Nurses' use of the Internet in clinical ward settings

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Background. The potential of the Internet as a fast and efficient way of accessing evidence to support nursing practice has been well recognized. In addition, nurses have highlighted the need for training in the use of information technology, information retrieval and critical appraisal as essential to their professional development.

Aim. The aim of this paper is to present selected results of a longitudinal project that evaluated the impact of networked computers, with open access to the Internet, on four acute wards in a large UK teaching hospital.

Method. Evaluation methods in the project included monitoring data from an Internet surveillance software package, a questionnaire survey with the nurses ($n = 97$) and in-depth interviews with a sample of nurses ($n = 12$).

Findings. A complex picture was revealed of the nature of Internet use and the factors that nurses perceived as influencing this. The majority used the networked computers and some frequent users emerged. Nurses were able to use the technology during quiet periods throughout the day and night. Patterns of use were mixed, with nurses accessing the Internet for a combination of work and non-work-related activities. They integrated use of Internet technology into their working days in ways that appropriately fitted patterns of clinical activity. Factors relating to the organization, workplace culture and training were identified influencing Internet use.

Conclusions. Open access to the Internet in the workplace emerged as a useful but unrefined tool for encouraging the retrieval of information for practice. Future development of this technology in the workplace must include support and training for professional staff in order to enhance the skills required. Recommendations are

made about what and how training may be useful in promoting nurses' use of Internet technology in clinical settings.

Keywords: Internet, workplace use, information technology, evidence-based care, nursing

Introduction

This paper presents selected results of a longitudinal project, funded by the Department of Health that evaluated the impact of networked computers, with open access to the Internet on four acute wards in a United Kingdom (UK) teaching hospital in the North of England. The paper focuses on what monitoring data revealed about how nurses use the Internet to access information to support their practice, and the need for training and facilitation in Internet use will be discussed. Interview and questionnaire results can be accessed at http://www.impact.shef.ac.uk/uni/projects/impact

Literature review

The drive for health care to be evidence-based and cost-effective has accelerated during the last 10 years. Since 1997, a succession of policy documents has promoted a growing expectation that health care professionals should review their practice in the light of current evidence. In this way it is anticipated that the quality of care delivery will continually improve (Department of Health 1997, 1998a,b, 2001).

The potential of the Internet as a fast and efficient way of accessing evidence to support nursing practice has been well recognized (Beyea 2000, Tod *et al.* 2003). Supporting policy such as *Information for Health* (Department of Health 1998a) and *Building the Information Core* (Department of Health 2001) has highlighted the central role of information communication technologies (ICT), such as the Internet, for these purposes (Department of Health 2001).

Singer and Tan (2000) emphasize that nurses, particularly in North America and Australia, have had access to the advantages of the Internet-driven information age. In contrast, UK nurses have experienced limitations of access in the workplace because the nature of nursing work and shift patterns have restricted opportunities for accessing the Internet (Foundation of Nursing Studies 2001), although access has increased in private homes and public places (Duffy 2000). It was also identified in a recent report on evidence-based nursing (Foundation of Nursing Studies 2001) that nurses need training in the use of information technology, information retrieval and critical appraisal for their professional development. It was also suggested that an increase in ward-based access to the Internet was important in promoting evidence-based practice (Foundation of Nursing Studies 2001).

Implicit in commentaries and articles on Internet access has been an assumption that workplace access will circumvent barriers to use such as lack of time, skills and confidence. This may be because workplace access allows busy staff to make use of quiet times and short periods of time between care delivery to access evidence via the Internet. It is also possible that ward-based access would create opportunities for nurses to acquire information searching skills from their colleagues.

The study

Aim

The overall aim of the study was to observe nurses' use of the internet when given unlimited 24 hour open access.

The intervention

At the time of the study the National Health Service net (NHSnet) (Department of Health 1998a) restricted access to a limited number of Internet sites. It was not available to staff in the clinical area chosen for the study. As we wished to observe nurses' use of the Internet when given unlimited 24 hour open access, it was necessary to provide each ward in the study with an open access networked computer. These were situated within clinical practice areas at the ward nurses' station. The terminals were connected via the local area network to the University of Sheffield Intranet and the Internet.

