

**Attitudes of Australian nurses to information technology in the workplace: A national survey**

Robert Eley<sup>1</sup> PhD

Jeffrey Soar<sup>2</sup> PhD

Elizabeth Buikstra<sup>1</sup> PhD

Tony Fallon<sup>1</sup> PhD

Desley Hegney<sup>1,3</sup> PhD RN

<sup>1</sup>Centre for Rural and Remote Area Health, University of Southern Queensland,

<sup>2</sup>Collaboration for Ageing and Aged Care Informatics Research, University of Southern Queensland

<sup>3</sup>Research and Practice Development Centre, School of Nursing, University of Queensland and Blue Care

Name and address for correspondence:

Dr. Rob Eley

Centre for Rural and Remote Area Health

University of Southern Queensland, Toowoomba

Queensland 4350 Australia

Tel +61 7 4631 5477, Fax +61 7 4631 5452, Email [eleyr@usq.edu.au](mailto:eleyr@usq.edu.au)

Acknowledgements: The national survey was conducted by the Centre for Rural and Remote Area Health and the Collaboration for Ageing and Aged Care Informatics Research University of Southern Queensland for the Australian Nursing Federation with funding from the Australian Government Department of Health and Ageing.

**Abstract**

This paper reports on the views of Australian nurses as to their use of computers in the workplace. Data were collected by questionnaires mailed to 10,000 members of the 150,000 member Australian Nursing Federation which represents 60% of the Australian nursing workforce. The response rate was 43.3%. Computer use was 20% by assistants in nursing, rising to 75% by enrolled nurses and to over 95% by registered nurses. Principal uses for the computers by the nurses were for accessing patients' records and for internal communication. The majority of respondents (79%) agreed that the use of computers had improved information access. Only 9.4% considered that adoption of a national electronic health record would not be useful to health care. Fewer than 5% stated they have no interest in computers and 87% considered that their age was never or rarely a barrier to their use of the technology. However not all aspects of computer introduction to nursing were positive. The proportions of respondents who considered that the use of computers had made their work easier, reduced duplication of data entry and reduced errors in handing patient data were only 42%, 32% and 31%, respectively. Results demonstrate a positive attitude towards information technology by Australian nurses but identify issues that must be addressed to support continued interest and engagement.

Key words: Nursing informatics; nurses' attitudes; Australia; information technology; survey

## **INTRODUCTION**

Computers are an integral part of society and use of computers in the health sector for information storage and patient care is commonplace. Other uses of IT in health care are also increasing rapidly in Australia with telehealth, mobile devices and the internet all becoming part of normal health service delivery.<sup>1</sup> National and state governments are committed to increase the use of IT to improve health care<sup>2</sup> and as nurses are the largest body of health sector workers they will be at the forefront of the use of technology. Consequently the attitudes of nurses to the use of computers in their work will be important for full engagement and adoption. This study reports on part of a large national study on IT in nursing undertaken in 2005 in Australia that was aimed at informing future government strategy.

## **BACKGROUND**

The potential benefits in the use of IT in the health care industry include those of improved efficiency and communication; benefits that are consistent with IT adoption in any industry. However IT within healthcare is also expected to improve patient care in a cost effective manner through time savings, increased accessibility of information and a reduction in documentation.<sup>2</sup> Examples of Australian state and national government IT strategies to improve the quality of care through better information systems for carers and consumers are knowledge-based information systems to support evidence-based nursing practice<sup>3</sup> and electronic health records (EHR).<sup>4</sup> Another example of an area expected to benefit from the adoption of IT technology is the dispensing of medications<sup>5</sup> for which large numbers of errors are reported.<sup>6,7</sup> In fact in Australia it has been reported that medication errors account for the highest number of adverse effects suffered by patients in hospital.<sup>7</sup>

However along with advantages of adoption of IT come disadvantages; not the least of which is the cost of resources for infrastructure and training. This is exemplified in the aged care sector in Australia where computer uptake has been slow and nurses demonstrate poor computer literacy.<sup>8</sup>

In addition to fiscal considerations, uptake of IT in the health sector will be influenced by other factors including access to the technology, its applicability to clinical practice and most importantly the attitudes of

the users of the technologies. Several studies have shown that nurses who will be major users of IT hold positive views to its use. For example a longitudinal study in the UK undertaken on behalf of the Royal College of Nursing sought nurses' views on the importance and potential benefits of information and computer technology applications in the National Health Service.<sup>9-11</sup> The researchers summarised the findings by stating that nurses value the new technology which they see as beneficial to themselves and their patients. A follow-up survey in 2005 noted similar enthusiasm.<sup>12</sup> Studies in the USA looked specifically at nurses' views on EHR and found that the majority of nurses think that EHR would lead to improved safety and patient care.<sup>14,15</sup> Such positive views are not confined to nurses; Schaper<sup>13</sup> studied another health sector – occupational therapists – in Western Australia and noted that 100% of participants foresaw an increase in the use of IT in their work in the next five years and 88% believed that its use can add positive value to their work.

