

The Future of Computer-Mediated Communication in the Health Service: A Research Agenda

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Abstract

Introduction

Computer-mediated communication (CMC) involves the transmission of data, image and voice across networks under the control of computers. Such communication has expanded rapidly as geographically dispersed organisations establish computer networks and as the Internet has expanded, putting CMC in the public domain.

The use of CMC enables virtual organisations to be created in which allegiance, relationships and shared goals are established and maintained through electronic communication. CMC offers significant opportunities for the establishment of networks of communication within the health sector in which geographically dispersed workers - general practitioners (GPs), consultants, specialists, pharmacists, nurses and social workers - may be involved in the care of the same patient.

An alternative future can be envisaged involving a completely networked health service in which information flows freely, resulting in a more efficient system in which quality data promotes the formation of virtual networks of clinical expertise for the benefit of patients. The wide availability of the Internet, which would allow public involvement in health care decisions and the establishment of the NHSnet could provide the platform a variety of applications. However, the presence of the technology does not guarantee its exploitation. Business, social, economic and political issues must be taken into account.

This paper explores some of the issues involved in CMC within the health sector. Firstly, the nature of the NHSnet is described. Stakeholders interests in the NHSnet are examined and special attention is given to the role of GPs in the acceptance of the NHSnet. Secondly, the usage and benefits of the NHSnet are considered. Finally a possible agenda for researching the effects of the NHSnet is discussed.

The NHSnet

The NHSnet is essentially an Intranet for the UK health service. As such it uses the concepts, software and technology which are familiar through the Internet, to create an information environment internal to the NHS. It is described as a secure national network developed exclusively for the NHS (IMG, 1997).

The network is serviced by two connection providers, BT and Mercury Communications, each of which provide Wide Area Network (WAN) services. BT runs the core WAN services, while BT and Mercury compete for local WAN provision. Connections are provided to national applications including the Prescription Pricing Authority, NHS Supplies, and the Nationwide Clearing Service. The latter provides a central sorting point for statutory data forwarded from healthcare providers.

A messaging service provides a link from the NHSnet to a mobile communications network serviced by RACAL. E-mail and firewalls (a secure Internet gateway) provide links to the Internet through JANET and superJANET.

Organisations within the health service register to connect to NHSnet. Costs include some initial capital outlay for networking equipment, servers and connection. Following connection, services are paid for as they are used. Connection involves the signing of a 'Code of Connection' which specifies adherence to the NHS security policy (IMG, 1995) as well other requirements including the appointment of one named security officer, the removal of any connection to JANET and the Internet and appropriate password authentication.

An earlier edition of 'Establishing NHSnet' (IMG, 1996) highlights NHSWeb and NHSweb directory. This will include what is essentially an internal search engine which will enable users to locate information and services. Here knowledge bases, training materials and reference books will be located. It is intended that the search engine will enable searching on perspectives:

'the user perspective - as GP, clinician, manager etc.

the organisation perspective - information from or about the NHS Executive, NHS Trusts, Health Authorities, charities etc.

the geographic perspective - structured by countries (sic) of the UK and other geographical groupings such as the English regions.' (IMG, 1996)

The NHSnet went 'live' in April 1997. By August 1997, 451 organisations had connected via BT, 29 using X25 rather than Internet Protocol (IP). Seventy eight organisations had connected via Mercury. However, this includes only 171 GP practices from a potentially 10,000 GPs. Consequently, the NHSnet has yet to reach a critical mass at which point its value and effectiveness can be properly assessed.

Stakeholders in the NHSnet

Stakeholders can be defined as 'any human or non-human organisation unit that can affect as well as be affected by a human or non-human organisation unit's policies or policies' (Vidgen and McMaster, 1995). The identification of stakeholders in NHSnet, and the study of their interests, concerns and attitudes to the NHS net is of importance in researching CMC in the health sector. Stakeholders have different expectations and perceptions. They also have different reasons for wanting to be

involved in the NHSnet. Furthermore each stakeholder will have multiple perspectives. Stakeholder analysis is valuable in helping us to understand these interests and therefore take them into account. Stakeholder's interests can be viewed from three perspectives. Firstly stakeholders have rational interests. They take a logical view of a phenomenon and consider its objective value. Secondly they have organisational interests, depending on their social position within an organisation and their social agenda. Thirdly, they have individual interests, related to their status, career progression and job security, for example. Table 1 considers roles and interests for selected stakeholders within NHSnet. The interests described are somewhat speculative. Whether the interest is seen as positive or negative by the stakeholder is indicated by (+) or (-) respectively. Such a grid could result from a rigorous stakeholder research program.

