer a means for health care professionals to interact as knowledge workers and develop supportive communities of practice.

Methods

An online discussion forum was designed and implemented as a low-cost technological intervention, deploying existing hardware and a standard hospital intranet. The setting was a non-teaching, acute National Health Service Hospital in the United Kingdom. The evaluation of the forum was constructed as case-study organizational research. The totality of the online communication, both traffic and content, was analysed over a three-month period (193 messages downloaded 2003/04), and 15 in-depth interviews were undertaken with forum users.

Findings

The findings show that given simple, facilitative, innovative technology, supported by a positive working culture and guided by effective leadership, midwives can function as 'knowledge workers', critically reflecting upon their practice and translating knowledge into action designed to achieve change in practice. Participation occurred across all grades, and midwives were predominantly supportive and facilitative towards the contributions made by colleagues.

Conclusions

Midwives may be ideally located to exemplify the 'ideal' characteristics of the knowledge worker being demanded of modern health care professionals. The deployment of online interactive technologies as part of strategic vision to enhance knowledge work among health care professionals should be given attention within health systems.

Key words: Nursing knowledge, online communication, midwifery, decision-making. leadership, knowledge work, information technology.

SUMMARY STATEMENT

What is already known about the topic

- It is clear that organizational and professional structures have resulted in midwives remaining relatively invisible and marginalised in heath care policy decision-making.

- It has been argued that new communication technologies may offer a means for health care professionals to interact more effectively with each other and increase their visibility in decision-making processes.

- There is research on knowledge work in business and management, but very little research on the application of knowledge work theory to health care workers particularly in relation to knowledge creation, capture and use.

What this paper adds

- This paper shows that knowledge work theory is of relevance to the work of midwives.

- Online software tools such as interactive discussion forums can enhance midwifery practice.

- It appears that midwives can function as 'knowledge workers' with a significant element of the midwifery communication being "supportive" of the knowledge work of others'.

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INTRODUCTION

This paper examines midwives' communication and decision-making interactions via an online discussion system specifically implemented for them. In western health care systems, the demand for resource effective, quality and innovation directed services is leading health care professionals to embark upon a remodelling of traditional hierarchy-bound health care organisations. Knowledge work theory asserts that the main strength of an organisation lies in the knowledge held by the people within the organisation (Quintas 2002). "Knowledge workers" are critical reflective thinkers who can creatively generate new meanings or conceptualisations from experiences, thereby enabling them to perceive their working practices in a new light (Brockbank and McGill 1998, Nonaka and Takeuchi 1995). Moreover, they not only create new knowledge, but can also identify how new understandings can be translated into action and change (Schon 1987). Due in part to the abstract nature of knowledge, research on knowledge management faces practical constraints (Schultze 2000). A particular gap in the knowledge management field is research focussed on the actual practices of knowledge workers in situ (Blackler et al. 1993). Consideration of how knowledge workers actually 'do knowledge work', as opposed to categorising what they know, is important for developing a better understanding of knowledge production and use.

BACKGROUND

Practice orientated investigations are important in relation to the knowledge work of health professionals, for whom the context of knowledge and information use is shaped by very different organisational structures than for private industry. Knowledge workers in health systems will need to function not as subordinates, but as leaders who hold important tacit knowledge, the communication of which is vital to effective service delivery. Although the role of vertical leaders or managers remains important to the development of knowledge work, recent leadership theory has strongly emphasised the centrality of "team-based" knowledge work to the creation of innovation and change (Pearce 2004). Communication and discussion of work-based experiences within a team can create new "collective knowledge" (Seeley-Brown and Duguid 1991). Team-based or dispersed leadership results in members of a team being able to mutually influence their fellows to improve and maximise the quality of practice, with the consequence that staff feel valued and have ownership over their decision-making (Wenger and Snyder 2000). In this model, leadership is a 'shared', as opposed to a 'vertical' process. Different members of the community of practice are empowered to act as unofficial leaders, taking forward issues or projects (Kitson et al. 1998, Kirkman and Rosen 1999, Senge 1990).

Despite a recognition of the value for organisations of dispersed or team based leadership there remains a continued need to identify how communities of practice actually work together and can be supported through effective leadership (Gabbay et al. 2003). In the United Kingdom (UK), for example, every midwife is now asked to engage with the task of developing as skilled leaders, able to establish improvements in service delivery and engage with policy related decision-making (DOH 2003).