However studies also have emphasised the disadvantages that nurses see as being associated with adoption of IT. For example, over 30% of the nurses in a study in Brisbane, Australia believed that computers caused duplication of work.<sup>16</sup> This concern was also expressed by nurses in both the UK and the US who noted that in contrast to paper systems that stayed with the patient, IT generally required input of patient information at a desk away from the bedside.<sup>13,17</sup> This resulted in delays in data entry and potential errors as data are recorded bedside on bits of paper for later transferring to the computer. Nurses were also concerned that computerisation reduces quality time with patients with the nurses spending more time in front of the computer for what many perceive as non-nursing duties.<sup>16,18,19</sup>

Nurses' attitudes toward computerisation have been found to vary according to age, sex, level of science education, level of job satisfaction, clinical area of employment, sector of employment, geographic location, number of years of employment in the health care field and home computer use.<sup>19-24</sup> Perceived ease of use and usefulness of the application packages have also been linked to attitude.<sup>14</sup>

At home, computers are an item of choice; within the workplace employee refusal to use computer is not usually an option. Nevertheless as argued by Timmons, successful adoption of IT by nurses will be affected by their attitudes and willingness to comply with use.<sup>17</sup>

### **Purpose**

In order to inform Australian government policy and strategy a picture of current IT use by nurses and factors affecting use and adoption was required. A study was undertaken in 2005 by an independent research group commissioned by the Australian Nursing Federation with funding from the Australian Government's Department of Health and Ageing. The results are intended to support the continued introduction of IT into health care and the development of national strategies to meet the needs of nurses. This paper reports on one part of the study, namely responses to questions which aimed to ascertain the attitudes to use of IT in the workplace by Australian nurses.

### **METHODS**

#### **Project steering group**

A Steering Group consisting of 11 members was established. Members represented nursing organisations, private hospitals, chief nursing officers of public hospitals, deans of tertiary nursing and midwifery institutions, national government and the discipline of nursing informatics.

#### **Questionnaire development**

The survey tool, a questionnaire, was a novel instrument developed by the steering group and researchers to fulfil the client's stated objectives of the research and informed by the literature<sup>9-17</sup> and by key issues identified through:

- Telephone interviews with 25 key stakeholders from Australian state and territory governments, national nursing and other health and aged care organisations.
- A focus group of 30 representatives of national nursing organisations.

The questionnaire consisted of 78 questions in 13 sections which included each nurse's personal background; their access and use of computers; use of the internet for work related activities; past training and education in IT, current job requirements for IT; the barriers to use of computers; workplace technical support. For the purpose of this study IT was defined to the nurses as computer-based systems that assist in the management and processing of information to support healthcare and healthcare delivery.

Within the section on access and use of computers six single item questions collected information on the nurses' attitudes towards IT and its benefits to their work. In addition, within the section on barriers to use of computers, two of the 20 possible barriers that were offered were related to attitude and one to perception of the influence of their own age on their computer use.

To ensure content and face validity of the novel questions several iterations of the survey followed repeated review by the project steering group and by two separate pilot studies undertaken with nurses. The first pilot study involved nurses employed by a tertiary teaching institution. Following that pilot small changes were made to the wording of some questions in order to improve clarity and comprehension. A second pilot was then undertaken by a group of clinical nurses. No further changes were deemed necessary after this second pilot.

A free text box at the end of the questionnaire allowed respondents to offer comments about any items of their choosing. Comments were grouped into the same categories as the sections of the questionnaire.

### **Participants**

The questionnaire was mailed to 10,000 members of the 150,000 member Australian Nursing Federation who reside in the six states and two territories of Australia. Members polled included assistants in nursing (AIN), enrolled nurses (EN) and registered nurses level 1 to level 5 (RN1 – RN5). Stratification of the sample for the survey was by the Australian Standard Geographical Classification (ASGC)<sup>25</sup> with 2500 questionnaires (25%) going to nurses working in each of the four ASGC areas of metropolitan, inner

regional, outer regional and remote/very remote. There were two mail-outs with the second sent to all non-respondents three weeks after the first mail-out. Responses were anonymous and the only information made available to the research team was the post code of the respondents so that responses by the ASGC strata could be determined.

### **Analysis**

The questionnaires were scanned for entry of quantitative data using TeleForm (Verity Inc. Sunnyvale, California). Analysis was undertaken using SPSS version 12 (SPSS Inc, Chicago). Categorical variables were analysed using the chi-square test. Main effects are reported as significant if both  $p < .05$  and the Phi coefficient or Cramer's  $V$  was 0.10 or greater. Comparisons between categorical variables and continuous variables were determined by analysis of variance. An  $F$  statistic was considered significant if  $p < .05$ . For comparison of two continuous variables, a Pearson correlation coefficient was used and, consistent with other analyses, a relationship was considered meaningful if  $p < .05$  and Pearson's  $r \geq .10$ .