The use of the NHSnet in NHS trusts will expand only as hospitals develop new systems which require links to the NHSnet. Old systems may remain outside the influence of the NHSnet and there may be no connection with or influence on the host of disparate and unconnected specialist systems which inhabit hospitals. Patients remain excluded from the NHSnet. This gives them no increased choice, nor access to information which might reduce levels of anxiety and increase their involvement with their treatment. The rigorous efforts to isolate the NHSnet from public information systems may not encourage its use.

The success of the NHSnet will be influenced by the extent to which stakeholders support and use it. Barriers and differences between groups within the NHS may be reduced by the use of the NHSnet. However, a study of networked computer use in Canadian primary care suggested that computer networks can reinforce existing barriers and subcultural divisions (Legare and Douzou, 1996). Networked computer systems were installed in 105 GP surgeries in Quebec. These systems provided links with experts on mental health and were aimed at increasing GP's interest in mental health problems. Mental health experts could be questioned by the GPs over an e-mail link, a general clinical pharmacology databank was provided together with a bulletin board on mental health issues. Professionals already involved in mental health issues made use of the network. Those with less interest rejected the mental health specialists consultation network and made use of the drug databank without reference to mental health problems, reinforcing their traditional practice approach which concentrated on drug treatment of conditions and ignored therapy or alternative treatments. Thus the system had no effect in increasing mental health awareness. This suggests that more research is needed into how stakeholders view the NHSnet and how they may consider using it. Also the nature of stakeholder relationships and the perceptions each group holds of other groups is an important area for investigation.

Individual studies on particular stakeholders groups, their relationship with other groups and the social and political factors which would influence attitudes to, and usage of the NHSnet should be encouraged. The following section considers GPs in more detail.

| Stakeholder | Role | Rational | Organisational | Individual |
|-------------|---------------------------|--|--|---|
| GPs | Provision of primary care | Save costs of mail.(+) Provide access to clinical information.(+) | Increase power over providers through provision of information on provider | Increase amount of time used in non-patient care activities.(-) Enable moneys to |

| | | | | |
|------------------------------|---|---|--|--|
| | | | performance. (+) | be recovered quicker (+) |
| NHSTrusts | Provider of acute care | Save mail costs (+) Increase efficiency of booking(+) Reduce non-attendance (+) | Increase control over communications (+) | Increase power of IM department (-). |
| Health Authorities | Purchase of healthcare for given geographical area | Obtain more data about demographic trends (+) | Increase control over GPs (+). | Increase quality control centres reputation (+) |
| Network Suppliers | Provision of network services | Increase efficiency of communication in the health service (+) | Create a locked-in, long term, stable market for services (+) | Compete successfully and dominate healthcare market for 21 century (+) |
| Outsourcers | Provision of IT services | Enable better data quality and faster, more efficient services for clients (+) | Increase networking skills in order to be in a position to bid for further NHSnet work.(+) | Create network of IT functions. Strengthen hold on healthcare market (+) |
| Information Management Group | Provision of overall IS/IT policy | Reduce paper-based communications in the NHS, increase quality of data(+) | Strengthen power base of IMG (+) Increase control over IT within NHS organisations. (+) | Correct tarnished reputation of IMG(+). |
| Patients | Consumers of services | Get more information and reduce uncertainty about what treatments are to be carried out (+) | | |
| Self-help groups | Provide help and support to people with specific conditions | Produce strengthened networks so that faster support can be provided amongst members (+) | Increasing lobbying power and ability to influence GPs, consultants etc. (+) | |

Table 1: Stakeholders in the NHSnet

GPs as Stakeholders in the NHSnet

GPs are themselves a key group whose view of the NHSnet will influence its use. The role of the general practitioner (GP) within the community is pivotal to the delivery of healthcare within society. GPs reflect society's expectations of medicine and also influence those expectations. Their role extends beyond physical healthcare to the provision of advice which was once derived from within the extended family. The individualisation of society, and the replacement of natural caring networks with state

provision, has increased the public expectation of what the GP can provide and has resulted in an increased pressure on their time and resources.