Midwifery managers have also been challenged to improve their accountability and promote innovation in practice (Pashley 1998, Andrews 2004). Access to positive role models, the creation of strong teams and 'leaders with vision', are likely to be critical factors in improving organisational and professional cultures and enabling future clinical development (Lavender and Chapple 2004). However, the transition to routine participation by staff in policy and organisational decision-making is unlikely to be a straightforward process for the profession.

The WHO Global Advisory Group On Nursing And Midwifery has consistently expressed concern that nurses and midwives have remained relatively invisible and marginalised in health policy decision-making (Thompson 2002). In western countries, midwifery is represented by an increasingly mobile and part-time workforce, with the result that broad-based participation in decision-making and even discussion about policy is logistically difficult. In reinforcing task focused medicalised care, health care organisations have been found to leave midwives who seek to innovate feeling marginalised. In the UK, for example, this is a real problem (Kirkham 1999, Kirkham et al. 2002, Kirkham and Stapleton 2000). Indeed, such midwives even face negative sanctions and horizontal violence from colleagues (Leap 1997). In Australia also, there is evidence that midwives potential for autonomy has been poorly recognised and supported (Brodie 2002). This process of marginalisation has resulted in some leaving the profession (Ball et al. 2002). Even more significantly in a number of countries studies have reported that those in practice feel unable to respond positively to change or envisage how to develop innovations (Hughes et al. 2002, Begley 2002).

Existing international research indicates that functioning as knowledge workers represents a challenge for midwifery. In the case of midwifery, it seems that effective participation in decision-making and developing a culture that can positively respond to innovation is likely to be dependent upon addressing both the practical and the professional cultural barriers to achieving effective communication structures that support knowledge work. A potential solution to the communication needs of midwifery may lie in the development and application of new discursive Information and Communication Technologies (ICT's).

The assumption that new technology creates a passive recipient of information has been criticised as failing to consider the dynamic interactivity of new communication technologies (Ngwenyama and Lee 1997). Virtual discussion groups are now being seen globally, and in multiple sectors, as the means to achieve a knowledge based organisation, by ensuring staff participation in knowledge sharing decision-making processes and by enabling staff to expand their collaborative networks (Wood 2000, Ruberg et al. 1996, Ardichvilli et al. 2003, Bishop and Levine 1999). Specific features of online discussion may also offer advantages over both face-to-face communication and written forms, for example, in combining both the 'interpersonal' features of verbal communication and the opportunities for 'expanded' thought of written communication (Herring 1996b). Among geographically isolated staff, computer mediated discussion groups have also enabled staff to access a wider community of practitioners and thereby draw on a greater reserve of expertise and knowledge (Hightower and Sayeed 1996, Johnson 2001). In relation to health systems, computer mediated communication has been shown to promote the emergence of effective

channels of communication to vertical leaders from an empowered workforce (Scott 2004).

Midwives have also responded positively to multimedia and Internet technologies that support clinical work and audit midwifery practice (Betts and Washbrook 1995, Littler and Weist 1998, Furber 2001, Carroll 1997, Shirazi and Meija 1996). In the USA, web-based graduate education for nurse-midwives has also been positively evaluated (Avery et al. 2003). However, in contrast to a burgeoning literature in medical and nursing informatics, studies that have considered the specific needs and experiences of midwives in relation to new technology have remained comparatively few. Consequently, there is a need for research to attend to how midwives might actually engage with such systems, particularly to assess potential support for knowledge creation, capture and use.

THE STUDY

Aim

The 'midwifery discussion forum' was part of a larger project, the Assisted Electronic Communication (AEC) project, which sought to enable nurses and midwives to incorporate knowledge work into their daily practice through use of computer mediated communication technologies.

The aim is to provide an examination of the following question: If given a user-friendly online system, that enabled communication across the practice community, would midwives function as knowledge workers? This central analytic task is then sub-divided into consideration of the following:

- What levels of discursive debate, decision-making interactions and critical reflective thinking was found to occur?

- Would participation involve a range of grades and would dispersed leadership be evident? How would vertical leadership be displayed in the discussion?

- To what extent would the use of computer based discussion technology support the development of a community of practice? Would midwives be supportive of each other – or would an open discussion lead to the types of marginalisation, horizontal violence and the negation of innovation found previously in other studies?