### **Ethics**

The study was approved by the university's Human Research and Ethics Committee. A plain language statement was sent to all surveyed nurses. Informed consent was implied if the participant returned a completed questionnaire.

### **RESULTS**

This paper focuses solely on the attitudes that nurses held with respect to IT. Results on other sections of the survey such as education and training, use of IT by nurses and the influence by geographical location and sector of employment are not discussed in any detail in this paper. Results are presented as overall responses to the questions and after further analysis by age, length of time in nursing and level of job.

### **Demographic variables**

The overall response rate to the 10,000 distributed questionnaires was 43.3%. The mean age ( $\pm$  SD) of respondents was  $45.3 \pm 9.7$  years and 92.8% of respondents were women. The proportion of responses from the four strata ranged from 21.6% from remote/very remote to 26.9% from the inner regional.

### **Use of computers in the workplace**

86.3% of the respondents used a computer for work-related activities regardless of location of access (e.g. work, home, internet café). Use was mostly for accessing patient records, patients' results and internal communication. There was no significant effect on computer use by age or length of time in nursing; however level of job had a major influence with use increasing with the seniority of the nurse. As depicted in Table 1 only 20.4% of AIN used a computer for work related activities while use was above 94% for RN at levels 2-5.

### **Views about IT in the workplace.**

Nurses were asked how much they agreed with several statements about the benefits and disadvantages of computers and IT in the work place. They were also asked about their views on the adoption of a national electronic health record initiative. The questions and responses are listed in Table 2. Only those nurses who used a computer for work related activities were asked to respond to these questions.

As shown in Table 2 nurses were very positive about computers in the workplace. Only 2.9% of respondents strongly agreed with the statement that "I avoid using computers whenever I can". Over 92% of respondents agreed or strongly agreed that "learning about computers is essential for nurses working in today's health service". The vast majority (79%) also agreed that computer use had improved their access to information. Although 23.1% had no opinion on EHR, of those that did have an opinion 88% considered that adoption of EHR would be beneficial to health care.

However results in Table 2 also show that respondents were not as positive about the benefits that computers and IT had made to their work. They were divided as to whether reduced duplication of data entry or reduced errors in handling patient data had been achieved. In fact only about 31% of nurses in

each case considered that IT had made a reduction and only 42% agreed that their work had been made easier by the use of IT.

#### Length of time in nursing

Nurses newer to the profession were less likely to avoid computers than nurses who had been nursing for longer periods (Table 3). However nurses regardless of their length of time in nursing were generally positive about computer use. This is demonstrated by the high magnitude of the mean values (all greater than 3.7 on a scale of 1= *strongly agree* to 5 = *strongly disagree*) indicating that most nurses disagreed with the statement "I avoid computers whenever possible".

#### Age of nurses

Older nurses were more likely to avoid using computers and less likely to believe learning was essential. However older nurses were also more likely to agree that computers reduced errors, reduced duplication and made their work easier. Although significant, the influences of age were relatively small, with little change to mean values across age groups.

#### Level of job

There were level of job differences for all the questions as exemplified by the response to the statement that computers "made my job easier" as depicted in Table 4. Overall this statement was rated neutrally, however EN and RN 1-2 were less likely than RN 3-5 to agree that their jobs had been made easier.

The pattern that emerged for the other statements was similar in that the more senior nurses (RN 3-5) were less likely to avoid computers, and more likely to agree that learning was essential and that computers had increased access to information. RN 1-2 were less likely to agree with the statements computers had reduced duplication or errors.

#### **Barriers to use of computers**

The barriers to which nurses responded were listed under the question "do any of these items listed below restrict your use of a computer in your workplace?". Responses to the three barriers that

specifically referred to attitudes of the nurses and their perception of the influence of their age on their computer use are presented in Table 5.

“My age” and “I don’t have any interest in using a computer” were not considered to be barriers to computer use by the vast majority of nurses. Fewer than 5% believed the factors to be barriers *very often* or *always*. However in response to the statement “patients/clients/relatives/visitors are resentful of me at the computer” this was noted as a barrier *very often* or *always* by 13.2% of the nurses and *sometimes* by a further 23% of the respondents.

Age and lack of interest were seen more as a barrier by older nurses and those who had worked longer in nursing. However, as exemplified in Table 6 for length of time in nursing, for both factors the barrier still was considered to be very small with all means falling between *never* (= 0) and *rarely* (=1).

#### **Comments about attitudes to use of IT**

Further information on the attitudes of nurses to the incorporation of information technology into nursing was captured with their views offered through a free comment area at the end of the questionnaire. Just over a quarter of the respondents (27%) offered comments and these were grouped into the same 13 sections as appeared in the questionnaire. The sections that received the most comments were *Access to computers* and *Job requirement for IT*. Comments relevant to this paper on attitudes received the fifth most comments.