Setting

The intervention was placed in four clinical areas within the same medical specialty, but these differed in terms of procedures, care given and opening times (Table 1). Placing of the ward computers in the clinical environment was decided on in consultation with clinical staff. All ward staff decided to locate the computer in a place they thought would be most accessible to staff during working hours.

Table 1 Description of study wards

Ward	Description	Opening hours	Number of actual nursing staff users
A ward	Cardiac diagnostic suite	08.00–17.30 hours	14
B ward	General cardiac ward	24 hours	27
C ward	General cardiac ward	24 hours	27
D ward	Cardiac day ward	24 hours weekdays at times	20

Participants

All nurses (97) who participated were provided their own password (ID) to log onto the computer, and given an email address, and 88 actually logged on and used the Internet. It was not possible to determine why the others did not participate. It was assumed that each user logged on and used the work-based Internet under their own ID.

Data collection

The raw data collected over the whole study period amounted to approximately 60 MB which equates approximately to a total 175,000 A4 pages of log files, and this was a large amount of data to handle.

Pilot study

A pilot study was conducted to help detect the best way of analysing this, and proved useful in estimating how many actual individual user activity records would be generated over the study. Log files from all four wards were selected for the pilot and a 7 day batch of data was collected each month from October 2000 to March 2001. The pilot study demonstrated that participant Internet use could only be evaluated by collating all the log files. It was decided, therefore, that all 7000 (anticipated) records would be collated for the complete final analysis.

Monitoring Internet user activity

Monitoring of individual, ward-based, Internet user activity was achieved using a software recording system called '*007 Stealth Activity Recorder and Reporter*' (STARR) (Iopus® 2000). It operated continuously from October 2000 to October 2001. This software system captured all user Internet activity events by logging all keystrokes, user names, passwords, Unique Resource Locator (URL) path names, access times and windows titles generated by users as the hypertext environment was navigated. Internet activity data were collected as raw (encrypted) data log files that were automatically sent by email, from each PC to a dedicated central server. We chose this software because it was capable of operating invisibly to the user, as well as being the best for remotely recording and storing such information. Other monitoring software available required us to go to the wards daily to save and download an activity report.

In order to reduce the potential risk of data loss as a result of network and/or system failure, copies of all raw log files were forwarded to a similar second server in another building. Secondary CD ROM storage was completed according to an agreed protocol at regular intervals throughout the study and the CDs were stored in a University fire resistant safe.

STARR software encryption security and password protection was used throughout for to all data collection and storage systems, meeting the requirements of the UK Data Protection Office (1998). Only authorized project research staff were able to access log files stores. This required licensed software (STARR Commander) (Iopus® 2000) and the use of secure passwords for log file decryption.

Continuous data collection and secure storage provided a permanent record of all available Internet activity from all users. This facilitated real time (retrospective) observation of actual user behaviour. Manual collation and analysis of decrypted log files were undertaken to reveal the existence and patterns of digital information seeking/searching activity undertaken by participants.

Interviews

Pre- and postintervention semi-structured interviews were conducted. Participants created their own concept map to illustrate their own feelings about the experience of workplace access to the Internet. The maps were returned to participants during postintervention interviews, and additions and amendments were made to them according to individual experiences of the intervention.

Categorizing the Internet activity record

Surveillance monitoring recorded all keystrokes on all four intervention computers and sent daily logs to the server. Files were then decrypted and viewed as Word documents (Box 1: sample log) listing all activities including search terms typed, search engines used, websites/URLs visited, content of emails and email providers. Content of received emails was not recorded for reasons of data protection. All content was then

Box 1 Sample log (date: 12.02.2000, time: 18:14–18:19)

Key
Text in `Courier new font` = Query typed in by user.
Text *italicised* = URL visited by user.