Setting

The project was located in a non-teaching, acute hospital trust in central England with a largely stable midwifery workforce. Maternity provision was based in an obstetric consultant unit with midwifery-led care. Midwives were responsible for all aspects of care, including inter-partum care in the hospital. Separate core teams provided ante-natal and inter-partum and post-natal care. An additional team also worked exclusively in the community.

METHODOLOGY

Case-study organizational research as an approach is particularly valuable for studies concerned with information technologies. The methodology being concerned with 'real life' events offers a means to describe technological interventions and explore outcomes and the context of usage (Yin 2003, Tellis 1997). Computer mediated communication also offers a number of advantages over traditional data collection methods (Hine 2000, Anderson and Gansneder 1995). It allows for the interpretation

of naturally occurring interaction without a constant visible presence or the requirement that the researcher transcribes reality into text (Flick 1998). Online discussion may offer the researcher a highly reliable means of considering true feelings and opinions, as the respondent constructs their message outside of the interactional pressures of normal face-to-face interaction (Mann and Stewart 2000).

In the AEC study, the discussion forum data made possible a 'naturalistic' examination of exactly how midwives communicate with each other, display leadership skills and generate decision-making interactions.

Data generation

Participation in the discussion was advertised as open to any midwife in the hospital. The promotion of the discussion forums to potential participants (on the advice of the steering group) adopted the 'usual' channels employed by the hospital to promote innovations and developments. Advertising and promotion of the system occurred in the form of posters, a piece in the hospital newsletter and one open meeting for midwives to see a demonstration of the system. All publicity also highlighted that the forums were part of an on-going research project. Previously, it has been demonstrated that midwives at the Trust viewed the design of the forum positively, were not technophobic and felt that the discussion space was a valuable resource (Brooks and Scott 2006, Brooks et al. 2004).

It was intended that technology-assisted discussion forums could be used to stimulate a connection between professional communities of practice, leading to possible innovation in practice without staff ever leaving the ward. The forums provided a

means for midwives to send views, ideas and responses directly and electronically, to other practitioners in a public discussion space. All the messages were available to be either read or responded to by anyone accessing the system. Contributions from participants were posted as text based messages to be read at the convenience of the user. The discussion space was viewed as web pages via any computer connected to the hospital internal computer network (intranet).

This paper draws on a new data set of the total traffic on the forum over a three month period, downloaded 2003/04, (n=193 messages). Originally, the forum was supposed to function for one month to enable staff to respond to a specific patient satisfaction survey. However, due to requests from midwifery staff the forum was kept open and discussion of topics continued.

The perceptions and experiences of participants were explored at the end of the forum's operation through 15 in-depth qualitative interviews, sampled to represent the range of midwifery grades (E grade or newly qualified midwife, n=4; F grade or experienced staff midwife, n=5; G grade or equivalent sister or clinical specialist midwife, n=3; H grade or midwife with senior management responsibilities, n=2) plus one midwifery assistant (HCA). The interviewees were invited verbally to participate, in the first instance, by the local researcher (17 approached, 2 refused due to time constraints). A member of the external research team subsequently contacted the 15 interviewees, and all re-confirmed their agreement to be interviewed. All interviewees, as forum participants, were aware of the research project prior to contact by the local researcher. The interviews explored the technological features of the forum, the value and ease of participation, perspectives on participation in

decision-making, leadership and collegial support. All the interviews were taped and transcribed.

Ethical considerations

Discussion in online forums represents a data source that falls somewhere between semi-private communications and open, publicly authored acts (Mann and Stewart 2000). However, researchers in the field have tended towards the view that postings cannot be simply accessed without any ethical safeguards. In particular the use of pseudonyms has been advocated (Herring 1996a) and ensuring that participants are made aware that the intended audience of the posting includes the researcher (Mann and Stewart 2000).

All participants used the discussion tool as volunteers and were reminded when they accessed the system that the forum was part of an on-going research project. The system was not password protected so that authors of messages were able to choose to post a message anonymously. The interviewees were invited verbally to participate in the first instance by the local researcher. All interviewees were assured confidentiality; pseudonyms have been used in this paper for both the interview and forum data. Approval for the study was gained from the Local Research Ethics Committee at the hospital. Tapes and transcripts from the interviews will be archived for five years.