An increased focus by the media on medicine and medical matters has expanded the amount of information available to the public concerning hospitals and treatments. Some patients have begun to use this information to make more demands of their GPs. More informed patients may have greater expectations of their GPs and may expect more information from them. The notion of trust, and the autonomy of the GP has been diminished. There has been a reduction of the knowledge gap

GPs have also been subjected to significant administrative change through the NHS reforms, the creation of GP fundholders and the creation of the internal market. These changes have been aimed at allowing patients and GPs a greater choice of consultant and hospital in referrals. Information on hospital costs, waiting lists, consultants' interests and quality may be required to enable informed decisions on referrals. GPs' power has potentially increased since hospitals depend upon their patient referrals, and GPs have more freedom, in theory at least, to choose hospitals. However, recent reports suggest that the internal market has been ineffective. GPs still refer patients primarily to local hospitals that they know. Also relationships between GPs and the consultant to whom they refer patients have become less strong over the years with the increasing workload of the GPs. There was a time when the GP would accompany the patient to the consultants and discuss the problem with the consultant. This would strengthen the GP-patient relationship and result in the informal education of the GP through discussions with the consultant. This close triangle of relationships has been lost. It could be suggested the NHSnet offers a chance to restore it.

GPs are required to produce more information, both administrative and clinical. The growing popularity of evidence based medicine may work in increasing information flow into the GP's practice and the flow of clinical information out. Pharmaceutical companies are seeking closer links with GPs and exploring possibilities of electronic communication in order to gather results for clinical tests.

GPs have a core role in the community. They provide the pivotal link between the individual in his or her home and the massive organisational structures represented by hospitals and acute services, social security and even work where illness and health issues are concerned. They are also key providers and distributors of information on a grand scale within the community. As such they are key players in the successful use of the NHSnet.

GPs are significant users of IT. Over 90% of GPs have computers in their surgeries, over half of those in their consulting rooms. More than 8% of GPs may be considered to be running a paperless office (Purves, 1996). Only a small percentage are currently connected to any network, primarily due to concerns about confidentiality. (House of Lords Select Committee in Science and Technology (SCST), 1996) The proliferation of computers within GP practices has been piecemeal. Hundreds of suppliers have provided a range of systems of varying quality. These have been unable to share information. Different rules for reimbursement of GPs for computer systems have been in place across the UK and attempts to links GPs has been of limited success, with unrealistic targets not being met (Jones, 1996).

The House of Lords Select Committee on Science and Technology recommended the connecting of GPs to hospitals for on-line appointments, the use of email to reduce paper-based communications between GPs and hospitals, and the use of the NHSnet to disseminate health warnings. It could be envisaged that access to the NHSnet from within the GPs surgery could provide instant call-up of a wide range of medical information for the use of both the GP and the patient. Email communications between GPs and patients could also occur in some cases. Links between GP surgeries could change the nature of consultations. GPs might employ primary care health workers who would answer patient's queries, provide reassurance - which is often all that is required - and become a virtual network of health information and family support. An electronic expansion of health care could pay dividends in preventative measures, resulting in significant savings of the GPs time. This in itself raises issues concerning the nature of the GP/ patient relationship and the extent to which patients may be willing to trust health workers other than the GP. Here, then, cultural change is occurring in an environment in which information technology is also being introduced, thus raising research questions about the interrelationship between the two and the influence of IT on culture and culture in the acceptance of IT.

For example, the following research questions may be validly considered:

- How will increased communication and knowledge availability affect the GP/ patient relationship?
- Will the connection between hospitals and GPs surgeries result in increased communication between GPs and consultants and a more rapid dissemination of clinical information and medical progress?
- Will electronic communication favour a particular group of patients who are affluent and educated?
- Can the use of electronic communication speed up health care reforms and accelerate the move towards a market?
- How will the use of electronic communications affect referral practice?
- What is the effect of the GP's view of technology? Will the effective use of the NHSnet be limited to those practices where there is a GP who is a technical hobbyist?
- Does the networking of a GP practice change the nature of working relationships within the surgery?
- To what extent is it possible to replace face-to-face interactions between patients and GPs with electronic links?
- Can the NHSnet be expected to catalyse the formation of virtual networks of GPs, pharmacist, optometrists, dentists and other services within primary care?
- How does the level of computer expertise of the GP affect use of the NHSnet?
- What are the drivers for NHSnet usage by GPs?
- What are the attitudes of GPs and patients to communicating using e-mail?
- What links and contacts might develop between GPs and Internet-based special interest groups?
- Attitudes to computer mediated communication with hospitals and consultants;
- What ethical worries do GPs have concerning NHSnet?
- How can the trustworthiness of information on the NHSnet be assured?