Time stamp: 18:14:10/12.02.2000
18:14: Ovid: Citation display – Microsoft Internet Explorer
(Path: c:\programfiles\internetexplorer\iexplore.exe)
18:14: Ovid: Titles Display – Microsoft Internet Explorer
(Path: c:\programfiles\internetexplorer\explore.exe)
18:15: http://biomed.niss.ac.uk/ovidweb/ovidweb.cgi – Microsoft Internet Explorer
(Path: c:\programfiles\intrnetexplorer\iexplore.exe)
18:15: Ovid: Citation display – Microsoft Internet Explorer
(Path: c:\programfiles\internetexplorer\iexplore.exe)
Time stamp: 18:15:15/12.02.2000
18:15:
(Path: c:\windows\xplorer.exe)
18:15: Yahoo! UK & Ireland – Microsoft Internet Explorer
(Path: c:\programfiles\internetexplorer\iexplore.exe)
+ *Link: http://uk.yahoo.com/*

`cardiac discussion groups`
+ *Link: http://uk.google.yahoo.com/bin/query_uk?p=cardiac+discussion+groups&y=y&hc=0&hs=0*
18:16: http://uk.google.yahoo.com/bin/query_uk?p=cardiac+discussion+groups&y=y&hc=0&hs=0 – Microsoft Internet Explorer
(Path: c:\programfiles\internetexplorer\iexplor.exe)
18:16: Yahoo! UK & Ireland Search Results for cardiac discussion groups – Microsoft Internet Explorer
(Path: c:\programfiles\internetexplorer\ieplore.exe)
Time stamp: 18:16:23/12.02.2000
+ *Link: http://medical.icsi.net/mailinglists.html*
18:17: Mailing Lists/Discussion Groups – Microsoft Internet Explorer
(Path: c:\programfiles\internetexplorer\iexplore.exe)
Time stamp: 18:17:26/12.02.2000
Time stamp: 18:18:30/12.02.2000
18:19:
(Path: c:\prgramfiles\outlookexpress\msimn.exe)
Time stamp: 18:19:39/12.02.2000
18:19: Mailing Lists/Discussion Groups – Microsoft Internet Explorer
(Path: c:\progrmfiles\internetexplorer\iexplore.exe)

categorized according to a system of classification agreed by the research team and informed by the pilot study. The categories were: work-related search, library databases, non work-related search, work-related email and non-work-related email.

Rules for categorizing the surveillance data were created (Box 2: rules for log file categorization). These were also based on a pilot sample of the content from the record of computer activity. Any uncertainty of category was resolved immediately by logging on to the URL in question to view the actual site and pages visited. Where content remained unclear the website visited was reviewed and discussed by the research team. It always became clear into which activity category the data fitted.

Inter-rater reliability

Due to the large amount of monitoring data collated, two research assistants were involved in the process of collating the monitoring data. For optimum reliability of the monitoring data, it was necessary to ensure that the degree to which these two raters assigned the log file activity remained consistent. Inter-rater reliability was evaluated by random repeat categorization of one 24-hour section of log data at 3 monthly intervals. Members of the research team checked one another's categorization, and the Kappa coefficient test was used to check inter-rater reliability. Following advice from expert users of Kappa, we decided that this test was suitable to evaluate the handling of our data, which was an objective record of actual activity that raters categorized according to rules (Brennan & Hays 1992), and substantial inter-rater reliability was achieved ($k = 0{\cdot}901$).

Ethical considerations

Approval to conduct the study was obtained from the Local Research Ethics Committee. Software monitoring of the Internet activity operated continuously and invisibly to the user and therefore did not alert or remind the user that their activity was being monitored. Participants were fully informed about the monitoring strategy at open seminars, and written information was provided about monitoring of their Internet use as part of the invitation to participate in the project. The information given was at the same level and content as information given to NHS staff about monitoring use of the NHSnet. Participants gave written consent to participate, and those who objected to participation were not included. Individual user identity codes were allocated by administrative staff and participants' identities of were available to surveillance team researchers. The intention was to promote natural and unguarded use of the Internet by ensuring anonymity. In the event of inappropriate Internet use being detected, the lead researcher was able to identify the individual from their user ID and this was explained to participants during the prestudy seminars.