Analysis

The analysis considered the totality of the online communication that is, the usage patterns and complete contributions to the forum. The analysis of the online

discussion was also undertaken by grade of midwife (see below for an explanation of the UK grades). Thematic coding was employed and themes were generated both inductively from the raw data and deductively employing the theoretical framework (Boyatizis 1998). All digital participation was logged and coded separately for inter-rater reliability by three members of the inter-disciplinary research team (midwife, sociologist and a knowledge media specialist), data was categorised into initial and higher codes and repeatedly searched for disconfirming cases as part of the coding refinement process. The interview data was specifically mined as part of the triangulation process to refine the emergent theory. The forum data was interrogated for: knowledge work, collegial and leadership relationships. The discussion forum data was also descriptively analysed for issues such as the general character of participation, such as messages by grade and entered into SPSS.

Case study research can be a useful means to explore existing theory as well as the generation of new revelations (Yin 2003). For this project in order to analyse the operation of knowledge work among nurses and midwives the existing theory relating to knowledge management and virtual communication primarily relating to other contexts was employed to guide the coding (Mantovani 1994, Quintas 2002, Milton et al. 1999). To analyse knowledge work, a distinction was made between those messages displaying solely information usage (e.g. reporting an event or policy) and those applying knowledge in a discursive way. Information work encompassed messages that solely reported on explicit knowledge without an additional discursive or reflective element. In contrast, 'knowledge work' messages demonstrated an ability to critically reflect upon new information or the explicit knowledge of the organisation by adding personal, theoretical and tacit knowledge acquired from

contributors' own experience. Underlying our coding is an argument that the character of knowledge work will be displayed via decision-making interactions (Condon and Cech 1996). In coding forum messages particular attention was given to the presence or absence of critical reflective thinking in decision-making interactions as a measure of knowledge work (Schon 1987). In our framework, critical reflective thinking is defined as: '*the display of an ability to employ experience in a manner that openly reflects upon current care and service provision*' (Brooks and Scott 2006). This definition of critical reflective thinking also encompasses a willingness to generate new knowledge, articulate alternative forms of provision and suggest ideas for the resolution of issues in a discursive manner (Brockbank and McGill 1998).

FINDINGS

This section explores the levels of participation, and then outlines the nature of the interaction with reference to the extent of evident knowledge work and the way leadership is displayed and enacted via the usage of the forum.

Participation on the forum

Over the three-month period, a broad based community of midwives posted 193 messages. Figure 1 illustrates the postings by grade. The system was available to all 96 midwives working in the hospital setting (day and night staff, all female), although because community midwives did not have access to the intranet, the system was not promoted to the community staff (n=37). However, three community midwives did come into the hospital to access the intranet and post messages. Three named midwifery assistants (HCA) and two nurses also participated at the invitation of the midwives. Overall, 44 named hospital staff participated and 39 (40% of the total

targeted population) were identified as midwives working for the hospital. About half of the staff (21 of the 44) were part-time and nine were exclusively night staff. Among participating G grades (equivalent to sister grades) three held specialist positions in relation to specific areas of practice, such as smoking cessation. An additional nine postings were made anonymously, eight with just the title 'Midwife' and 1 with the title 'HCA'. From the in-depth interviews it is known that at least two midwives posted messages both anonymously and with their names attached, depending on their perception of the sensitivity of the issue.

(INSERT FIGURE ONE HERE)

The proportion of active authors (posting messages) on discussion forums have been identified as likely to be significantly lower than those who just read the discussion (Nonnecke and Preece 2000). The fact that nearly half of the target community, across all grades of midwife, functioned as authors on the system suggests a successful forum in terms of online discussion communities.

In line with findings from other settings (Ardichvilli et al. 2003, Bishop and Levine 1999) features inherent to computer mediated communication made participation from the perspective of the midwives an attractive option. The ability to express views without the normative interactional pressures of face-to-face communication was valued by interview respondents (irrespective of grade). This positive perception also included a sense that the removal of interactional pressures increased the significance of the message.

> 'There's no pressure on, so you're hopefully getting exactly what people are thinking instead of what they think you want to hear, or the hidden agendas.' (Midwifery sister, G grade,

15

named author)

Although the study did not set out to examine the nature of the existing hierarchy within the hospital, there was some evidence that respondents felt more usual forms of work based interaction could leave them open to negative sanctioning if they expressed opinions. In contrast, when respondents added their name to a message, they felt less open to negative sanctioning on the forum than through more usual routes of communication, such as meetings.