Some respondents believed that using computers took time away from caring.

*Every minute I am sitting at a computer I am a minute away from a patient!!!!*

Enjoyment, enthusiasm or interest to IT was evident.

*I enjoy working with computers and given the opportunity would access their use for patient data and educational opportunities at work more frequently.*

Others respondents, while expressing enthusiasm, noted that lack of training was a barrier to the application.

*In this day and age IT is vital and would certainly benefit clients with better outcomes of care. It seems that management use this technology but nursing staff receive no formal training in IT. What I have learnt I have done in my own time, at my own cost.*

Many, through their enthusiasm, had a vision on what IT could achieve.

*I can see the use of IT in the workplace in much greater capacity than it is currently used. I would like to see the use of digital cameras to record or monitor the healing of wounds on our ward. These pictures would allow us to compare them with compatible type wounds.*

Only 13 respondents out of the whole cohort provided comments that could be interpreted as fear of IT.

The following quote sums up their statements.

*I am frightened of computers.*

## **DISCUSSION**

The response rate to this study was excellent. The survey was lengthy and this response rate suggests that the topic is one that is very important to the nurses.

As with any voluntary participation study there are possible limitations; namely how representative of the ANF members were respondents to the study and b) how representative of the nursing workforce are ANF members. At the time of the survey the Australian Nursing Federation had 150,000 members who constituted 60% of the total enrolled and registered nurses in Australia.<sup>26</sup> Based on demographic information of sex, age, job level, employment type and geographical distribution the responses are considered to be representative not only of the Australian Nursing Federation members but also of the Australian nursing workforce for enrolled and registered nurses.<sup>26</sup> However AINs within the ANF under-represent the proportion within the national workforce<sup>27</sup> and results therefore must be viewed with caution for this cohort.

Over 85% of all nurses reported that they use computers in the workplace. This figure is lower than that reported in a previous Australian study which looked only at hospital based nurses<sup>16</sup> but followed a similar trend with lowest use by AIN and EN. Of particular significance is the fact that fewer than one in five AIN use a computer at all. Computers are no longer the exceptional item in any workplace and that use of computers by AIN will need to change. This is particularly true in the aged care industry, where AIN comprise the largest proportion of the nursing workforce.<sup>27</sup>

For change to occur it is desirable that participation is voluntary and attitudes are positive. Questions were asked to ascertain the attitudes of nurses towards their use of IT. The finding that nurses are very receptive to the use of computers is consistent with other recent studies that have looked at IT in general<sup>22,23</sup> or specific aspects such as electronic patient record systems.<sup>14</sup> The trend for younger nurses with computer science education and more frequent computer usage being more positive towards computers than others concurs with those studies.

Results also are in general agreement with attitudes of nurses in two Brisbane hospitals<sup>16</sup> and a small sample of Irish nursing students who agreed or strongly agreed that learning about computers was essential.<sup>20</sup> In response to a statement that computers were boring only 13.5% of the Irish nurses either agreed or strongly agreed. That particular question was not asked in this study but may be compared to the similar low percentage of respondents who agreed to the question *I have no interest in the use of computers*.

This general acceptance of IT in nursing must be stated with the qualification that for a significant proportion of nurses the use of IT was at odds with the job of caring. To them using a computer is not part of being a nurse. This view concurs with results from other studies that have shown nurses to believe computers actually detract from patient care and remove the human component of nursing.<sup>14, 16</sup> It is interesting that RN 3-5 were more likely to recognise the benefits of integrating IT into their job. It is probable that the administrative and management assistance offered by the technology contribute to this.

It may be concluded from these results that in general nurses are a receptive audience to the incorporation of IT into the workplace. However in the opinion of those surveyed some benefits of computers have not been realised. Overall respondents did not consider that the use of IT had made their working lives easier. It is critical therefore to address the issues that reduce the use and performance of IT. Many nurses expressed frustration that their use of computers often failed to reduce errors in data entry. Similarly as with other studies nurses noted that duplication of data entry had increased.<sup>16</sup> Lack of data entry at the point of care has been reported to be a major frustration and a contributory factor the errors and location of the terminals resulted in patients and visitors wondering why the nurses were 'wasting time'.<sup>13,17</sup> However this disadvantage should be reduced by the introduction of handheld and wireless technologies that better facilitate data entry and retrieval at the point of care.<sup>2</sup>

In general, where computer use for clinical use was the highest, which is by RN levels 1 and 2 at the point of care, the more frustrated the respondents were with the practical applications and the lower the view of the current benefits. Additional comments from nurses substantiate this view and suggest that there are a number of contributory factors. An application that is incompatible with another resulting in duplication of data entry not only opens the opportunity for error but is also defeating the purpose of the technology. Applications that are not "fit for purpose" will do nothing to promote compliance and adoption. As noted recently, too often the views of the nurses are ignored; where the equipment is located to make it easiest for the nurses should be determined before installation.<sup>28</sup> These sentiments also mirror those of an earlier study in Australia in which participants were predominantly critical of systems in areas related to "user-friendliness".<sup>29</sup> Consultation is important and lack of it can be detrimental. In the UK a decline in enthusiasm by nurse about electronic health records is largely attributed to the lack of consultation<sup>11</sup>.

