Sharon Mina Okeyo, MSc. Nursing (Nursing Education), University of Nairobi College of Health Science, School of Nursing Sciences P.O. Box 30197 GPO 00100, Nairobi. Kenya, Prof. Anna Kagure Karani (PhD), Professor of Nursing & Nursing Education, University of Nairobi College of Health Science, School of Nursing Sciences P.O. Box 30197 GPO 00100, Nairobi. Kenya.Dr. Emmah Matheka, Lecturer, University of Nairobi College of Health Sciences, School of Nursing Sciences P.O. Box 30197 GPO 00100, Nairobi. Kenya.

Corresponding Author: Sharon Mina Okeyo, MSc. Nursing (Nursing Education), University of Nairobi College of Health Science, School of Nursing Sciences P.O. Box 30197 GPO 00100, Nairobi. Kenya. Email: mina304061@yahoo.com

# CHALLENGES OF TECHNOLOGICAL TRENDS IN NURSING AND COPING STRATEGIES BY NURSES AT KENYATTA NATIONAL HOSPITAL

S. M. Okeyo, A. K. Karani, and E. Matheka

## ABSTRACT

*Background-* **Technology in nursing has been shown to reduce redundancy and improve efficiency of work. Information Communication and technology (ICT) incorporation in nursing at Kenyatta national Hospital (KNH) has been ongoing for some years yet the uptake seemingly is slow. Challenges that could be associated with the slow incorporation of technology into nursing practice have not been studied.**

*Objective -* **To identifying the challenges faced by nurses as a result of technology trends in nursing practice and to establish ways in which nurses are coping with the challenges.**

*Design -* **Cross-sectional descriptive**

*Setting –* **Kenyatta National Hospital**

*Participants -* **Nurses in medical and surgical wards.**

*Interventions -* **Simple random sampling was used to select 91 participants after applying fishers' formula. Purposive sampling was used to select 5 nurse managers as key informants. Data on challenges of technological trends in nursing and coping strategies by nurses was collected using a pre-tested semi-structured questionnaire. Chi-square test was used to determine Association between challenges faced and Electronic health records (EHR) usage levels, also between technological skills and challenges faced at confidence level of 95% at a p-value of 0.05.**

*Results -* **Majority of the nurses (62.6%, n = 57) reported experiencing challenges related to technology developments in their departments. The study established that less technological skills among nurses led to more challenges experienced with technology (Chi= 7.2, DF=1, P=0.007). The study also found that reports on more challenges experienced was significantly related to decreased level of use of EHR (Chi= 16.8, DF=3, P=0.001) and (Chi=11.8, DF=3, P=0.008).**

*Conclusion -* **Nurses are facing many challenges as a result of technological trends in nursing. Special attention should be paid towards tackling the challenges by including comprehensive training on technological skills and formulating policies on proper handling of the challenges to enhance integration of ICT in nursing.**

# INTRODUCTION

Incorporation of technology in health care delivery has resulted in better accuracy in results, efficiency in time and resources management, new discoveries and innovations in health care and even new opportunities for science and research (1). Health records continue to evolve as a result of technology and any changes in documentation of care have a significant impact on nursing practice (2). Despite the challenges that continue to exist in understanding and demonstrating meaningful use of Electronic Health Records (EHR), it is fast becoming part of health care delivery and all health workers must become well versed with it and adopt it in their daily practice (3).

ICT has been gaining foot in Africa health systems, with technology enabled programs emerging at the rate of 60% in sub-Saharan Africa in all areas of health particularly in HIV/AIDS, general primary care and maternal and child health (4). Yet ICT has continued to be underutilized in most hospitals which are considered to apply use of ICT. For example, in Ebonyi State of Nigeria though some hospitals and nursing institutions have computer or IT units, they serve primarily to support word processing for typing pools and offices (5).