> 'It's, you know, a free atmosphere; to be able to do it without any comeback. You can raise the issue and see what other people think about it, without worrying that it goes against what is expected.' (Midwife F grade, named author)

From the outset midwives appeared to approach online communication as a means to improve on existing communication patterns and to bring to the fore previously submerged issues and agendas.

The next subsections focus on the nature of the discussion.

Information work and knowledge work

The online discussion was overwhelmingly characterised by messages that displayed discursive discussion and critical reflective thinking. This was coded as "knowledge work" (88%, n=172). In contrast, messages that were concerned with posting or requesting explicit knowledge were coded as "information work" (9%, n=16).

It should be noted that 'information work' can be very valuable. Indeed, the 'information work' contributions were predominantly characterised by messages that added detail to the knowledge work discussions. In any organisation, by virtue of

holding either a managerial or specialist position, some staff will have access to information that is not widely available. Through the discussion forum, senior and specialist midwives had a means to disseminate this information to the wider community. The following example is a good illustration of such valuable information work. A senior midwife is able to convey action that the organisation is taking to address a problem raised by the midwifery staff.

(INSERT FORUM EXTRACT 1 HERE)

In terms of the application of knowledge work, midwives deployed tacit knowledge (grounded in practice experiences) with either the discursive raising of an issue (20%, n=39) or to give additional explanatory force to suggested resolutions/action (34%, n=66). The online discussion was perceived as a vehicle to enable a collective consideration of important issues that had previously not been attended to within the organisation. Accounts from the in-depth interviews also indicated that participants particularly valued being able to 'critically reflect' via the forum. Midwives repeatedly expressed a desire to move away from functioning as task-focused information workers to knowledge workers.

> '… just to express an opinion really, just say what you think, instead of just sitting at the back and doing your job and not being heard really.' (Midwife E grade)

In many cases, midwives initiated a 'knowledge work' discussion by posting messages drawn from their experiential knowledge base of working with women. In the example below a midwife drawing on a patient-centred narrative has taken a comment by a patient, subsequently critically reflected on service provision and

raised the issue for discussion with colleagues. Importantly, she also proposes a resolution for further debate.

(INSERT FORUM EXTRACT 2 HERE)

Within the 'knowledge work' coding, a striking feature was the number of messages (34%, n=66) that proposed a 'resolution' of the issue raised. In the majority of these cases proposals for resolution were composed, as in the example above, in a question format that invited further debate and refinement by other midwives. In seven messages the proposed resolution took the form of a request from a senior or specialist midwife to undertake specific action to form a working party to achieve change, for example, to write a new information pack.

In practical terms, the final resolution of issues will necessarily occur outside of the virtual discussion making actual change difficult to track online. However, towards the end of the three months of the forum, traffic on the forum relating to feedback on action was taking place. Five messages (which were coded themselves as information work) related to the outcomes of issues initially raised on the forum. Reported outcomes included the provision of fans on the labour ward, the development of new information leaflets, and a policy on siblings visiting the labour ward after a delivery. The remaining sections consider how the work on the forums displayed leadership skills and served to facilitate a functioning community of practice.

Dispersed leadership and collegial support

Collegial support is an aspect of midwives' working lives that appears to be highly valued and, when absent, a major contributor to low job satisfaction (Kirkham and

Stapleton 2000, Hunter 2004, Lavender and Chapple 2004). About one third (32.6%, n=63) of messages posted on the forum provided explicit support for the contribution and work of other colleagues. A common pattern was to thank and praise a previous contributor:

(INSERT FORUM EXTRACT 3 HERE)

The F grades posted more messages that were supportive per author than the other grades e.g. nearly twice as many messages that were coded as supportive than E grades. Collegial or horizontal support was also found in the form of encouragement for emergent leaders from within the ranks of participants. In the following example, a more experienced midwife offers encouragement and guidance to a newly qualified midwife, on how to effectively lead on a patient information issue that she had raised.

