The potential of information technology for nurses in primary care: a review of issues and trends

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This article presents a review of current issues and trends in the use of information technology (IT) by nurses in primary care. Its aim is to raise awareness of the particular problems faced by nurses, and so it is not aimed at the IT expert but at the primary care nurse, researcher or educator who seeks a wider perspective on the issues involved. It is not the purpose of this paper to offer specific solutions to the problems; these will be discussed in further publications. The first section highlights recent policy changes in the area of information technology that are already affecting nurses in primary care. The second section addresses some of the barriers to progress in this area, which should be taken into account if the Government's vision of an IT-rich health service is to be achieved. To draw attention to the fact that nurses in other countries face similar issues to those in the UK, we include a wide selection of international as well as national literature. Finally, the third section suggests how these barriers might be overcome, and identifies emerging trends.

Key words: information technology; nursing; nursing education; primary care

Background: information technology in health care and primary care

The launch of the recent information strategy for the health services, *Information for Health* (Department of Health, 1998a), seems to promise a bright new dawn for the use of information technology (IT) within health care in the UK.

Coupled with the Government's overall vision for the future development of the NHS as set out in the White Paper (Department of Health, 1997) and other subsequent documents dealing with the delivery of quality services, such as *A First Class Service* (Department of Health, 1998b), there certainly seems to be top-level commitment to widespread change in the nature of health services and the forms of delivery. However, there is still an important contrast between the current reality of nurses' computer use in primary care, and the future vision as made explicit within this recent information strategy. If current reality is to be transformed into the future vision, a serious skills gap will need to be urgently addressed.

The use of IT is seen to be integral to the development and delivery of health services, with *Information for Health* setting out a 7-year timetable for the development of widespread electronic information storage and exchange across all parts of the health service. Such an implementation has profound implications for the way in which all nurses and other health professionals work, and has equally vast implications for their education and training needs, to enable them to use the new technologies that the strategy promises.

The emphasis on the need for clinical benefit from computer systems has been widely welcomed within the health professions, and is generally seen as a much-needed contrast to the previous finance- and management-driven Information Management and Technology (IM&T) strategy. However, many

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of the factors which will determine the success or otherwise of these developments as we move into the twenty-first century are human factors. Furthermore, there is increasingly a shift from focusing on the intricacies of the technology to considering how best to manage information using it. These factors, rather than any detail of the technological issues, will be explored in this paper.

If we are to believe what has been said and written about the development of computer systems within the health service, primary care would already seem to be well served by the technology and well placed to take advantage of the benefits to patient and client care promised by the new direction and focus. There has been substantial financial investment in computer systems for general practices in recent years, and it is now estimated that well in excess of 90% of practices in England are computerized. The Government now envisages all practices being computerized by the year 2000. However, there is concern that although such systems may be in place, they have been – and will continue to be – used primarily by general practitioners (GPs) (e.g., for repeat prescribing and for financial and administrative purposes), and have generally not been used by or provided any direct benefit to nurses.

Obstacles to access to and use of information technology

Although in the past few years most general practices in the UK have invested in computer technologies (Brown, 1998), a number of problems associated with computerization in primary care still remain. This section highlights some of the difficulties encountered in making information technology work for nurses in primary care, namely attitudes to computerization, changes in work practices, and education and training needs in IT.

Attitudes towards computer technology

For computerization in health care to be successful, the attitudes and concerns of health-care professionals, and particularly of nurses, need to be considered. Recent literature has reported on nurses' mixed and ambiguous attitudes towards the use of computers and information technology (e.g., Scarpa *et al.*, 1992; Lacey, 1993). Such negative attitudes towards computer technology affect both the use of and access to IT. Negative attitudes have developed when, for example, nurses have had unsuccessful experiences with computer systems. In conjunction with the nurses' own past experiences of computers, their perception of what computer technology can or cannot provide is very important. There is still a gap between the nature of nursing as provision of care and nurses' understanding of the benefits of IT to support patient care (Simpson and Kenrick, 1997). Furthermore, there is also the perception that computers take away nurses' responsibilities. For example, some nurses view computers as a threat that challenges their traditional codes of ethics and confidentiality (Miller and Jeffcote, 1997).

