What barriers do nurses need to overcome in order to function in a working environment that relies on IT?

By Carrie Farnell, RN, BScN, MA
Acute Care Clinical Educator
Clinical Learning, Learning & Wellness, DTHR

Introduction

In response to the alarming number of medical errors and rising costs occurring in the US health care system, the US government is calling for a "nationwide adoption of interoperable EMRs (electronic medical records) within a *decade"* (Stein & Deese, 2004,p.273). This national initiative in health care will dramatically transform the way health care services are delivered. Stein & Deese (2204) assert that, "IN the 21st century health care workers are knowledge workers" (p.273). Over the past number of years, the amount of information available to health care professionals has increased exponentially causing a shift in the traditional methods of caring for the health care client.

This paradigm shift in the way that health care professionals perform their work is taking place north of the US border as well. Hospitals/health regions across Canada are adopting health care information systems (HCISs) in an effort to increase care quality, decrease costs by increasing efficiencies and to decrease preventable medication errors (Wilson & Anderson, 2004). Vancouver Island Health Authority implemented a HCIS in its hospitals between 2002 and 2004 and Alberta is set to fully implement a province-wide HCIS by the end of 2007. The majority of health care disciplines will feel the impact of this change. "Such and implementation has profound implications for the way in which all nurses and other health care professionals work, and has equally vast implications for their education and training needs, to enable them to use the new technologies" (Alpay, Needham & Murray, 2004,p.5).

Nurses are by far the largest group of health care professionals in proportion to all others, including physicians, ancillary disciplines and support workers, and in many cases have the closest contact with the health care customer over sustained periods. It makes sense then, that the impact of changing nurses' traditional work

philosophies and patterns will in turn affect those customers. In order to realize the benefits of implementing an HCIS for all involved, nurses will need to be advocates of this new system and utilize it to its full potential.

Hospitals in the US are beginning to recognize the importance of nurses supporting new technologies, "Nurses' use of online clinical documentation was critical to the success of NCBH's entire HCIS implementation project. In addition to serving as leaders and trainers for the implementation system, nurses were early adopters of the system" (Wilson & Anderson, 2004,p.6).

After reviewing some of the literature, it seems that there is no questioning the importance of having nurses' support for implementing new systems; however, research reveals some hesitance on the part of nurses, in this regard. One professional nursing organization in the US conducted an online questionnaire to determine nurses' attitudes toward using information technologies in their workplace. Over two-thousand nurses responded with the following messages:

- Nurses feel that their IT needs are largely being ignored
- Nurses also feel that they have not received adequate training on IT
- Nurses want to be involved in developing the systems they are expected to use
- Many nurses believe that existing clinical systems are often not suitable for the needs of their practice. (Dinsdale, 2004, p.8).

Researches Alpay, Needham and Murray (2000) report that based on recent literature, nurses have mixed feelings toward the use of computers and information technology. The authors attribute nurses' negative attitudes to the following factors:

- Unsuccessful experiences with computer systems
- A gap between the nature of nursing as provision of care and nurses' understanding of the benefits of IT to support patient care
- A perception that computers take away nurses' responsibilities (challenge traditional codes of ethics)
- Cultural differences
- Age, gender, and nursing experience

The authors also attribute nurses' "resistance to learning, lack of information and general resistance to change resulting form fear of the unknown" (Alpay, Needham & Murray, 2000, p.6.). According to the literature conducted thus far, barriers relate primarily to lack of experience (or negative experience) with IT, lack of information about what kinds of training would work best for nurses and lack of nursing access to IT in the workplace. In addition, nurses' perceptions about the relative benefits of IT to their clients, lack of involvement in planning IT initiatives and plain old resistance to change play a large part in creating barriers to nurses' accepting this cultural change in their workplace.