One of the objectives of the entire study was to determine the readiness of nurses to participate in e-health initiatives. Nurses are likely to have a key role in the adoption of e-health in mainstream health care and information about the perceived benefits of electronic health records contributed to that determination. Similar to US studies<sup>14, 15</sup> our national study nurses overwhelmingly agreed that the

adoption of a national electronic health record would be beneficial to health care. That response augurs well for future implementation of national e-health in Australia.

These results may be compared with those of a small study on the perceptions of Australian nurses to e-health. The benefits were recognised but knowledge was basic and use and ability were not high.<sup>30</sup> Data not reported herein determined that current use of on-line applications and telehealth were rare or occasional. It is suggested therefore that for e-health initiatives to meet their desired outcome and become a major part of nursing in Australia attention must be paid to training.

Our study found that age was also a small but significant factor in attitude of IT by nurses. In a study of the aged care sector in Australia it was reported that the older age of nurses was a serious barrier to adoption in information technology and to be the cause of a scared or negative attitude.<sup>31</sup> Negative relationship between attitude to computers and age have been reported,<sup>15,22</sup> although others have reported this to be very small or non-existent.<sup>14, 32</sup> Even though our results do demonstrate age effects, these effects are very small and the most important observation is that the vast majority of nurses do not perceive their age to be a barrier. Nevertheless with an ageing Australian nursing workforce, this issue however small will have to be addressed if IT is going to be fully utilised.

## **CONCLUSION**

Ample evidence has been provided by this study and others that nurses demonstrate enthusiasm and positive attitudes to IT. However this must be matched by information, training and ease of use and suitability of the technology. As noted by the Royal College of Nursing, the enthusiasm in IT from those closest to the patients should be used wisely and expectations must be managed carefully<sup>12</sup>. The challenge here in Australia is to learn from others and for nurses, support services, nursing management and policy makers to work together to ensure that IT is appropriately integrated into health practice for the benefit of health providers and clients alike.

## **REFERENCES**

1. Ayres D, Soar J, Conrick M. Health information systems. In: Conrick M, ed. *Transforming Healthcare with Technology*. Melbourne: Thompson/ Social Science Press; 2006.
2. Gururajan R, Murugesan S, Soar J. Introducing Mobile Technologies in Support of Healthcare. *Journal of Information Technology Management*. 2005; 18(8):12-18.
3. Joanna Briggs Institute. The Evidence-based Healthcare Movement: Overview and Development. Available at [http://www.joannabriggs.edu.au/about/jbi\\_model.php](http://www.joannabriggs.edu.au/about/jbi_model.php). Accessed April 2, 2008.
4. Information and Communications Technology Standards Committee. Foundations for the future, Priorities for health informatics standardisation in Australia, 2005–2008. Canberra, Australia: Commonwealth of Australia; 2004.
5. Coiera EW. Health informatics. *Medical Journal of Australia*. 2002; 176(1):20.
6. O' Farrell M. Bar codes urged to halt hospital errors. *Irish Examiner*. October 11, 2002.
7. Australian Broadcasting Corporation. Concerns over medication errors in Australian hospitals [Radio]. Monday, 9 May, 2005. Available at <http://www.abc.net.au/worldtoday/content/2005/s1363139.htm>. Accessed April 2, 2008.
8. Demirjian S, Chaczko Z, Hughes J. *Information Technology and the Residential Aged Care Workforce National Survey Report*. Sydney, Australia: DPS Publishing Pty Ltd; 2004.
9. Nursix. Nurses and NHS IT Developments, Results of an online survey by Nursix.com. Available at [http://www.rcn.org.uk/\\_\\_data/assets/pdf\\_file/0009/78714/003079.pdf](http://www.rcn.org.uk/__data/assets/pdf_file/0009/78714/003079.pdf). Accessed April 2, 2008.
10. Nursix. Nurses and NHS IT Developments. Qualitative analysis results of an online survey by Nursix.com. [http://www.rcn.org.uk/\\_\\_data/assets/pdf\\_file/0011/78635/002477.pdf](http://www.rcn.org.uk/__data/assets/pdf_file/0011/78635/002477.pdf). Accessed April 2, 2008.
11. Nursix. Nursix survey of nurses' views on IT developments in the NHS. Available at [http://www.rcn.org.uk/\\_\\_data/assets/pdf\\_file/0015/111552/003166.pdf](http://www.rcn.org.uk/__data/assets/pdf_file/0015/111552/003166.pdf). Accessed April 2, 2008.
12. Royal College of Nursing. The Information Needs of Nurses. Available at [http://www.rcn.org.uk/\\_\\_data/assets/pdf\\_file/0010/78670/002780.pdf](http://www.rcn.org.uk/__data/assets/pdf_file/0010/78670/002780.pdf). Accessed April 2, 2008.
13. Schaper L, Pervan G. Exploring the links between technology acceptance and use and the attainment of individual and organisational goals: a case study in the community health sector. In

Proceedings of the 11<sup>th</sup> Americas Conference on Information Systems 2005; Omaha, NE, USA.