(INSERT FORUM EXTRACT 4 HERE)

From the perspective of newly qualified staff, the forum was seen as providing an opportunity to gain experience of engaging in debate with colleagues and more senior staff and therefore to have a more 'visible' presence in the organisation

> 'It gives you a chance to … chat and put your views forward on various subjects and discuss them with lots of your colleagues; mostly you wouldn't even have that chance or see that many colleagues. I noticed very senior members of staff used it and they then can see what we feel and discuss change with us.'
> (Midwife E grade)

A final way midwives displayed horizontal leadership and collegiality was through their support for others to use the forum. The midwives actively promoted peer-learning approaches to the use of the system and included several messages that encouraged access to the system by midwifery assistants (HCA's).

(INSERT FORUM EXTRACT 5 HERE)

In this forum midwives strongly demonstrated an ability to provide collegial support and to promote the development of other midwives. In addition, within their community practice more senior midwives appeared prepared to support horizontally emergent leaders, facilitating participation and responsibility for taking actions forward.

Vertical leadership

Transformational leaders are concerned with the promotion of visionary perspectives that challenge established practices, enable and maximise potential (Clegg 2000, Kouzes and Posner 1997, Markham 1998). This form of leadership is particularly essential to the development of knowledge workers as it involves the ability to inspire and create an environment where team members can be influential on organisational culture (Kramer and Hafner 1989). Consequently, it is valuable to consider the specific contribution of vertical midwifery leaders within the midwifery forum. Vertical leaders or managers were defined as those of H grade and above, H grade plus postings amounted to 18 messages (9.3% of the total sample) from four individuals. Postings from the two most senior midwifery managers (post holder changed during the duration of the project) amounted to 11 messages in as many threads (i.e. 11 of 41 threads). Two features defined the input from senior midwives

and most senior midwifery managers in particular. Firstly, they validated contributing to the forum as a worthwhile activity. Secondly, they provided concrete support for action arising from the discussion. Validation for participation on the forums was expressed either through overt commitment to 'keep using the forum' or through explicit supportive praise and feedback to authors of messages.

A potential disadvantage of public discussion in the workplace is that the increased visibility that comes from active participation could result in individuals being fearful that they might be negatively sanctioned by management, a fear which, as previously discussed, may be well founded for many midwives (Leap 1997, Kirkham and Stapleton 2000, Ball et al. 2002). In contrast to the vertical sanctioning suggested by other studies, the discussion forums in this study operated as a tool whereby senior management could positively and publicly support and acknowledge midwives' contribution.

> 'What really pleased me was that midwives used their voice and put their name to it. Then I could say to Jill thanks for putting that on, it was a really good idea.' (Senior Manager)

Six of the 11 messages from the head of midwifery were concerned with concrete resolution of issues, such as offering resources, or suggesting resolution strategies that forum participants could take forward. However, in all cases, the ownership of the issue and responsibility for its resolution was explicitly given back to the forum participants.

(INSERT FORUM EXTRACT 6 HERE)

This was articulated as an overt strategy adopted by the senior manager, designed to give midwives experience of change management, but also to encourage a culture whereby midwives perceived themselves as being drivers of change by thinking about how to achieve the innovation or change they were advocating. In the same way, posting a relatively small number of messages diffused across the forum was a strategic decision by the head of midwifery to prevent participation being perceived as an elite activity; *'a senior thing'*.

Overall, the messages from senior staff appeared to support discursive debate and participation in specific ways, for example, by being regular and diffused throughout the forum and by giving ownership of the discussion back to staff. The resolution messages posted by senior managers consisted of suggestions for action that opened the debate for further comments rather than closing the discussion by posting a solution.

DISCUSSION

We found clear evidence that an online discussion system supported the midwives in this study to undertake midwifery-specific knowledge creation, capture and use. The midwife participants appeared to value the features of virtual communities such as, freedom from normative group and interactional pressures (including immediate visible reactions, approval and disapproval) as well as the opportunity to take part in an asynchronous 'reflective' discussion (Herring 1996b, Johnson 2001, Palloff and Pratt 1999). Moreover, our findings also supported the literature which emphasises the value of virtual forums as a means to achieve broad based horizontal participation

among communities of practice (Brooks et al. 2004, Ardichvilli et al. 2003, Johnson 2001).

In terms of functioning as knowledge workers, midwives demonstrated the ability to discuss previously uncodified knowledge held by virtue of their position as frontline workers. The working discussions captured here represent tacit and experiential knowledge derived from the practice experiences of the individual workers. In this forum, the individual's knowledge becomes public and part of a working, shared discourse. For knowledge work theory, it is precisely this aspect of knowledge capture that is not only vital to effective knowledge work, but is often so hard to achieve (Quintas 2002). In illuminating how midwives function as knowledge workers within a community of practice, this study further adds weight to the knowledge work literature that calls for the study of knowledge workers in situ (Blackler et al. 1993, Schultze 2000).