While the research certainly seems to reveal that the reason for nurses' resistance to technology is multidimensional, there exists evidence that would suggest resistance may be founded on deeply ingrained social relationships and patterns as well as the fundamental relational structures embedded in our present society. It is relatively easy to identify any number of superficial causes (as many researchers have); however, nothing is gained by applying downstream solutions to these problems. A search for root causes is more likely to yield viable strategies for overcoming the problems faced by nurses and health care organizations in effectively implementing IT systems. Timmons (2003) cites Bauer's 1995 critique of *technophobia theory*, which suggests "understanding resistance in terms of the fit between the systems (or lack of it) and existing work practice would be a more fruitful basis for enquiry" (p.258).

Key issues raised by those who research resistance to technology, include issues of gender, power, social relations and organizational change. It makes perfect sense that technology would be affected and in turn has an effect upon all of these significant aspects of the work environment. This paper will focus on the relationship between gender and technology as well as the impact of a 'knowledge society' on nurses' work environments. Despite the recent increase in the number of men entering the nursing profession, approximately ninety percent of nurses are female. In light of the long history of nurses acting as subordinates to physicians and the continued presence of the medical model of patient care – it is not a stretch to imagine that the introduction of technology into the hospital setting might be reinforcing a system that is already patriarchal in nature. It is worth investigating the nature of technology as it relates to gender even if all we can glean are small clues as to how this relationship might be altered to meet the needs of everyone involved.

In addition, the nature of the profession of nursing as it has existed throughout the past century is such that it focuses predominantly on a 'caring' relationship between client and nurse, therefore, basing its entire identity on being present for the client, often at the expense of the 'paperwork'. That nurses view computers as time consuming and inconvenient (Timmons, 2003) is not all that surprising in this light. As previously acknowledged, nurses are increasingly becoming 'knowledge workers' as they are expected to conduct their daily business in an IT environment.

It seems that a culture clash exists between nurses and the environment they work in with the result manifest in decreased job satisfaction and perhaps lost productivity for the organization. Nurses must cope with the changes in their traditional methods of working heralded by the rapid expansion of IT into many sectors of our society. Previous studies show that "the systems did not take account of the ways in which the nurses practiced, which were often deep-seated, long-standing and to the nurses, entirely justified" (Timmons, 2003,p.267). Moreover, I hope to show that what we assume knowledge workers to be is replicating gendered approaches to technology compounding the difficulties that a nurse faces.

Design and Method

A literature review has been undertaken for the purpose of revealing recurring themes and connections in and between the following subjects:

- the relationship between gender and technology
- the nature and relevance of the 'information society' to the profession of Nursing
- information from studies reporting on nurses' reactions to the introduction of IT in their work environment

A critical review of the existing literature on these subjects should help to get a sense of the best manner in which to focus future research efforts and to provide a context for interpreting new research findings. Using a literature review approach will also aid in utilizing existing research to inform current policy and practice (Harlen & Schlapp, 2005). There does not appear to be a great deal of research that makes a connection between a gendered approach to technology and barriers that a nurse faces in adapting to IT. It is, therefore, necessary to first establish a connection between the two phenomenons before pursuing the matter with more extensive

research. A review of the literature should help to establish this connection and form the impetus for more extensive research.

A 'best evidence synthesis' approach was chosen to review the current literature for its suitability in analyzing both qualitative and quantitative research data. The limited scope of this paper makes a thorough literature review quite impossible; however, a limited review in several areas of relevant research could provide enough evidence to warrant further investigation. Since the research question involves research into three distinct and even divergent bodies of knowledge: IT science, information management, and the profession of nursing, discovery of a recurring theme connecting all three would at least give sufficient evidence of the need for further study into the nature of that relationship.

A search of several reputable databases (CINAHL, Medline, Communication and Mass media Complete) yielded a moderate amount of information in each of the three chosen areas for study. The studies included in this review constituted all those located in the aforementioned databases bearing a relationship the three identified areas of research. In addition, books chosen for review were those whose author's names were referenced three or more times in the research study literature obtained from the three databases.