These questions centre around a main question: will the use of the NHSnet within a GPs surgery change the behaviour, attitudes and activities of the GPs and modify the relationship between the GP and the patient? While the expectation is that the use of the NHSnet could revolutionise primary care, there is little evidence for this and some scepticism is in order.

The consideration of GPs as stakeholders raises issues about the political and social impact of the NHSnet. Knowledge availability on the NHSnet may have a significant impact on how GPs investigate conditions. However, it could be suggested that the demands of external groups - patients, pharmaceutical companies, pressure groups and special interest groups - will put significant pressure on GPs who may be acting as gatekeepers to a network of information from which the public is excluded. NHSnet security policy excludes contact with external networks and consequently involves the exclusion of large stakeholder groupings.

The Uses of the NHSnet

The NHSnet offers a platform for a wide variety of applications within the NHS. Communications between GPs and consultants can be established. Results may be transmitted directly to the GPs. Dialogue may be entered into with the consultant concerning a patient's condition. GPs may be able to obtain information on hospitals, services and standards of care through the NHSnet in order to make the best decisions on patient referrals. Electronic Journals may provide the latest information for GPs, selected by relevance to the GPs interests. Special interest groups may be set up, using electronic mail (e-mail) to exchange information and ideas concerning specific conditions. Health warnings and health scares may be transmitted to all GPs to inform them ahead of the media.

With greater access to the NHSnet, or the use of the NHSnet, patients could be able to set up self-help networks to share experiences and information concerning specific conditions. Consultations may take place over e-mail and information provided in order to close the knowledge gap between GPs and patients. Information provided through CMC may reduce worry, enable patients to be better informed and even reduce the number of non-attendances at clinics.

The NHSnet may aid the remote viewing of conditions by specialists at large hospitals who can provide advice remotely. Expertise and information on rare cases can be distributed through CMC. Remote tutorials may allow the sharing of information from centres of excellence. Patients may be discharged earlier and their condition monitored from home using CMC to transmit necessary clinical data. Virtual GP practices could be established over wide geographical areas.

Existing services may be extended and their efficiency improved and new services developed. Each service will require its own research agenda. Technical and social issues will have to be addressed. The use of the NHSnet will require a balanced approach in which different ways of using it are equally promoted in order to promote the widest possible stakeholder involvement.

The ICDT model (Angehrn, 1997) provides a reasonable approach for designing a balanced NHSnet strategy in which a range of uses is considered. The ICDT model considers uses of a network under the heading of information, communication, distribution and transaction (Figure 1).

| | |
|--|---|
| <p>Virtual Information Space</p> <p>Clinical Information Evidence-based medicine studies Electronic Journals Health scares and warnings Provider performance information</p> | <p>Virtual Communication Space</p> <p>GP special interest groups Tutorials General e-mail</p> |
| <p>Virtual Transaction Space</p> <p>Booking hospital services Payment requests Items of service claims Supplies orders and invoicing Prescription pricing Ambulance transport requests</p> | <p>Virtual Distribution Space</p> <p>Results services Discharge information Medical records transfer Hospital at home Remote consultation</p> |

Figure 1: Outline ICDT Model of NHSnet

The virtual information space provides channels for hospitals to display information about themselves for internal and external consumption. This information may include details of waiting lists, information about specialties and other economic and practical information about the hospitals. Access to scientific journals and the latest clinical information can be provided. Such an information network may promote evidence-based medicine. Researchers will need to ask whether the presence of the NHSnet alters the way GPs obtain their clinical information, and what factors influence the decision they make. The NHSnet could host important decision support systems which may alter decision-making activities.

The virtual communication space provides new channels for relationship-building. Dialogues concerning clinical and management decisions can take place. Opinions can be polled and ideas developed. Closer relationships between GPs and consultants may be established. Researchers need to ask: do existing relationships change as a result of the NHSnet? Are new relationships formed? What is the effect of the NHSnet on the development of attitudes and responses to comments from the Department of Health, for example.

The virtual distribution space provides a new channel for the distribution of services within the NHS. Results services can provide much faster responses to GPs, providing instant test results from machine to GPs surgery. Consultation between GPs and consultants are facilitated. Mobile links with ambulances may allow clinical assessments to be carried out on the spot. It is important that the NHSnet allows the promotion of appropriate medical support. For example, it may not be necessary to have highly qualified emergency teams attending minor incidents if mobile communications provide the assurance of the availability of specialist intervention if it is needed. It is noteworthy that the consumer of services, the patient, is excluded from the NHSnet. The possibility of providing computer-based counselling services

and of using electronic communication to deal with the minor ailments and psychological problems that take up so much of the GPs time would provide an efficient means of getting appropriate care to patients in an efficient manner. Researchers need to address the social issues around the use of CMC in distributing medical services and providing medical advice.