Data analysis

A database was created to manage the monitoring data. Data were as entered into this manually and an activity

Box 2 Rules for log file categorization

Activity types

Work search:

- Using any search engine to find information on health/illness/treatment/therapy/prevention/medical/pharmacological/nursing/allied health professional
- Searching for information on career progression, professional development and curriculum vitae is categorized here
- All health-related searching not using library databases (separate category). This includes alternative therapies

Non-work search:

- Using any search engine to find information on anything not incorporated in work, included in here is all travel type searching (see note 1 below)
- Searching for jobs with a different employer is categorizd here
- All chat rooms except any obviously work-related (none recorded)

Work email:

- All email conveying or sharing information about work and professional practice (read content) – meetings, discussion on care decisions and protocols, sharing work-related information)
- Where email mentions a busy shift or similar within a social conversation it is categorized as non-work email
- Record email provider used in notes if not project (university) email
- The examination of URLs sent via email, with no apparent searching is also categorized here

Non-work email

- All email not discussing work issues (read content)
- Record email provider used in notes if not project (university) email

Email check

- Where the user logs on to email provider to check for messages but does not send any (see note 2 below)

Library databases

- All visits to library databases such as CINAHL, PUBMED, RCN library, COCHRANE, all ATHENS access databases
- Include in this category from time of arrival at library databases, regardless of the journey the user took (searches leading to this will be included in 'work' or 'non-work' search as above)

Notes

1. All travel-related searching was categorized as non-work. Examination of these episodes showed wide searching for holidays, although a small minority might be for work-related conferences or study days
2. We are unable to define whether received emails were work or non-work: accessing the content of received emails would go beyond our ethical approval as senders were not informed participants
3. All periods of three time stamps or greater in the record of Internet activity during one session were recorded only as a gap in the data (> 3 minutes). A session began at the point of logging on and was concluded when a user logged off. These 'gaps' might reflect a user having left the computer (for instance called away by a patient) or a user sitting reading the screen

type was allocated to each episode of use recorded on the STARR (Iopus® 2000) log files. The Activity types were work email, non-work email, work search, non-work search, non-work search and library databases. Criteria for assigning categories to episodes are shown in Box 2. This database was then manipulated to reveal details of Internet use.

Interpretive Phenomenological Analysis (IPA) methods were used to analyse the qualitative data. Line by line analysis revealed emerging and recurrent themes from the interview transcripts. Concept maps created by participants provided a simple format in which the themes derived by the researcher could be returned to the participants to check that they reflected their original meaning.

Further details of the monitoring and interview data are available at http://www.impact.shef.ac.uk/uni/projects/impact or in the paper by Tod *et al.* (2003).

Findings

Selected quotes from interview data have been included to illustrate issues raised by the monitoring data.

Access and use of intervention

The total number of hours in Internet activity by all nursing staff ($n = 88$) over the 1-year study period was 804 hours and 24 minutes. This represents actual Internet interactive time logged by the software programme. These logged hours may not represent such activities as user-time reading online text at the project computer.

Internet activity levels differed on the four wards (Table 2) and revealed differing opportunities for staff to access the computer. All times quoted are total hours and minutes accrued over the whole study period. The two wards with the

Table 2 Internet activity (over the whole year by ward)

Ward	Hours:minutes generated by nursing staff users	Percntage of grand total of Internet activity %
A ward (open 08.00–17.30 hours weekdays)	56 hours, 42 minutes	7·0
B ward (open 24 hours)	301 hours, 47 minutes	37·5
C ward1 (open 24 hours)	393 hours, 47 minutes	48·9
D ward (open 24 hours weekdays-at times)	52 hours, 8 minutes	6·5