Of course, even when using strictly quantitative literature review methods such as 'meta-analysis', bias cannot be completely eliminated (Harlen & Schlapp, 2005). Hence, the direction of this review of both qualitative and quantitative studies may demonstrate some unavoidable bias, particularly since the scope of the review has been necessarily limited.

Gender and Technology Debate

First, a definition of what is meant in this paper by the term 'technology'; Merriam Webster defines the word technology as "a technical method of achieving a practical purpose" (1981, p.1188). Based on this simple definition, one could imagine that men and women are equally capable of devising technical methods to achieve practical purposes. Women are innovators in their own right and throughout history have proven themselves as such in their roles as experts in agricultural, natural resource management, domestic and even medicinal matters (Huyer & Westholm,

2005). However, women's role as technician and innovator has been devalued and marginalized by historical events in favor of a male-dominated model of technology.

During the Industrial Revolution, technology in general was seized upon and developed almost exclusively by men. The industrial revolution helped to create a technologically gendered division of labor by providing the conditions under which men saw the need for some areas of technical production to be 'their own', resulting in the subsequent feminization of trivial and lower paid, lower valued occupations. "Craft workers, typically seen as the defenders of working-class interests in disputes over technical change, resisted the entry of women into skilled technical jobs in order to protect their own conditions. Industrial technology from its origins thus reflected male power, as well as capitalist domination" (Wajcman, 2004, p.26). The QWERTY computer keyboard stands as testament to this phenomenon in post-industrial society as women were meant by the *male* inventors of the computer keyboard to use this new device in the same 'clerical' capacity as they had the typewriter. "New technologies may be 'epistemologically open', but many of their current forms are similar in their material relations to pre-existing technologies" (Wajcman, 2004, p.75).

The term 'gender' may "be defined as the 'set attributes assigned to women and men by history, society, culture and politics, which vary across time and space' (Lewis et al, 1992)" (Huyer & Westholm, 2005). This definition allows for some flexibility in the nature of gender. The literature on gender and technology reflects, generally, that women have been excluded by one means or another from technological discourse. Having very little part in developing new technologies and few opportunities to enter the 'patriarchal ' world of technology, women have limited means with which to influence technological development. Liberal feminists, in the 70's argued that this condition is essentially a product of the way that women are socialized (Wajcman, 2004). In regards to the small numbers of women in technology: "remedying the gender deficit was seen as a problem that could be overcome by a combination of different socialization and equal opportunity policies" (Wajcman, 2004, p. 14). From this perspective the solution was to increase the numbers of women working in information technology by increasing enrollment in technical training programs (Gender, 2005).

In retrospect, this approach does seem somewhat simplistic given the complex interrelationships between science, society, culture, religion and political ideology. The nature of technology cannot be separated from the milieu in which it was created. Technology is woven into the fabric of our society taking on the shape and texture of multiple and dynamic societal conditions. Wajcman argues that technological artifacts are not, in fact, neutral but that they "embody gendered power relations in their design" (2004, p.14). She argues against thinking of technology as a 'thing' in and of itself, suggesting that it is subject to changing influences and not necessarily bound to continued patriarchal reproduction (Wajcman, 2004).

The process of shaping technologies is both social and cultural in nature. For Wajcman, technology is the product of ongoing, dynamic socio-cultural forces (2004, p.53). Cultural feminist theory takes a broader view than the idea that technology is shaped by men and continues to manufacture itself in patriarchy. According to cultural feminists (like Wajcman), there are other factors involved in the production of certain technologies. Susan Ormrod and Cynthia Cockburn studied the design and evolution of the microwave oven as a tool for men, designed by men, that was eventually modified and co-opted by women (Wajman, 2004) (Moser, 2001). For them, the microwave oven is an example of the way that technologies are 'relationally constructed' and continually renegotiated over time (Moser, 2001). According to Cockburn and Ormrod, "this process is firmly located in the gendered assumptions of designers about prospective users" (Wajcman, 2004, p.47). As the microwave oven illustrated, these 'assumptions' are not always on target and are up for ongoing debate. Like technology, gender is not a 'fixed' concept but subject to multiple influences in our society, shaping and being shaped in turn.