Available at <http://espace.lis.curtin.edu.au/archive/00000709/>. Accessed April 2, 2008

14. Moody L, Slocumb E, Berg B, Jackson D: Electronic Health Records Documentation in Nursing: Nurses' Perception, Attitudes and Preferences. *CIN: Computers Informatics Nursing* 2004; 22(6): 337 - 344.
15. Dillon TW, Blankenship R, Crews TJ: Nursing Attitudes and Images of Electronic Patient Record Systems. *CIN: Computers, Informatics, Nursing* 2005; 23(3): 139 -145.
16. Webster J, Davis J, Holt V, Stallan G, New K, Yegdich T. Australian nurses and midwives knowledge of computers and their attitudes to using them in their practice. *Journal of Advanced Nursing*. 2003; 41(2):140 -146.
17. Timmons S. Nurses resisting information technology. *Nursing Inquiry*. 2003; 10(4):257-269.
18. Ho M, Hovenga E. What do Health Care Workers have to say about Information Technology in their Workplace? In: Walker J, Whetton S, Wise M, and Stark K. eds. *HIC 1999*. East Brunswick, Australia: Health Informatics Society of Australia (HISA); 1999
19. Yu P, Comensoli N. An Exploration of the Barriers to the Adoption of Information Technology in Australian Aged Care Industry. In Walduck K, Cesnik B, Chu S, eds. *HIC 2004*. East Brunswick, Australia: Health Informatics Society of Australia (HISA); 2004
20. Curtis E, Hicks P, Redmond R. Nursing students experience and attitudes to computers: a survey of a cohort of students on a bachelor in nursing studies course. *ITIN, Journal of the Nursing Specialist Group of the British Computer Society*. 2002; 14(2):7-17.
21. Stricklin M, Bierer S, Struk C. Home care nurses' attitudes toward computers: a confirmatory factor analysis of the Stronge and Brodt instrument. *CIN: Computers, Informatics, Nursing*. 2003; 21(2):103-111.
22. Brumini G, Kovic I, Zombori D, Lulic I, Bilic-Zulle L, Petroveckii M. Comparisons of Physicians' and Nurses' Attitudes towards Computers. *Studies in Health Technology Information*. 2005; 116:608-613.
23. Ribeiro M, Lopes - Revista M. Measurement of nurses and physicians' attitudes towards computer usage in the age of Internet. *Latino-Americana de Enfermagem, SciELO Brasil*; 2004.

24. Australian Bureau of Statistics. *8146.0 - Household Use of Information Technology, Australia, 2004-05*. Canberra, Australia: Commonwealth of Australia; 2005.
25. Australian Bureau of Statistics. *1216.0 Australian Standard Geographical Classification (ASGC)*. Canberra, Australia: Commonwealth of Australia; 2001.
26. Australian Institute of Health and Welfare. *Nursing and Midwifery Labour Force 2006*. Canberra, Australia: Australian Institute of Health and Welfare; 2006.
27. Richardson S, Martin, B. *The Care of Older Australians - A Picture of Residential the Aged Care Workforce*. The National Institute of Labour Studies, Flinders University, Adelaide. 2004 Available at <http://www.health.gov.au/internet/wcms/publishing.nsf/Content/ageing-workforce-workforcerep.htm-copy2>. Accessed 26 March 2008.
28. Flade R. Computers Need to Work for Nurses, not the Other Way 'Round *Journal of Emergency Nursing*. 2006; 34(4):269.
29. Darbyshire P. User-friendliness of computerised information systems. *Computers in Nursing*. 2000; 18:93 - 99.
30. Edirippulige S. Australian nurses' perceptions of e-health. *Journal of Telemedicine and Telecare*. 2005; 11(5):266-268.
31. Yu P. *Residential Aged Care Workers' Computer Skill Sets and Attitudes Toward Using Information System to Manage Care*. University of Wollongong, Australia; 2005.
32. Levy S. *Attitudes to information technology: toys or tools?* *Nursing Standard* 1999; 13 (52): 1-13.