Another factor which influences nurses' attitudes towards computerization concerns cultural differences. For example, Marin *et al.* (1998) have investigated nurses' requirements for information technology in the USA and in Brazil. Nurses in the USA were found to be more comfortable with computers than nurses in Brazil, and in each country they had a different view of the role of computers within their work practices. For example, nurses in Brazil tended to agree that computers should be mostly used in the administrative nursing area, whereas nurses in the USA believed that computers could help in other nursing areas as well. Mixed feelings about how IT can support nurses in different countries were also reported by Simpson and Kenrick (1997). They compared attitudes towards computerization in the UK with a similar study in the USA. Although their results show that the UK situation was not too dissimilar to that in the USA, they found that other underlying factors were affecting attitudes towards computer technology, including age, gender, and experience as a nurse. For example, it was found that older nurses who had not been trained in IT during their nursing studies were more likely to display negative attitudes towards computer technology. With regard to the gender factor, Simpson *et al.* (1998) reported that in general practices, it was more likely that male partners than female partners had responsibility for computer development.

Closely related to negative and ambiguous attitudes, anxiety about and resistance to computers contribute to the difficulties in accepting and using computer technologies. Negron (1995) reports on the impact of computer anxiety on nurses using IT.

Resistance to computer technologies includes both resistance to learning and lack of information. Another type of resistance is that to change generally, including using computers. These are serious problems that need to be addressed. Otherwise, they will continue to hinder progress in the use of IT to support and deliver patient care.

Changes in work practices

The mode of health-care delivery is undergoing major changes. Nowadays the style of patient care delivery is moving towards integrated care. Primary care centres are organized around multiprofessional teams, and within the primary care team the role of the nurse in the UK is changing rapidly. Nurses in the UK now play an active role in disease management and health promotion, while primary care groups (PCG) can give nurses a clear role as part of PCG boards involved in commissioning health services for their local population.

Changes in work practices may be strongly influenced by technological changes, and technological innovations may drive the change to progress. Many of the studies (e.g., Hall, 1996; Fogarty, 1997; Shepherd, 1999) investigating current and projected use of information technology in general practice have identified areas where IT could be added to the existing activities of the general practice (e.g., links to digital medical libraries). However, although most GP practices in the UK are computerized, nurses tend to have little access to the system, especially for uses other than updating patient records (Miller and Jeffcote, 1997).

Changes in work practices can also be hindered by technological and human factors. In some cases, the technology in place (e.g., electronic mail and connection to the World Wide Web or WWW) may not work efficiently, or the systems used may not fit the general practice's wider needs and requirements (Shepherd, 1999). Furthermore, national and institutional guidelines for technological changes can be difficult to implement because health-care professionals, including nurses, cannot always grasp the benefits and potential of IT. For example, there is some evidence that when nurses in primary care are not involved in the introduction of IT into the workplace, they will miss the opportunity to enhance their practice and status (Miller and Jeffcote, 1997).

Changes in work practices also mean that health-care professionals, including nurses, are faced with new challenges of communication and collaboration (Alpay and Heathfield, 1997). However, health-care professionals may be reluctant to alter their current modes of communicating and collaborating with colleagues – for example, in using electronic patient records in the practice (e.g., Swanson *et al.*, 1999). In addition, as Herbert (1998) has pointed out, socio-economic and organizational factors impact on collaboration and communication. More and more health-care institutions (such as primary care centres) need to contain their expenditure, and aim to achieve increased quality of care and staff development while at the same time minimizing costs. Thus members of the primary care group must collaborate in order to maximize resources (e.g., Lock, 1995; Whitecross, 1999).

The introduction of information technology in the workplace impacts not only on changes in work practices but also on other related aspects such as changes in roles and responsibilities, and changes in 'culture'. For example, the roles and responsibilities of health-care professionals, including nurses, have been reported to change in relation to electronic access to and data entry of patient information (Herbert, 1998).