Wajcman suggests that by looking at the relationship between gender and technology with an "emphasis on the contingency and heterogeneity of technological change", space is created for the possibility that women may actually have "agency in transforming technologies" (2004, p.54). Her view is also reflected in the idea that technologies are socially constructed (as the radical feminists believed), and that they in turn help to construct our social worlds (Moser, 1996). Wajcman stresses that "not enough attention is paid to women's agency" (2004, p.30). She uses the relatively new idea of 'cyberfeminism' as an example of one way that male

dominated technology has developed in an unpredictable way, diminishing the ability of men to control it (Wajcman, 2004).

> Cyberspace is out of man's control: virtual reality destroys his identity, digitalization is mapping his soul and, at the peak of his triumph, the culmination of his machinic erections, man confronts the system he built for his own protection and finds it is female and dangerous. Far from being a technology of male dominance, computing is a liberatory technology for women which delivers a post-patriarchal future (Wajcman, 2004,pp.65-66).

While this statement seems somewhat over-dramatized and essentialist in the sense that technology is seen as an "emancipatory force" (Moser, 1996), there is some value in conceptualizing the Internet as a place particularly suited to women's natural abilities. The potential of the Internet as a place for networks to develop and thrive corresponds rather well with women's demonstrated inherent (or perhaps socialized) desire to connect with others.

I believe, as Wajcman does, that there is reason for optimism that women will one day come into their own, adapting to technology as it adapts to their uses. However, there is still abundant evidence of the distance they must travel to reach this goal. Studies have shown that "women's employment is heavily concentrated in a few occupations. They work typically as home and farm helpers, nurses, lower-school teachers, secretaries and so on. Compared to men with similar qualifications, tasks and responsibilities women are over-represented in part-time employment and in low-paid insecure jobs" (Huyer & Westholm, 2005, p.1). Furthermore, a 1995 UNDP Human Development Report shows that women in industrial societies do twice as much unpaid work as do men (Huyer & Westholm, 2005). "In the case of women, the structure of personal computer users is entirely different, more than half of the entire group use that tool when in the position of an office worker without higher education, that is, a position that requires simple, routine functions" (Chernysh, 2004, p.61).

Information Age vs. Industrial Age Workers

According to the literature, the work of Nurses is evolving from task-based, process-focused activities to those requiring highly integrated processing of knowledge. In fact 'patients' are now being referred to as 'clients' and are increasingly subject to a 'client-focused care' model of care. Client-focused care means less reliance on the medical model of care (based primarily in system

pathology and diagnosis) and greater autonomy granted to the client in setting their own health and wellness goals. The emphasis in modern Nursing practice is placed upon the client's right to decide what 'health' means to them and then to set wellness goals with the assistance of the nurse. The process/ skill -based model of health care that nurses once learned has become obsolete in many respects.

In the age of technological advancement, people are spending much less time in hospital, healing at home and subsequently requiring a continuum of care that looks much different than the hospital-based model of health care practiced twenty years ago. A shift from treating disease to preventing disease is gradually taking place (Saba, 2001). Slowly, the profession of Nursing is transforming to meet entirely different needs on behalf of the new 'clients' of healthcare.

In a broader sense, the industrial work model is transforming into one based more on the transfer of knowledge than the execution of skills. The information society is defined by Stevenson (2002) as the idea that information and knowledge are now the "key resources in determining economic success or failure" (p.229). For others, the definition is multifaceted, having technological, economic, occupational, spatial and cultural dimensions (Williams, 2003). "Hence whereas industrialism was oriented towards economic growth, informationalism is more concerned with the development of knowledge and the creation of networks" (Stevenson, 2002, p.192).