The concept of a Hospital at Home could be supported through the NHSnet. Patients are released from hospital at an earlier date if home facilities are suitable and clinical monitoring can continue. Biochemical and physiological monitoring takes place using CMC and removes the need for the patient to remain in hospital. Given the right home conditions, the advantages are considerable in terms of faster recovering in a relaxing environment over which the patient has more control, and the reduced risk of infections. Furthermore, the use of CMC may enable the promotion of home births, that have significant advantages over hospital births. Both technical and social issues need researching. What are the technical and data requirements for Hospital at Home? How does remote monitoring affect clinical decision making? What factors inhibit remote monitoring?

The virtual transaction space enables transactions between purchasers and providers to be executed quickly. It is envisaged that a variety of transaction will take place over the NHSnet, including ordering and requisitioning, item of service claims, patient registrations and exchanges of contract minimum datasets (IMG,1994). Here issues of transaction cost reduction and data quality need to be examined.

The availability of the NHSnet may support applications in all four virtual spaces. Current IMG literature suggests a primary emphasis on the transaction space. We consider that effective use of the NHSnet to deliver improved services to patients requires a balanced use of all four transaction spaces. Research needs to address the use of the information, communication and distribution spaces as well as the transaction space.

The possibility of services which do not duplicate existing services using the NHSnet, but develop as new services which harness the distinctive properties of the NHSnet need to be identified by researchers and examined for feasibility.

The Benefits of the NHSnet

A study in the Netherlands (Ribbers, 1995) suggested that possible benefits of CMC included lower message cost, higher quality data and data transfer, greater social cohesion and more information available for the patient. The IMG identify benefits in efficiency, effectiveness, working practices and delivery of patient care (IMG, 1997). The networking strategy identifies cost savings benefits through competitive procurements, reduced local networking costs and reductions in stationary and delivery costs.

Benefits from cost savings need to be approached cautiously. The Netherlands study found no costs saving, although that provided the basis of the case for the implementation of the CMC pilot. It was particularly costly for GPs to link up. Systems were seen as non-user-friendly, terminals were expensive and the message set was limited. The study noted the key role of GPs in successful CMC. There is clearly a need for research to identify success factors associated with CMC in healthcare.

The Netherlands study found that the primary benefit of the local CMC was in improved data quality. Similar benefits can be expected from the NHSnet. Timely and

better quality information can be provided to GPs, including up-to-date, accurate results. IMG identifies other data quality improvements in administrative statistics, better collections of data and more reliable analysis. It suggests that better cashflow will follow. Efficiency benefits are also cited, including avoiding re-keying of data, reduction in paper and reduction in time looking for omitted data.

Several points can be made. Firstly, the benefits focus on administration and the flow of administrative tasks. The focus is on the transactions, rather than the activities generating the transactions. It is as if the transaction is the treatment, rather than an artefact resulting from the treatment. Researchers should question this administrative, transaction focus. There is little in the benefits cited to suggest clinical benefits to the patient. This may be a result of the exclusion of the patient from the system. The system of administrative messages and transactions runs virtually in the absence of the patient who is external to the system and merely modelled in the system. Secondly, there is the assumption that administrative benefits such as single entry point for data, reduced time opening, forwarding and filing information and reduction in telephone enquiries naturally occur as a result of the installation of CMC systems. We would suggest that this is not the case. Such administrative activities are generated from social interactions. They are a result of social activities and interpretations of events and actions by the stakeholders. The expectation of the delivery of efficiency benefits results from the adherence by technologists to a machine view of the organisation (see McBride et al, 1997). Efficiency benefits are often not realised and do not represent the real benefits of the system (McBride & Fidler, 1994). Research is required to identify the benefits of the NHSnet, to look for factors that might inhibit or promote those benefits and to develop case studies that illustrate how the benefits may be obtained.