It is recognized that a culture change in nursing is taking place, and information technology is viewed by some nurses and nurse leaders as supporting rather than conflicting with activities (Procter, 1998). However, such a change would seem difficult to achieve in the short term when computer resistance and computer anxiety still affect a large number of nurses (Negron, 1995).

Are the changes in work practices brought about by IT always beneficial and desirable? This question merits consideration for, as Herbert (1998) points out, technological changes do not always result in better work practices. The need to spend more time using computers, and the necessary training for this, may result (at least temporarily) in less frequent interactions with patients.

Training needs and requirements in information technology

In this section, two separate educational contexts are discussed, namely training professional nurses in IT (as part of their continuing professional

development) and integrating IT within the nursing curriculum.

Information technology training for professional nurses

It has been recognized for some time that healthcare professionals, including nurses, have an inadequate knowledge of the principles of health informatics (Hasman, 1994; Barnett, 1995). One of the main problems is that there is still little empirical research reported in the literature which has assessed the current situation of IT training needs and requirements for nurses (see, for example, in Wright, 1994; Murray, 1996; Simpson and Kenrick, 1997). Examples of studies investigating IT training for general practice have usually focused on GPs rather than on other members of the primary care team, such as nurses (e.g., Ahmed and Berlin, 1997).

Unfortunately, computer training for nurses is often either nonexistent or inadequate and targeted at audiences other than nurses, as was found for example for 80% of practice nurses interviewed in the study by Miller and Jeffcote (1997). It is also important to point out that GPs may not always give a high priority to the professional development of their colleagues, including nurses. Furthermore, in the UK the absence of any agreed accredited IT training for nurses, which has been highlighted in recent surveys (e.g., Miller and Jeffcote, 1997), has certainly contributed to the low level of IT literacy within this health-care group.

Where IT training programmes do exist, nurses are not always provided with IT educators who can appreciate their educational and learning needs. Thus these instructors often fail to facilitate the teaching–learning process without provoking anxiety and discomfort (Negron, 1995; Nagelkerk et al., 1998).

Other problems associated with IT training arise from the nurses themselves, in that they may lack interest and concerns in IT and may not have aspirations to develop their expertise in this area. Nurses in need of training in IT will have received their formal education before this technology was integrated into the curriculum, and some of them will not been been inclined to find out about developing computer technologies (Roberts and Peel, 1997). Furthermore, for some, training in IT is only seen as relevant when the information content is deemed to be directly helpful (e.g., if it is

linked with training in the use of specific information management systems).

In addition, some nurses experience difficulties in prioritizing their learning needs due to the magnitude of these needs, including computerization and information technology (Lindner, 1998). Moreover, some nurses are being increasingly challenged by new educational demands. Continuing education through open and distance learning is an attractive way to acquire informatics skills. However, recent courses for newcomers to computers (e.g., some of the courses developed at the Open University in the UK) expect their learners to be able to adapt to novel study modes of communication and collaboration.

Information technology within the nursing curricula

There are various problems associated with nursing curricula. First, the number of nursing curricula which include informatics is limited (Mantas, 1998). This situation results in utilizing existing materials developed for health or medical informatics courses, or using materials from outside the health-care sector. Neither approach is desirable for nursing education. A related difficulty in nursing education is the fragmentation of the curriculum. That is, IT teaching modules are not always developed as an integral part of the curriculum itself (Carlile and Sefton, 1998).

The curriculum content for teaching IT to nurses is still far from achieving its goal (Travis et al., 1992). Although nurses are trained in the use of information technology, there are still areas of study that require attention. Frequently practical skills are limited (e.g., to word-processing software), and nurses lack knowledge of health information systems (Saranto, 1998). Furthermore, not enough emphasis is placed on support for nursing practice and nursing research (Moritz, 1990), and on bridging theory and practice in the use of IT (Crudele et al., 1996).

The learning environment in which nursing students acquire their knowledge and skills is also a crucial factor. One recent study showed that nursing students were dissatisfied with the current learning environment, and that they wanted more depth and breadth to the teaching of information technology (Saranto et al., 1997). The importance of learning in a peaceful environment when studying IT in nursing education has been stressed

previously (Vanderbeek *et al.*, 1994). Nurses need to be away from work pressure and delivery of nursing care. Thus an inadequate learning environment will not reduce initial computer anxiety and enhance computer literacy.