For the purposes of this paper, the term used to describe this broad phenomenon shall be 'information society' and those who work within this society shall be referred to as 'knowledge workers'. Other terms used in the communications literature for this view of society is post-industrial, network or knowledge society and for those within the society, 'information workers'. Moreover, the *technological* and *occupational* definitions described by Williams (2003) are most compatible with the purpose of this paper. The technological definition is concerned with "the rise of innovation in information and media technology" (Williams, 2003, p.228) and the occupational dimension of the information society "examines the changing patterns of occupational activity, focusing on the decline of manufacturing and the growth of the service sector" (Williams, 2003, p.228).

In light of the change in the nature and culture of work across our society, it is not surprising that certain professions have been making an effort to 'get with the

times'. The introduction of Information Technologies (ITs) into environments where they have not previously been utilized is creating a need to re-examine and restructure those environments into ones more conducive to the function of this particular technology. In some ways this phenomenon is an example of technological determinism in the workplace. A circuit is established whereby; the technology shapes the workplace even as the workplace gradually shapes the technology in order to achieve its goals.

The 21st Century worker is a 'knowledge worker'; for this new creature, a new definition and concept of 'work' is required. In the literature, the 'knowledge worker' is defined in a number of ways. Chernysh (2004) defines knowledge workers as follows: "In light zones there are crossroads of information flows where data come together from different areas of society. In these light zones, a new social group is formed, that of the 'information workers' "(Chernysh, 2004, p.59). In a more pragmatic sense, the information worker is accountable to synthesize a broad array of information and to bring that synthesis to bear in achieving an organization's overall goals (Porter-O'Grady, 2003). According to Castells, 'informationalism' has allowed an organization to achieve increased flexibility through more knowledge-dependent and less hierarchical structures (Stevenson, 2002, p.192). These new networks can be defined as "a set of interconnected points within a circuit, which may involve actors (human, animals, technology) or organizations" (Stevenson, 2002, p.230). In the healthcare 'network' nurses are a group of actors, as are physicians, lab technicians and the clients, themselves. They are all both interconnected and interdependent. A Health Care Information System 'lights up' that existing network in new ways.

For Nursing, the transition from 'industrial worker' to 'knowledge worker' means changing the focus of the profession from that of process-oriented, task-focused activities to greater integrative and evaluative efforts. In other words, the Nurse's job will be less about how *well* something is done and more about whether what they are doing is *making a difference*. At the very least this new way of working will require some restructuring in the way that nurses are currently operating in their work settings. In an IT environment, nurses become an integral part of the networking and integration of the care continuum. The whole organization will need to adjust its sails, if it is going to function optimally in this new working environment. Wajcman (2004) cites Castells as she emphasizes that the "key to success in the

network society is self-programmable labor - knowledge workers who are highly educated, talented, flexible, innovative and autonomous" (p.110).

Nursing in the Information Age

To understand where the profession is going, it will be helpful to examine where it has been in the last century. The nurse was once the physician's adjunct - a handmaid or 'angel of mercy', and completely subject to the power of the medical model. It has only been in the last two to three decades that a knowledge base specific to the 'art' of Nursing has begun to emerge. "Treating the patient as an individual, 'whole' person remains a major part of how nursing defines itself, particularly by contrast with medicine, which is perceived (by some nurses) as being reductionist, concerned only with pathology and body systems" (Timmons, 2003). Not yet autonomous in many practice areas, nurses are slowly building their role as holistic practitioners and counsel to the clients in their care. What hasn't changed in the last three decades is the nurse's fundamental feeling of connection to the direct patient care aspects of their work. Any task considered by nurses to be 'administrative' is seen as interfering with the nurse-client relationship and in many ways these tasks are viewed as extraneous to it (Kirkley & Stein, 2004). Moving Nurses toward a synergistic relationship with technology will involve resolving the contradiction they face in having to 'let go' of their identity in immediacy to the client and embrace the larger, integrated picture. It is difficult not to be task focused when your identity is founded in 'caring' directly for your client.