Social and Ethical Issues surrounding the NHSnet

A key issue affecting the use of the NHSnet is security. Debates have raged between the IMG and the BMA concerning whether encryption should be used, whether electronic patient records (EPRs) can or should be transmitted over the NHSnet and what level of security is provided by the NHSnet. It is sometimes possible to identify patients even from minimum details such as date of birth and postcode. Such worries have led the IMG to produce a fairly strict code of connection which prohibits connection of the NHSnet to other networked systems. This creates second-order security problems. Security restrictions can be so effective that use of the system is effectively throttled. The security measures themselves cause problems. For example, medical schools are effectively excluded from the NHSnet since the cost of linking in using a new and separate server may be prohibitive. Research is required into the effect of the various security measures on usage and user attitudes. It has been shown that management attitudes and organisational culture can provide security measures as effective as technical measures (Backhouse and Dhillon, 1996). Therefore a study of cultural attitudes to security within the NHS may shed light on the possible problems associated with the NHSnet. Security should be set at an appropriate level which provides the maximum protection with the minimum restriction.

Ethical issues relating the NHSnet abound. Management codes for its use, demands for training and the effects of inadequate training, the involvement of 3rd parties (particularly pharmaceutical companies), and issues of data ownership all need to be investigated. CMC assumes a significant level of literacy. Therefore patient

involvement with the NHSnet, were it to occur, could exclude members of lower socio-economic groups.

If the NHSnet promoted use of evidence-based medicine, this would raise the potential for deprofessionalisation, where treatments are based on statistical outcomes more than individual clinical judgement.

The spread of the NHSnet may result in changes in power and autonomy. On the one hand, requirements for data transfer and the ability of central authorities to access individual GP's information over the NHSnet could result in greater centralised control. On the other hand, the use of networks can lead to forms of anarchy and the development of informal networks outside the authority structures of the NHS.

It seems to us that networks such as the NHSnet will eventually change social relationships. The development of new social approaches to medicine can be hypothesised in which the dominance of the GP is removed in favour of a variety of community-based medical roles. 'Bare-foot' medical practitioners accessible via CMC provide more general care and advise on minor ailments and conditions. Mental health advice and counselling is delivered efficiently via CMC and general, up-to-the-minute medical data is always available. The social and ethical issues behind the use of CMC within the healthcare sector should be a significant focus for research activity.

A Research Agenda

An outline research agenda is described in figure 2. The agenda is not exhaustive, but suggests some directions in which research should go. Importantly it identifies the key role of stakeholders. It is their social, political and cultural views which will determine the direction of the NHSnet. While economic and technical drivers may have an important effect on the use of the NHSnet, the most important drivers are arguably the social drivers (McBride, 1996). Stakeholders will place a social interpretation on the NHSnet. Interested groups will seek to influence and enrol others to their particular view. Powerful agencies will seek to enforce use through their control of resources; for example, authorities can demand submission of payment requests over the NHSnet. It is therefore important that we understand the network of alliances and explore the social and political issues that will determine the social construction of the NHSnet.

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| Identify stakeholders |
| Survey stakeholders |
| Investigate usages of NHSnet |
| Explore applications within the ICDT model |
| Identify issues concerning use of virtual distribution space |
| Identify social issues |
| Examine organisational and social change catalysed by NHS |
| Identify case studies |
| Investigate benefits |
| Establish socio-technical framework for understanding benefits |
| Identify ethical issues |
| Model ethical issues |
| Identify effects at boundaries with public networks |
| Examine effects on pressure groups |
| Investigate changes in GP/Patient relationship |
| Identify limits of security policy |
| Model second-order security problems |

Figure 2: Research Agenda for CMC within the NHSnet

Conclusions

The NHSnet will have significant implications throughout healthcare in the UK. Although there has been much discussion on technical and security issues, there is a paucity of research on the social implications. For example, the Government White Paper on Primary Care (DoH, 1996), suggests alternative forms of contracting, the ability to employ doctors or alternative workers within practices in contract relationships other than partnerships, and an increased role for the community pharmacy as a first port of call for minor ailments, a source of counselling on the use of medicines and a source of health promotion. Such changed approaches could result in virtual networks of primary health care if appropriately supported by the NHSnet. These changing social structures and social roles need to receive the attention of researchers.

How healthcare expectations will be affected by the NHSnet and whether culture and politics within the NHS will inhibit or promote its use is a matter for urgent research. Unless we examine the nature of the NHSnet, and its social and political influence in a holistic way and do not restrict ourselves to technical and economic issues, we will find that its potential is not achieved. A system which may provide new and improved ways for delivering clinical care and promoting community health may be reduced to a glorified transaction processing system, with little benefit for the patient and an increased transaction workload for medical staff.

It is up to researchers to point the way to effective CMCs for the healthcare sector in the 21st Century.

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