Another set of difficulties in incorporating IT in nursing curricula arises from the teachers themselves. The selection of those who teach nursing students is important and needs to be done carefully. For example, in a study by Saranto *et al.* (1997) it was found that nursing students felt that the best choice for a nursing informatics teacher was an IT teacher, rather than a nursing teacher. While some nursing academics feel comfortable teaching nursing students in informatics, others display negative attitudes towards computerization and thus hinder the implementation of technological advances in their academic settings (Lewis, 1997). Furthermore, with the advent of computer and telematics technologies, nursing educators need to rethink nursing education altogether. However, the need to re-examine and re-conceptualize the field of nursing in the light of IT still remains a problem for some (Ronald, 1991). Many of the issues discussed above were identified and discussed by Nelson (1997) in the early 1990s, but there is little evidence of substantial progress towards addressing them.

Discussion

The above section examined three types of difficulty documented in the recent literature on access to and use of IT by nurses. These aspects are closely intertwined. For example, negative attitudes towards computerization arise from a lack of training and positive experiences of exposure to IT. The changes in work practices that are brought about by computers and IT generally may initially be a source of anxiety about and resistance towards computers. The following section illustrates how these difficulties can be addressed, and discusses the emerging trends.

Nurses' pro-activity

Nurses need to work within a computer environment that can deal with the complexities of the care that they plan and deliver, rather than working with computer technologies that require them to adapt their practices to the computer environment. One way to achieve this is for nurses to be more pro-active in finding out how IT coupled with adequate information management will improve their practice (Glen, 1998; Marin *et al.*, 1998). The view that nurses ought to be involved in the IT revolution is also echoed by Negron (1995) and Keen and Malby (1992). It is through models like that proposed by Nagelkerk *et al.* (1998) that nurses can prepare themselves for computerization and change their negative attitudes. Those authors identified six factors that will successfully help nurses in nursing informatics, including strong leadership, effective communication and organized training sessions.

Furthermore, in order to be more pro-active nurses need to be reflective. For example, they should assess and aim to raise their levels of concern in their use of and access to IT. Stages of concern as proposed by Hall and Hord (1987) range from no concern or awareness, through interest and information-seeking to personal concern about how the computer innovation will affect the individual. These levels of concern can be applied to the nursing context (Barnett, 1995). For example, a nurse may have reached the personal level of concern about the technical aspect (e.g., being uncertain about the personal demands and her competence in using the technology) and at the same time be at a different level for the policy aspect (e.g., having only a general interest in the new NHS information strategy).

Capitalizing on 'nursing intelligence'

As work practices in primary care change, the role and responsibility of its nurses also change. Consideration is now given to 'nursing intelligence' (i.e., information gathered from nurses in their nursing work) and the nurse's role in utilizing such intelligence (Ballard, 1997). This view reinforces the idea of knowledge transfer as an evolving paradigm that will provide full and effective use of the technology by nurses (Ball *et al.*, 1997). Furthermore, it is through methods such as focus groups that nurses can capitalize on nursing intelligence, explore their role in depth, and identify their information needs and requirements (Torn and McNichol, 1998). Strong leadership coupled with the capitalization of nursing intelligence will put nurses in a favourable position to lead IT innovations in their practices.

Assessing the use of information technology by nurses through a socio-technical perspective

The introduction of IT in primary care means that nurses not only have to rethink and change their perceptions about computerization and IT, but they also have to adapt to new working practices. In order to have a better understanding of the impact of IT in primary care, especially for nurses, the nature of those changes needs to be assessed. This can be achieved by adopting a socio-technical approach. Indeed, there is an increased awareness of the interactive relationships between users such as nurses and the technology, and there is an increasing recognition of social, organizational, political and nontechnical factors surrounding IT use and access (Kaplan, 1997; Herbert, 1998).