Unfortunately, it is too easy to locate the blame for this situation within the profession of nursing itself. Systems designed and based on the medical model of care are not equipped to measure the 'caring' dimension of what nurses do. Darbyshire (2004) speculates that "today's computerized systems may have been developed with scant regard for clinician end users" and states that "point-of-care systems need to be developed in ways that involve clinicians meaningfully and which recognize and respond to the complexity and subtlety of the world of nursing and midwifery practice" (p.17).

There is abundant evidence of resistance to information technologies in nursing. In some respects this is a curious phenomenon. Nurses do not appear to resist 'technology' in general, as many aspects of nursing care have been automated

and successfully adopted by nurses over the years including intravenous pumps, feeding pumps, ventilators, thermometers and blood pressure monitoring devices. Do nurses resist the introduction of computers into their working environment because they do not view documentation of the client care record to be a legitimate activity relating to client care, as some would suggest (Kirkley & Stein, 2004) (Timmons, 2003)? Or, is it simply because they do not have time to learn how to master another machine? In his qualitative investigation of nurses' reasons for resisting technology Timmons (2003) identifies a number of other factors related to technology resistance by Nurses, including poor implementation plans, detraction from individualized care, erosion of documentation/ assessment skills, and concerns with system reliability. At the end of his analysis, Timmons (2003) notes that the "reasons for resistance are to be found at the interface between system design, on the one hand, and nursing culture and practice on the other" (p.267). These two factors, design and the intersection between technology and culture, surface as a recurring theme in the research findings of others investigating the causes behind nurses' resistance to information technology. These factors are also at the heart of the gender and technology debate as well as the new discursive structure of 'work' in an IT environment.

One study (Darbyshire, 2004) that explored the experience of a large number of Australian Nurses and Midwives using a Computerized Patient Information System revealed that those nurses felt as though they were not getting 'out' of the system, what they were putting in. It is difficult to know if nurses are in fact, making a difference when the data generated by that system does not reflect the nurses' contribution to client outcomes. One study participant noted that although the system reported overall length of hospital stays for cardiac bypass patients had decreased from 10 to 8.6 days, the "actual nursing care that goes into that (looking after these patients) has gone up" (Darbyshire, 2004, p.21). The locus of control over client outcomes is effectively removed from nurses by systems that do not accurately reflect their contribution to the multidisciplinary aspects of client care. The nurses in this study felt as though they were taking time away from their patients to input data that does not give them any useful information upon which to model their practice (Darbyshire, 2004).

In accordance with the patriarchal nature of technology, it seems to follow that the technology will collect and reflect according to the wishes of its makers,

sometimes at the expense of others in the system whose voices are not being reflected - since they were not involved in creating the system to begin with. If data is extrapolated according to the medical model (by diagnosis or physiological systems) - it will reflect the concerns of physicians and hospital administrators. As one of the study participants in Darbyshire (2004) identifies, "CPIS should 'live up to their side of the bargain' by providing information or data that will be useful to clinicians as they work to identify and improve clinical outcomes for patients" (p.22). In summary, nurses should be able to count on the system to provide decision-making support for the type of work they do.

Timmons (2003), makes note of the issues of power involved in the implementation of ITs in the hospital environment. Like Ormrod and Cockburn's microwave, he suggests that the 'system is always in the process of implementation, it is constantly being redefined and renegotiated between, among others, those implementing the systems, 'managers' and those using the systems, 'nurses' " (p.261). He suggests (with reference to Bourdieu) that different types of power exist within the social structure of these institutions; both nurses and managers have the power to "confer and fix meanings" while nurses have power as a result of the skills and knowledge they possess and finally, the managers/ administrators have the power resulting from their "differential access to wealth and resources" (Timmons, 2003, p.258). Issues of power in the implementation of ITs take the form of resistance by nurses to 'management' and are likely based on the perception by nurses that management is imposing something else upon them that they have not been consulted upon (Timmons, 2003) (Darbyshire, 2004).