**Legends for Tables**

Table 1. The job level of nurses and their use of computers for work related activities

Table 2. Nurses' attitudes to use of computers and information technology

Table 3. Length of time in nursing and responses of nurses to the statement *I avoid using computers whenever I can*

Table 4. Nurses' job level and their responses to the statement that *the use of IT has made my job easier*

Table 5. Frequency of responses by nurses to statements about barriers to computer use

Table 6. The effect of length of time in nursing on the nurses' view that a lack of interest was a barrier to their use of computers

**Table 1. The job level of nurses and their use of computers for work related activities**

	Level						
	AIN <sup>1</sup>	EN <sup>2</sup>	RN1 <sup>3</sup>	RN2	RN3	RN4	RN5
Do not use a computer							
Number	125	161	165	43	12	14	19
Percentage	79.6	25.3	12.1	5.1	3.1	5.6	5.6
Use a computer							
Number	32	476	1204	807	381	235	323
Percentage	20.4	74.7	87.9	94.9	96.9	94.4	94.4
Total respondents	157	637	1369	850	393	249	342

<sup>1</sup>AIN have significantly ( $p < .05$ ) lower use than EN and all RNs

<sup>2</sup>EN have significantly ( $p < .05$ ) lower use than all RNs

<sup>3</sup>RN1 have significantly ( $p < .05$ ) lower use than RNs levels 2 -5

**Table 2. Nurses' attitudes to use of computers and information technology**

Statement	Percentage of respondents in each category					Mean <sup>1</sup>
	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	
I avoid using computers whenever I can	2.9	8.8	15.7	37.0	35.5	3.8
Learning about computers is essential for nurses working in today's health service	48.3	43.5	3.9	1.4	1.7	1.6
The IT that I use in my workplace reduces errors in handling patient or client data	6.9	24.1	45.4	18.2	5.3	2.8
My use of IT reduces duplication of data entry and storage	8.3	23.6	30.7	28.0	9.5	3.0
The use of IT in my workplace has made my job easier	11.1	31.4	26.3	22.8	8.4	2.8
IT has improved my access to information	30.3	48.7	11.9	6.6	2.5	2.0
Adoption of a national electronic health record will be beneficial to health care	20.1	47.4	23.1 <sup>2</sup>	6.1	3.3	1.90

<sup>1</sup> Calculated from Likert scale where strongly agree = 1, agree = 2, neutral = 3, disagree = 4 and strongly disagree = 5.

<sup>2</sup>The mid range response for this question was "no opinion" and those nurses who entered this answer were excluded from the calculation of the mean where strongly agree = 1, agree = 2, disagree = 3 and strongly disagree = 4.

**Table 3. Length of time in nursing and responses of nurses to the statement *I avoid using computers whenever I can***

<b>Years in nursing</b>	<b>n</b>	<b>Mean<sup>1</sup></b>
0-5	399	4.065 <sup>ac</sup>
6-10	383	4.133 <sup>bd</sup>
11-15	417	3.962
16-20	616	3.948
21-25	636	3.945
26-30	555	3.807 <sup>ab</sup>
31+	485	3.740 <sup>cd</sup>

<sup>1</sup>Mean calculated from a Likert scale where strongly agree = 1, agree = 2, neutral = 3, disagree = 4 and strongly disagree = 5.

<sup>a a</sup> means with same superscripts differ ( $p < .05$ )

**Table 4. Nurses' job level and their responses to the statement that *The use of IT has made my job easier***

Level of job	n	Mean <sup>1</sup>
AIN	29	2.593 <sup>a</sup>
EN	466	2.976
RN1	1190	3.004
RN2	797	2.937
RN3	375	2.543 <sup>b</sup>
RN4	234	2.678 <sup>b</sup>
RN5	315	2.491 <sup>b</sup>

<sup>1</sup>Mean calculated from Likert scale where strongly agree = 1, agree = 2, neutral = 3, disagree = 4 and strongly disagree = 5.

<sup>a</sup>AIN differ from EN, RN1 and RN2 ( $p < .05$ )

<sup>b</sup>RN3 - RN5 differ from EN, RN1 and RN2 ( $p < .05$ )

**Table 5. Frequency of responses by nurses to statements about barriers to computer use.**

Statement	Frequency (percentage of respondents)					Mean <sup>1</sup>
	Never	Rarely	Sometimes	Very often	Always	
Patients/clients/relative/visitors are resentful of me at the computer	43.5	20.2	23.0	9.3	3.9	1.097
I don't have any interest in using a computer	70.0	12.5	13.0	3.1	1.4	.534
My age restricts my use of a computer	77.5	10.3	7.9	3.0	1.3	.403

<sup>1</sup>Mean calculated from Likert scale where never = 0, rarely = 1, sometimes = 2, very often = 3 and always = 4.

**Table 6. The effect of length of time in nursing on the nurses' view that a lack of interest was a barrier to their use of computers**

<b>Years in nursing</b>	<b>Mean</b>
0-5	.168 <sup>abcd</sup>
6-10	.210 <sup>efg</sup>
11-15	.244 <sup>hij</sup>
16-20	.343 <sup>aki</sup>
21-25	.428 <sup>beh</sup>
26-30	.527 <sup>cfik</sup>
31+	.638 <sup>djil</sup>

<sup>1</sup>mean calculated from Likert scale where never = 0, rarely = 1, sometimes = 2, very often = 3 and always = 4.