Although the social interactionist perspective proposed by Kaplan (1997) still remains largely at a research level, this approach provides a useful framework for examining the impact of IT for nurses in primary care. This framework allows us to reflect on and raise questions about issues of communication, care, control and context that occur in primary care. For example, one may ask whether communication within the primary care team, as well as between the primary care team and the primary care group improve, and whether the delivery and quality of care is better. It is also important to identify who owns the electronic patient record and who controls the updates of the patient database.

Need for empirical investigation

In order to help nurses to change and improve their attitudes towards computers and IT, it is necessary to have details of the nurses' current situation in this area. It is important to investigate not only nurses' IT skills but also their understanding of information management using those skills. However, as stated in the previous section, there is little empirical evidence in the literature. It is acknowledged that more empirical investigation is needed to assess the situation (e.g., Negron, 1995; Strachan, 1996; Marin *et al*., 1998). At the Open University in the UK, the work in progress in the project PRACTIS (**PR**imary care nurses **A**ccess to **C**ommunications **T**echnology and **I**nformatics **S**kills), led by the first author of this paper, aims to collect empirical evidence on the current levels of access to and use of IT by practice nurses in Buckinghamshire, UK. The project also aims to

assess nurses' educational needs and to investigate their perceptions of the proposed benefits of IT to their practice and lifelong professional development.

Adequate nursing training programmes

Changes, either of attitudes or of work practices, brought about by the introduction of IT into primary care need to be complemented by comprehensive IT training programmes (Lynn, 1995; Fullerton and Graveley, 1998). Although courses in information technology that are offered to healthcare professionals are usually satisfactory for teaching the use of specific software packages, they fail to provide a broader overview of the potential of IT (Saranto, 1998). Nurses need support as they develop their understanding of the benefits of IT for patient care, and of the complexity of using information technology. More attention is now given to metacognition and cognitive tools to facilitate higher-order thinking skills required for the effective use of IT in nursing education (e.g., Ribbons, 1998). Furthermore, educating nurses in IT ought to act as a bridge between the learning needs of the nurses and the needs of the care setting (Lindner, 1998). For example, understanding the fundamentals of IT can help nurses to apply evidence-based nursing by accessing computerized databases (Kessenich *et al.*, 1997).

The situation with regard to IT training for nurses is now slowly evolving (Barnett, 1995; Nagelkerk *et al.*, 1998). In the UK, a number of initiatives have supported nurses in identifying their own training and development needs, such as the NHS Enabling People programme (NHSTD, 1995). Furthermore, the new NHS Information Strategy, *Information for Health* (Department of Health, 1998), has set out specific objectives to address these issues for nurses. At an international level, recent recommendations on education in health and medical informatics, including information technology, have been put forward by the working group of the International Medical Informatics Association (IMIA) (IMIA Working Group 1, 1999). In the USA, an informatics agenda for nursing education has been put in place to prepare nurses to develop and use IT (Gassert and Salmon, 1998).

Successful IT training for nurses requires not only that the subject matter be prepared adequately

to meet nurses' learning needs but also that IT be taught by carefully selected educators. There is a need for a more humanistic approach to teaching informatics in nursing continuing education (Negron, 1995).

A further issue associated with IT training that is worth pointing out here centres around information contents. There is a growing view that, in order to be of practical value for nurses, IT training ought to be complemented by adequate training in information management (e.g., English National Board for Nursing, Midwifery and Health Visiting, 1998).

Conclusions

It is clear that the future development of health care will be increasingly underpinned by sophisticated use of information technology. Nurses in primary care are faced with the challenge of making IT a valuable tool in their practice. Drawing from current literature, this paper has as its focus some aspects which hinder successful access to and use of IT by nurses in primary care, namely attitudes towards computerization and IT, changes in work practices, and education and training needs in IT. Although solutions to these difficulties are under way, there are still discrepancies between the reality of today and the ultimate vision of the 'IT-skilled' nurse. It is by actively addressing these challenges, recognizing the benefits of IT coupled with adequate information management, and by taking charge of their future that nurses in primary care will be equipped to meet the technological advances of the twenty-first century with confidence.

Acknowledgements

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