The relationship between power structures in the healthcare organization is a reflection of the "social and political nature of organizational change" (Timmons, 2003, p.259). It is also possible that nurses' resistance to ITs is based on their resistance to the medical model, as Timmons (2003) suggests, which much the same as information technology, is traditionally patriarchal. In this sense, nurses' resistance to information technology can be directly related to the gender and technology literature. The medical model is male in origin and design; it is characterized by an objective scientific approach to diagnosing and curing disease. The holistic, client-centered model adopted by nursing theory is in turn, characteristically female with an emphasis on caring and connectedness. The male nature of IT and the female nature of nursing theory reflect the socialization of both

genders. "For men, separation and individuation are critically tied to gender identity" (Gilligan, 1982, p.8) and "in all of women's descriptions, identity is defined in a context of relationship and judged by a standard of responsibility and care" (Gilligan, 1982, p.160). This difference is related to fundamental issues of gender socialization in our society and is also reflected in the transition from task/ process based work to that which is based on connecting with the client and working collaboratively to establish health care goals.

Nursing Informatics

All aspects of the relationship between nursing and technology seem to intersect in the discipline of *Nursing Informatics*. Informatics in nursing is defined by Kirkley and Stein (2004) as "the ability to use information technology in providing patient care to communicate, manage knowledge, mitigate error, and support decision making" (p.222). The discipline of Nursing Informatics may be further defined as the "vehicle that enables evidence of the effects of nursing interventions to be linked with the outcomes of care in relation to the problems identified for a specific patient or groups of patients" (Swan, Lang & McGinley, 2004, p. 329). Even more to the point, Swan et al. describe Nursing Informatics as a combination of computer science, information science and nursing science (2004). This description corresponds very well with the three main topics of this literature review: the patriarchal nature of information technology, the effects of the information society on the profession of nursing and the unique body of nursing knowledge.

The literature consistently recommends the use of information technology as a tool for implementing quality standards in healthcare organizations. Nurse researchers are recognizing the value of information technologies in their ability to measure patient care outcomes, for example, against an established plan of care. An integral part of evaluating nursing care plans involves knowing what the 'best practices' are within the overall body of nursing research. 'Evidence-based practice' is the term used to describe the decision-making process nurses employ to determine the best methods for achieving positive client outcomes. One challenge nurses and many other professionals face, is finding the most reliable sources of information upon which to base their practice.

An example of IT used as a tool for nursing research is that of the 'Nursing, Midwifery, and Allied health Professions' (NMAP) Internet gateway, developed in the United Kingdom (UK) (Ward, Scrivener & Smart, 2004). NMAP ensures that the "number of results returned for any search will be smaller than that from general search engines; however, the results obtained will be of higher quality and relevance" (Ward et al, 2004, p.228). Interestingly, healthcare professionals in the UK had used another gateway service for this same purpose since 1994 but according to Ward et al, the 'Organising Medical Networked Information (OMNI) service was perceived as having a medical bias by some professionals, resulting in relatively low usage (2004). That nurses would take it upon themselves to develop an Internet gateway tool to satisfy their need to identify evidenced-based practices within their own distinct body of knowledge, demonstrates both their commitment to quality client care and advocacy for the use of IT to achieve their professional goals. This is also an excellent example of how nurses have co-opted an IT for use in a way that reflects their own needs and their own voice. Examples like that of NMAP demonstrate that nurses are gradually becoming more aware of what information technology has to offer them and serves as an indication of what the future of nursing as it relates to the use of IT, might look like.