<sup>a-i</sup>means with same superscript differ ( $p < .05$ )

CIN: Computers, Informatics, Nursing
Authorship Responsibility, Financial Disclosure, and Copyright Transfer

Manuscript Title (the "Work"):

Corresponding Author:

Mailing Address and Telephone/Fax/E-mail:

Each author must read and sign the following statements; if necessary, photocopy this document and distribute to coauthors for their original ink signatures. Completed forms should be submitted to CIN Editorial Office, 10A Beach Street, Suite 2, Portland, ME 04101; fax: 207-553-7751; as email attachment to edit@medesk.com

CONDITIONS OF SUBMISSION

RETAINED RIGHTS: Except for copyright, other proprietary rights related to the Work shall be retained by the authors. To reproduce any text, figures, tables, or illustrations from the Work in future works of their own, the authors must obtain written permission from Lippincott Williams & Wilkins (LWW); such permission cannot be unreasonably withheld by LWW.

ORIGINALITY: Each author warrants that his or her submission to the Work is original and that he or she has full power to enter into this agreement. Neither this Work nor a similar work has been published nor shall be submitted for publication elsewhere while under consideration by the Journal.

AUTHORSHIP RESPONSIBILITY: Each author certifies that he or she has participated sufficiently in the intellectual content, the analysis of data, if applicable, and the writing of the Work to take public responsibility for it. Each has reviewed the final version of the Work, believes it represents valid work, and approves it for publication. Moreover, should the editors of the Journal request the data upon which the work is based, they shall produce it.

DISCLAIMER: Each author warrants that this Work contains no libelous or unlawful statements and does not infringe on the rights of others. If excerpts (tables or illustrations) from copyrighted works are included, a written release will be secured by the authors prior to submission, and credit to the original publication will be properly acknowledged. Each author warrants that he or she has obtained, prior to submission, written releases from patients whose names or photographs are submitted as part of the Work. Should LWW request copies of such written releases, authors shall provide them to LWW in a timely manner. Each author also warrants that the Work contains no matter that is obscene, defamatory, in violation of any right of privacy, or otherwise contrary to the law. The author(s) shall jointly and severally indemnify, defend and hold harmless Lippincott Williams & Wilkins against loss or damages, including reasonable attorneys' fees, arising from the breach of any warranty made in this document.

TRANSFER OF COPYRIGHT

AUTHORS' OWN WORK: In consideration of the Journal's publication of the Work, the authors hereby transfer, assign, and otherwise convey all copyright ownership worldwide, in all languages, and in all forms of media now or hereafter known, including electronic media such as CD-ROM, Internet, and Intranet, to LWW. If LWW should decide for any reason not to publish an author's submission to the Work, they shall give prompt notice of their decision to the corresponding author, this agreement shall terminate, and neither the author nor they shall be under any further liability or obligation. The authors grant LWW the rights to use their names and biographical data (including professional affiliation) in the Work and in its or the Journal's promotion.

WORK MADE FOR HIRE: If this work has been commissioned by another person or organization, or if it has been written as part of the duties of an employee, an authorized representative of the commissioning organization or employer must also sign this form stating his or her title in the organization.

GOVERNMENT EMPLOYEES: If this submission to the Work has been written in the course of the author's employment by the United States Government, check the "Government" box at the end of this form. A work prepared by a government employee as part of his or her official duties is called a "work of the U.S. Government" and is not subject to copyright. If it is not prepared as part of the employee's official duties, it may be subject to copyright.

FINANCIAL DISCLOSURE: Each author certifies that he or she has no commercial associations (e.g., consultancies, stock ownership, equity interest, patent/licensing arrangements, etc.) that might pose a conflict of interests in connection with the submitted article, except as disclosed on a separate attachment. All funding sources supporting the Work and all institutional or corporate affiliations of the authors are acknowledged in a footnote in the Work.

INSTITUTIONAL REVIEW BOARD/ANIMAL CARE COMMITTEE APPROVAL: Each author certifies that his or her institution has approved the protocol for any investigation involving humans or animals and that all experimentation was conducted in conformity with ethical and humane principles of research.

Signature [ ] Author's Own Work [ ] Work for Hire Printed Name [ ] Government Date [ ] Financial Disclosure Attached

Signature [ ] Author's Own Work [ ] Work for Hire Printed Name [ ] Government Date [ ] Financial Disclosure Attached

Signature [ ] Author's Own Work [ ] Work for Hire Printed Name [ ] Government Date [ ] Financial Disclosure Attached

Signature [ ] Author's Own Work [ ] Work for Hire Printed Name [ ] Government Date [ ] Financial Disclosure Attached