Collaboration between midwives within a community of practice was established remotely and virtually. The midwives' interaction with each other in this project did appear to conform to many of the positive aspects of communities of practice. For example, users demonstrated the ability to share knowledge and experiences creatively and were facilitative of continued discussion by others in the community (Wenger and Snyder 2000, Bate and Robert 2002, Brown and Duguid 2000). As a 'community of practice' they were able to critically reflect on their experiences of providing care and re-conceptualise those experiences into both 'proposals for change' and 'resolution of issues'. The high level of suggested resolutions within the online discussion indicates that the midwives (across grades) were able to solve

problems concerned with real practice issues that were of direct relevance to women's experience of care.

One transformational effect of computer-mediated communication is the potential it offers for displaying, and thereby making visible to the organisation, the contribution of certain types of worker (Wood 2000). The virtual community of practice also offered junior members of staff a means to function as emergent leaders and take forward actions resulting from the discussion. Furthermore, senior managers were able to display characteristics of "transformational leadership" through expressing overt and practical support for innovation, actions and discursive debate (Clegg 2000, Kouzes and Posner 1997, Markham 1998). Innovative individuals and horizontal leaders could be publicly supported and 'rewarded' (thanked) for their input, thereby positively reinforcing a culture of knowledge work among the midwifery staff-base.

Previously, it was noted that the midwifery literature highlighted an absence of support for colleagues, as a factor in the isolation of innovators and poor staff retention (Brodie 2002, Ball et al. 2002, Kirkham and Stapleton 2000, Kirkham 1999, Leap 1997, Begley 2002). A suggested feature of virtual interaction is the potential to encourage contribution from across hierarchies, as the absence of a physical presence allows for greater equity in the exchange (Johnson 2001). The discussion forum seemed to provide a mechanism for midwives to access personal and professional support from their colleagues and leadership, both vertically and horizontally.

Limitations

The study represented a small-scale 'naturalistic' observation of midwives using a novel software tool in a single hospital context. The small number of participants and short timescale of the observations reported here, clearly limit the claims that we can make. However, some of our findings are nevertheless striking and may offer some significant insights for the development of knowledge work in health care systems.

IMPLICATIONS FOR NURSING AND MIDWIFERY

This study indicates that midwifery can benefit from the deployment of information and communication technologies. Discussion forums can have a significant and positive impact on midwifery communication patterns. The perception that participation via an online forum could circumvent potential negative sanctioning from hierarchical structures is likely to be an important feature of online discussion forums, particularly for the nursing and midwifery professions who still need to overcome traditional hierarchy-bound working practices. Consequently, virtual online discussion may provide a means to assist with the process of change towards dispersed leadership and improved collegial relationships in nursing and midwifery.

Through making the contribution of innovators and emergent leaders more visible the application of discursive communication systems also offers the potential to contribute to reducing the global invisibility and marginalisation of nurses and midwives, as highlighted by WHO (Thompson 2002).

CONCLUSIONS

The AEC project has demonstrated that simple software tools can enhance midwifery practice by enabling midwives to communicate and debate issues of relevance to the delivery and organisation of care. New information and communication technologies deployed in this project appear to offer a means for midwives to develop supportive communities of practice. In particular, we have shown that such systems can minimise the organisational and structural marginalisation of those who seek to innovate.

This research highlights the relevance of knowledge work theory to understanding how health care professionals can collaboratively communicate to enhance knowledge creation, capture and use. A continued research focus on the work practices of knowledge workers in naturalistic settings is likely to yield valuable insights into how to further develop effective communities of practice in health care organisations.

Finally, the positive impact of on-line communication found in this study can be achieved with low-cost software tools and employing existing network capabilities. Health care professionals and organisations should consider how to fully utilise the capacity of these network tools and capabilities and should implement strategies to facilitate professional online communication. Further attention should be given to the implications of such discursive technologies as part of a strategic vision to enhance leadership development and the management of change in health care systems.