In his article on the technologies that will shape healthcare over the next 10 years, Roy Simpson outlines four important areas that should be addressed for nurses by information technologies: patient care, staffing and scheduling, training and education, and recruitment and retention (2004). He suggests that nurses' ability to "embrace technology is a critical determinant of the profession's future" (Simpson, 2004, p.42). Even greater is the challenge for nurses to become intimately involved in designing and molding the technology to effectively assist in accomplishing their patient care goals.

Even though education in nursing informatics is still largely self-directed, interest has been so prolific that the formal designation of *Informatics Nurse Specialist* was recently approved by the American Nurses Association" (Ball, 2005,p.77). Despite this optimistic outlook; however, nurses have a long way yet to go to fully realize the potential that informatics holds for them. Swan et al (2004) note that as information systems are developed, financial and administrative concerns take first priority followed by the concerns of physicians and pharmacists. "Last and rarely included in the technology priority list is nursing care, especially the

nursing problems, interventions, and outcomes in a standardized format to be stored in administrative and clinical data repositories" (Swan, Lang & McGinley, 2004, p.330).

Conclusion

Information technology design and the intersection between technology and culture, surface as a recurring theme in the research findings of others investigating the causes behind nurses' resistance to information technology. These factors are also at the heart of the gender and technology debate as well as the new discursive structure of 'work' in an IT environment. These same factors interact to produce the marginalization of nurses' voices in many of the IT systems currently used by healthcare professionals. Interestingly, very few of the studies specifically identified gender as a component in nurses' reactions to ITs in their work environment; however, the literature on gender and technology is quite persuasive in terms of the inherent nature of IT being male in origin. Furthermore, based on even this limited review, fascinating comparisons can be made between technology as a male domain and medicine as a male domain as well as between both technology's and medicine's marginalization of female concerns.

Information systems should account for the nurses' need to define their practice in an evaluative manner as is indicated by current trends in our information society. A nurse-friendly IT would allow the nurse to conduct his/ her practice according to the principles of best practice - better yet, tools to accomplish this end would be designed into the systems, providing the nurse with effective ways to measure clinical outcomes for her clients. "Embedding nursing language within informatics structures is essential to make the work of nurses visible, and articulate evidence about the quality and value of nursing in the care of patients, groups and populations" (Swan, Lang, & McGinley, 2004, p. 330). Multidisciplinary teams representing all areas of the healthcare system, with considerable involvement from members of the nursing profession would design these systems with all of nurses' practice needs in mind. It only makes sense that nurses help design systems for other nurses to use.

Physicians and Administrators will need to recognize the unique contribution of nurses to the health care system. In order for this to occur, nurses will need to re-

invent themselves, imagining a future for their profession that includes IT, envisioning themselves as agents of change and advocating for their unique role within the multidisciplinary health care environment. In Castells' words, nurses will need to become the "highly educated, talented, flexible, innovative and autonomous" knowledge workers of our future (Castells in Wacjman, 2004, p.110). Nurses will need to let go of the traditional, gender-defined, narrowly-focused practices of their past in order to accomplish this. Sweeping change of this nature will need to be initiated by policy makers within the discipline of nursing.

Subsequently, nurse educators may use information from the research literature to inform the development of nursing curricula in order to prepare new graduate nurses for work in an IT environment. There is evidence that policy is already in place to guide nursing education. The American Nurses Association has identified competencies for beginning nurses as fundamental information management, computer technology skills and using existing informatics solutions and available information to manage their practice (NLN, 2004).

In summary, there seems to be ample evidence that nurse's concerns and priorities are not given equal weight in the design of information systems. There also seems to be numerous parallels between the gendered nature of technology and nursing as a female-dominated profession resisting technology. There is certainly enough evidence of this parallel to warrant further study, perhaps a more in-depth literature review and subsequent research study. In terms of the actual interface between nursing and information systems, the literature seemed to say repeatedly and emphatically that in order for nurses to overcome the barriers which keep them from functioning optimally in an IT work environment, information systems need to change, nurses need to change and organizations need to change.

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