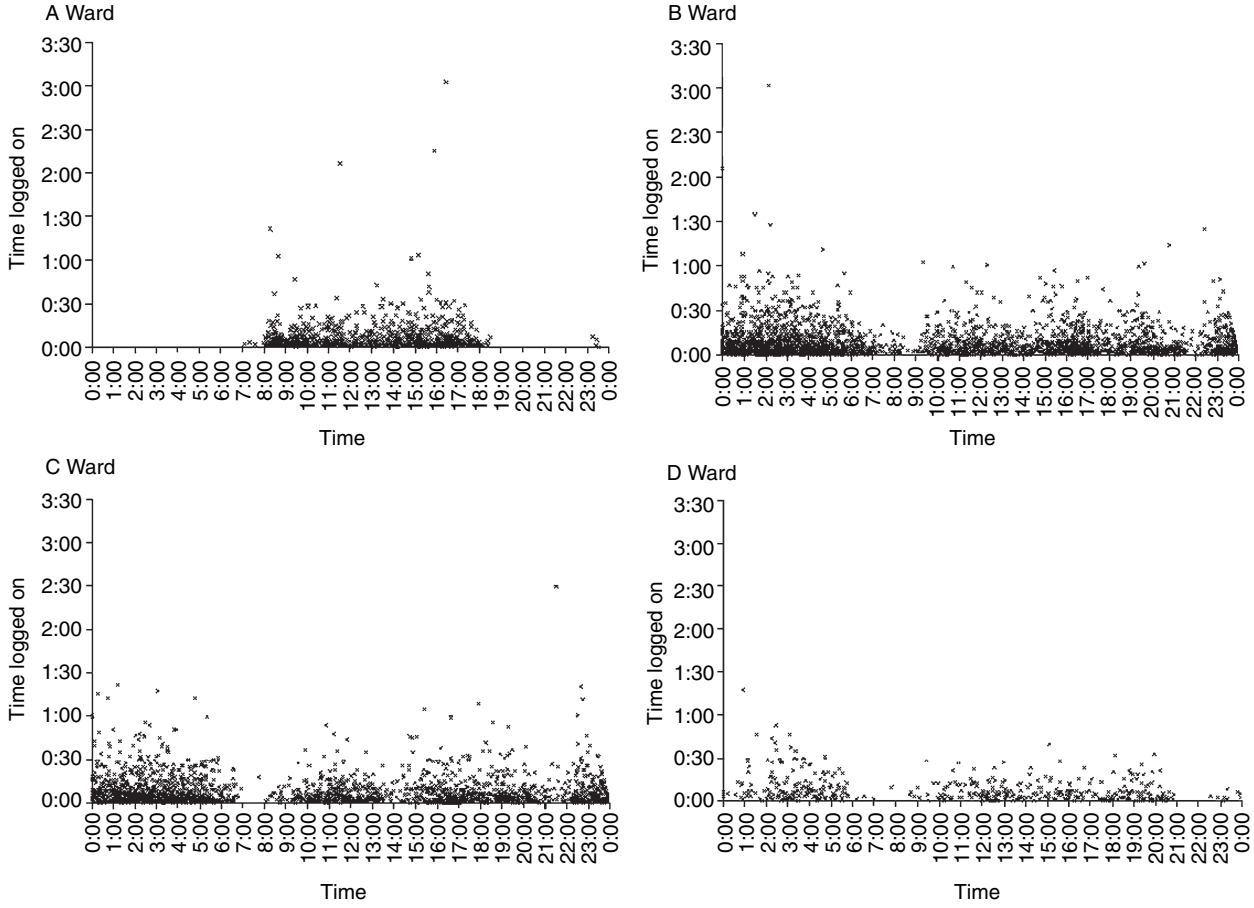

Figure 1 Scatter graphs of Internet use by all participants on each ward for the whole study period (each point on the graph identifies when a session began and the amount of time logged on during that session (h:m).

highest activity levels (B and C ward) provide a full 24-hour nursing service. These wards have a nurse staffing establishment that reflects this and showed the largest Internet usage totals, accruing approximately 49% and 38% of the total Internet activity over the whole year. The other two wards (A and D) had fewer staff and showed lower activity levels, accruing only approximately 6–7% of Internet activity time.

Scatter graph results showed that, unlike nurses on wards A and D, nurses on the 24 hour wards clearly had more opportunity to use the Internet at night and in the evening (Figure 1). These results also show other similarities across the wards. For example, on those open during the whole 24 hour period, graphs showed inactivity between approximately 06.00 and 11.00 hours when the most intensive nursing and medical activity took place. Less prominent activity gaps occurred around 13.00 hours and 21.00 hours, and these can be related to shift handover periods.