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Figure 1 – Forum contribution (postings) by grade
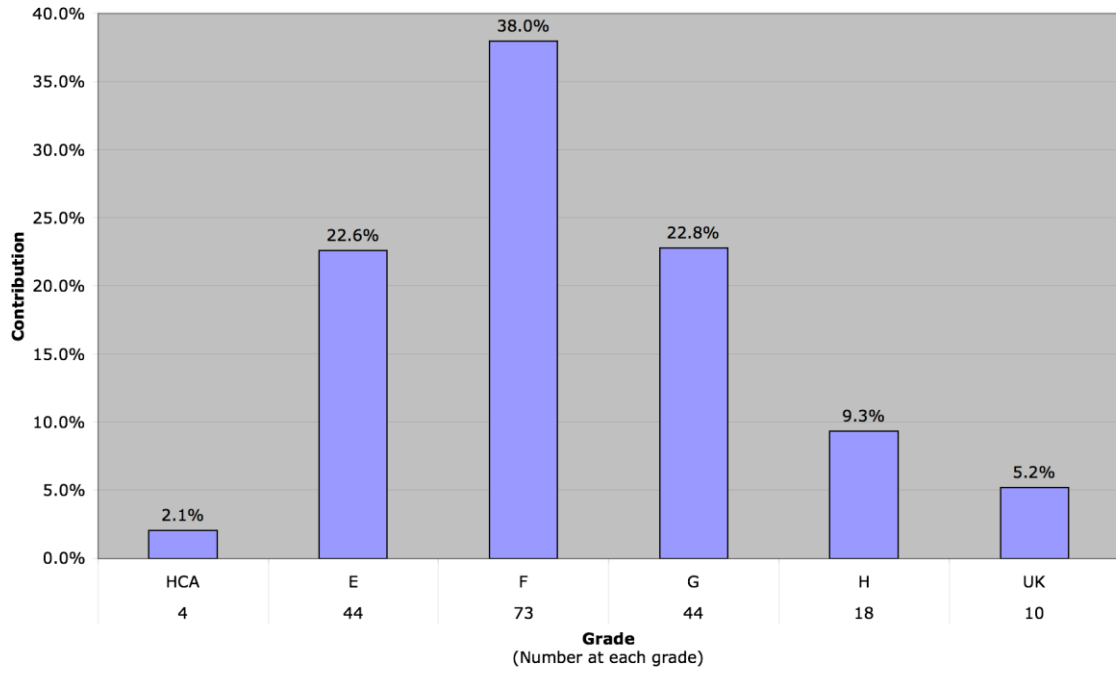
Forum Extract 1: information work

Thread: RE: SHORTAGE OF HCAS	
Ellen x G grade Time: 08:17	Apparently management are advertising for x2 day and x1 night CA-Midwifery staff.

Forum extract 2: initiating a knowledge work discussion

Thread: RE: Mealtimes when visiting SCBU	
Kate X *(E grade)* Time: 17:55	I was speaking to a patient whose baby was in SCBU. She found it very strange that staff would ring down whilst she was feeding to tell her that her meal was on the ward, as the baby was her priority! She did, however, state that she always ordered a cold meal. Maybe HCA's could encourage this when dealing with the menu's?

Forum extract 3: Collegial support

Thread: RE: Information packs	
Anne X *(F grade)* Time 02:51	Harriet X's suggestion of an A5 flyer is excellent. I wonder about the percentage of women that attend the ward tour, perhaps it would be better to hand the leaflet out at the 34 weeks ante-natal check. A supply on all the wards for those who deliver prematurally would be useful.

Forum extract 4: encouragement for emergent leaders

Thread: RE: Information Leaflets	
Helen X *(F grade)* Time 16:07 *(Note: this message was in reply to an E grade midwife)*	why don't you write them Amy, you don't need to be specially designated to do so i think. we need more input from midwives in these areas. However, do check that no-one else is writing them at the same time, i believe Jill X usually types them up so best check with her.

Forum extract 5: displaying horizontal leadership

Thread: Chat Room	
Sandra x Time 19:59	If you have looked at this site or posted a message then you know how to use it. Could you please pass this information on to your colleagues. USE IT OR LOSE IT!!!!!!!!!!

Forum extract 6: horizontal ownership of resolution

Thread: RE: Drinks	
Shelia X Time: 11:59	I agree we ought to investigate re-introduction of drinks machine. There will I presume be a cost implication but can overcome this. We need to discuss location and communicate SUGGEST to be discussed at ward meetings as a matter of urgency.