Whilst the majority of participants used the network computers to some extent, frequent users emerged. Interview data (Harrison 2003) revealed that an information enthusiast, also a frequent user, emerged on all four wards. These individuals were also identified as peers who would be able to help others with information retrieval. Interview data also suggested that the presence of the 'information enthusiasts'

helped enhance the development of information search and retrieval skills by other less frequent users:

I try and sort out problems myself now. It always helps me understand, but X on the ward can always work it out, so we leave her a message if she's not on.

Table 3 shows that the largest majority of Internet activity occurred as brief events. Approximately 75% of all activity logged took no longer that 10 minutes, data indicated that staff used appropriate short periods of nursing 'quiet time' to access the Internet:

It's been great having the computer here – we can go on when it's quiet. Nobody minds.

[It's] sort of opened up a lot of opportunities because if I've got 10 minutes between doing something, I can have a quick (look).

Around 20% of activities took 11–30 minutes and 3·5% of user time took 30 minutes or more. The majority of activity that took 30 minutes or more occurred at night (i.e. 22.00–06.00 hours) and fell was non-work-related searching or email.

Work-related and non-work-related activities at night were invariably intermingled. This was contrary to the expectation that staff might restrict non-work-related activity to break times and pursue work-related activity during shift time. Concerns that this mixed pattern of activity during the night might hide inappropriately lengthy non-work Internet use led us to calculate the mean accrued time per night shift for this activity. We found that non-work-related activity represented no more than 35 minutes per night shift (B ward = 33 minutes/night shift, C ward = 24 minutes/night shift, and D ward = 3 minutes/night shift. N.B. A ward was never open at night).

Table 3 Internet activity – frequency and length of activity events

Length of activity	Number of user activity events *n*	Percentage of total number of events
0–1 m	1335	20·69
2–3 m	1352	20·96
4–5 m	884	13·70
6–10 m	1306	20·24
11–30 m	1344	20·83
30+ m	230	3·57

Table 4 Internet activity – all participants by category

Category	Total time	Percentage of total use
Work email	13 hours	1·6
Non-work email	166 hours, 13 minutes	20·7
Work search	158 hours, 6 minutes	19·8
Non-work search	400 hours, 56 minutes	49·8
Library databases	38 hours, 33 minutes	4·8

Simple email checks and no activity when logged on omitted.

Types of internet activity

Table 4 shows the main types of activity observed, their total times and percentage of total use. The following section outlines each category in more detail.

Work-related email use

Work-related email use occurred across all wards. The 24-hour wards showed the largest activity levels, reaching a total of 9 hours, 17 minutes on C ward and 2 hours, 29 minutes on B ward. Non-24-hour wards engaged in very little work-related email activity, reaching a total of only 1 hour, 14 minutes for the whole study period across both wards. Work-related email messages were to professional organizations rather than to colleagues or other professional staff. The exception was a small number of emails (3–5) to arrange meetings.

Non-work-related email

Non-work-related email hours were considerably higher on the 24-hour wards. Total non-work email for B ward was 93 hours, 32 minutes and 62 hours, 41 minutes for C ward. However, for A and D wards this remained below 10 hours. The content of these messages was largely personal and occurred in the early hours of the morning between midnight and 06.00 hours.

Searching activity overall

On D ward the largest proportion of overall activity was work-related searching (23 hours, 2 minutes), and non-work-related searching represented approximately half this time (12 hours, 30 minutes). Activity figures for ward A show that non-work-related activity (29 hours, 41 minutes) was greater than work-searching activity (21 hours, 7 minutes).

B and C wards, the 24 hour wards, generated much larger work-related search activity totals of 55 hours, 22 minutes and 59 hours, 35 minutes, respectively. The amount of non-work-related searching represented the largest activity type. The total for B ward was 145 hours, 10 minutes and for C ward it was 213 hours, 35 minutes.

Work-related searching

Participants accessed information on a variety of subjects, including specific medical conditions such as diabetes and coronary heart disease. Searching for other information relating to the ward medical speciality included visiting websites

sites covering cardiac anatomy and physiology, pharmacology, diagnostic information and teaching materials. There was frequent use of an interactive cardiac monitoring website. Information on medical interventions such as Hickman lines and cardiac catheterization also occurred.

The search strategies used were unsophisticated. For example, many participants used the 'Ask Jeeves' (http://www.ask.co.uk) website, simply asking 'where can I find information about…'. Alternatively, the Google search engine (http://www.google.co.uk) was used with a simple search term. According to interview data (Harrison *et al.* 2002, Harrison 2003, Tod *et al.* 2003), these two search engines seemed to suit the needs of the nurse users, being preferred over library and professional databases.

Non-work-related searching

Non-work-searching covered a wide range of subjects, including information on house-buying, browsing for clothing and household goods, hobbies, finding out about local entertainment events, and the weather. Sites covering information about popular musicians were visited. Quiz sites were visited, including the 'Who Wants to be a Millionaire?' television programme website, which was apparently popular at the time.

Accessing library databases

Searching activity involving use of library databases was low, the maximum hours of use being 16:01 (C Ward). The databases used were predominantly BIOMED and the RCN archives, but library databases were accessed by selected users. Search terms used were largely professional and sociopolitical, suggesting that searching was for a specific purpose, such as for a work project or academic assignment. It was noted that searching these databases was either quickly completed or abandoned.

Discussion

The purpose of monitoring Internet activity was to reveal how nurses used the technology, based on the assumption that if the technology was available staff would use it and that their skills and confidence would grow. The monitoring data provided a consummate opportunity to explore how staff used the intervention. The data clearly showed that access to the Internet resulted in staff using the technology. This supports previous calls for an increase in access to the Internet (Alderman 2000, Foundation of Nursing Studies 2001). However, the results reveal a more complex picture of the nature of this use and the factors influencing it.

The study revealed that when provided with access to the Internet, nurse participants integrated its use into their working days. Furthermore, they were observed to do this in ways that answer some concerns previously identified in the literature that nurses would not have time to use the technology or might use it inappropriately (Department of Health 1998a, Foundation of Nursing Studies 2001).

The amount of time using the Internet appeared to be related to the opening hours of the wards involved and the number of staff available to use the technology. Wards B and C showed much higher activity times than A and D, and this difference did not appear to relate to differences in staffing numbers. One explanation of this disparity is that staff on different wards had different opportunities for using the technology.

When the study started there were concerns that users might engage in unacceptably lengthy use of the technology at the expense of patient care activity, but his did not prove to be the case. Monitoring did not reveal any lengthy use that might have interfered with patient care, nor was any such behaviour reported in interviews (Harrison *et al.* 2002). Mixed use of non-work and work activity during the night seemed to be a common occurrence. Mean values for non-work searching activity at night did not exceed allocated rest (break) time. This suggests that, although staff combined non-work-related searching activity with work-related activity, they remained disciplined in restricting their non-work activity to acceptable limits within the shift.

The study also showed that nurses used the Internet during quiet times and for short periods only. This suggests that clinical work has a governing effect on how nurses access the internet during work time. This may be reassuring to those with reservations about misuse of the technology because it illustrates that, even with open and unrestricted access; participants used the technology in a way that appropriately fitted the pattern of their clinical activities.

Before study there were indications from existing research that nurses were, at best, ambivalent towards the use and value of ICT in clinical practice. For example, in a study by Simpson and Kendrick (1997) only just over half the nurse participants showed positive attitudes. Little was known about the workplace, cultural and organizational factors that would facilitate a change in attitudes to and use of the technology. Our study acknowledged the influence of issues such as work organization and attitudes of senior staff on the amount and times the technology was used during work time.

If workplace access to this technology is integrated with and appropriate to clinical working practice, the Internet can be harnessed effectively as a convenient information resource for busy nursing staff. This obviates the problem of staff having difficulty finding time to leave ward areas to visit libraries or access information sources such as electronic databases (Lacey 1994).

Participants used the Internet for a mixture of activities such as work-related searches, non-work-related searches, and email checks. This mixed pattern of activity was observed throughout the study, suggesting that it was a preferred use pattern.

Searching and information retrieval from the Internet was also observed. The diverse range of simple search terms used, along with a variety of websites visited, suggested that searches were opportunistic and unplanned. There was limited evidence of participants attempting to refine their search terms. The only apparent refinement observed was when a user used the same search term with different search engines. The use of unsophisticated searching strategies tends to support the previously highlighted need for training for nurses in the use of information technology and information retrieval (Foundation of Nursing Studies 2001), however, further inquiry would be needed to substantiate this.

Before the study, no research could be identified on nurses' use of email. As with other Internet facilities, there was an assumption that email would be used if available. Contrary to this expectation, participants did not use email to contact each other within or between wards. Reasons given in the interviews for this included the pattern of shifts, lack of time, and variability of user skills. Further research is needed to build on these initial findings and indicate what would facilitate email use in health care settings.

Despite the call for training (Foundation of Nursing Studies 2001), little evidence existed previously to inform education to promote workplace Internet use. Our study has shown that frequent users emerged during the study who were useful to others in helping them to develop the skills needed to use the technology. These individuals may be instrumental in skill development in the workplace. This potential for learning would be considerably enhanced by the provision of targeted training for these individuals. Furthermore, encouraging people to teach others informally in the workplace maintains skills development in clinical settings. Thus, learning and Internet use occurs in and ultimately for the workplace.

Limitations

At the outset of the study no training was provided for staff in the use of the technology provided. This was because training was already available to them in readiness for the imminent rollout of NHSnet (Department of Health 1998a). Our data might have been more informative if training in information retrieval had been given halfway through the study.

The STARR surveillance tool (Iopus® 2000) was the only one available when the study began that was capable of unobtrusively monitoring user activity as it happened in clinical workplaces. This software was originally designed to monitor Internet and email services used by staff in office environments and thus proved limited for interpreting user activity for nursing workplace settings. For example, it was not able to identify circumstances where users logged onto the Internet, 'walked away' and then returned to continue what they were engaged in reading online. Both of these activities would certainly explain some of the longer periods of use that were detected, but without observational data this is impossible to confirm. Time, cost and ethical implications prevented the use of observational methods.

Another explanation of longer periods of apparent use (at night) were multiple participants sharing the use of the Internet without choosing to log on with their own IDs. Similarly, the monitoring strategy was not able to detect this.

Awareness of these confounding factors meant that the frequency and length of activity times were more informative than means and averages. This was because it the participant was not necessarily at the computer for the whole of the time that they were logged on.

Finally, it was not possible to deduce from the data the extent to which searching strategies were adequate for the purposes for which they were intended, although the interview data do illuminate this to some degree (Harrison 2003). Further research is required to evaluate the suitability of electronic searching skills of clinical staff.

Conclusions

A number of recommendations that relate to the issue of training can be made as a result of the study. Targeted training of specific users may result in both more effective and more efficient use of the Internet as an information resource. However, in order for overall skills in a staff group to be maintained, it would be necessary for those targeted for training to provide peer support for others in the workplace, thus raising overall skills acquisition. Failure to encourage individual use of the technology in favour of reliance on 'experts' might result in polarization of skills development and a culture in which those with the skills use it and those without them never progress.

Training to improve retrieval of practice-related information from the Internet should be based on the following considerations:

- It should focus on search planning and (search saving) that maximizes short periods of time available in shift quite time.
- Improvement of search results may be gained by assisting staff to develop more sophisticated searching and search refinement skills.

What is already known about this topic

- The potential of the Internet as a fast and efficient way of accessing evidence to support nursing practice is well recognized.
- Nurses have expressed concern about the limitations of access to the Internet in the workplace.
- Nurses highlight the need for training in the use of information technology, information retrieval and critical appraisal as essential to their professional development.

What this paper adds

- Nurses will make use of Internet technologies if these are accessible within the workplace.
- Nurses use Internet technology at quiet times across the 24-hour working day and perceive both professional and personal benefits, but its use was relate to organizational, workplace culture and training factors.
- Frequent users provided peer support and informal education in the use of Internet technology to those who were less experienced, but formal support and training is required to enhance Internet use.

- Introduction of protected information searching time for nurse within the shift may also enhance the quality of information retrieval.
- Acknowledgement of factors relating to the organization, workplace culture and training that influence Internet use.
- Encouragement and training staff in the effective use of the Internet may result in them developing their own collection of useful web-based resources that can be used regularly to inform practice without leaving the workplace.

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