In Kenya, for example, the presence of ICT in nursing in KNH since 2013(6), has not addressed a lot of inefficiencies in nursing care delivery. There is underutilization of computer technology in nursing and computers are mostly used to carry few functions like billing. Many other nursing functions suggested previously through other studies that could be done by the help of computer technology are still done manually, for example, generation of nursing reports, ordering of medication, history taking and vital sign observation (7).

This has contributed to redundancy of work and inefficiencies in delivery of many nursing functions. One of the main problems faced with introduction of new technologies or innovations in health is that professionals do not automatically use them as intended by the developers (8). Thus the intended outcome of increasing quality of patient care, reducing healthcare costs and/or solving workforce problems is not successfully realized. The role of technology in nursing and its place in caring for patients has been a debate because of its high-tech characteristics which cannot replace the human touch an important aspect of caring. Systematic incorporation of it into practice has been hindered by a lack of understanding of its exact place in nursing yet it still remains a vital part of nursing (9).

Studies have suggested that challenges to the introduction and successful integration of technology to nursing practice are related to three determinants. i.e., the technology itself, the organization/political context, the potential user who is the nurse in this case (8). Technology that was perceived to be advantageous to the user in terms of professionalism, time saving, financial or increased job satisfaction was easily up taken. Perceived difficulty in use and irrelevance to patient care or lack of benefit of the technology to patients led to slow uptake.

Challenges related to the user have been cited in other studies as lack of support from colleagues, lack of required skills and lack of support from other health professionals. Challenges related to the organizational and political context, have been cited as lack of involvement of nursing staff in the decision making process about the new technology, lack of sufficient time for nurses to adopt, train and use the new technology and a lack of sufficient resources like computers (8).

The nursing profession in particular, has been sluggish in embracing change and with

the new requirements in the health field due to the inevitable technological changes that have occurred in this field, it is important to establish the challenges related to incorporation of technology in nursing and the ways in which the nurses are coping with the challenges. Also, establish ways in which they can be supported to incorporate more use of technology in their practice (2).

## MATERIALS AND METHODS

*Population and sample*
This was a cross-sectional descriptive study to establish the challenges nurses at Kenyatta National hospital were facing as a result of incorporation of technology into nursing practice and the coping strategies they were using. Respondents were sampled through simple random sampling technique while 5 key informants were purposively sampled. Population of the study included nurses working in the medical and surgical units of KNH. The sample selected through fishers' formula included 91(61% of nurses working in medical and surgical wards). The nurses who were on duty during the study period were included in the study. The respondents were either registered nurses or enrolled nurses.

*Inclusion and exclusion criteria*
The participants were qualified nurses of all cadres working in KNH who were on duty on the day of data collection. They must have been registered by the nursing council of Kenya. They must have been willing to participate and showed this through a written consent. Nurses who were not willing to participate in the study, and did not consent by writing were excluded from the study. Also nurses who were not on duty on the days of data collection and those who were on leave were excluded from the study.

*Data Collection instruments*
Semi structured questionnaires were used to collect both qualitative and quantitative data. The questionnaire enabled the collection of detailed information on the demographic data, the challenges the nurses were facing as a result of introduction of computer technology into nursing practice and the coping strategies they were using. Oral interview guide was used on the key informants to conduct interviews.

*Data analysis*
Quantitative data was entered and analyzed using SPSS. Statistical significance and association between variables was determined through Chi square test at confidence level of 95%, at a p-value of 0.05.

*Ethical considerations*
Permission to undertake the study was obtained from University of Nairobi-Kenyatta National Hospital Ethics Research Committee (UoN-KNH/ERC) and KNH management. Participation in the study was on a voluntary basis. Participants who were eligible and had been selected for the study had to sign consent to participate. Confidentiality, privacy, anonymity and justice were assured in handling information given by the participants. It was made clear to the participants that there would be no incentives or material gain from participating in the study.

## RESULT

*Challenges on nurses' skills*
Majority of the nurses (62.6%, n = 57) reported that they had been challenged by the technological developments in their departments. Most nurses (53%, n = 48) reported that they did not have adequate technological skills to effectively practice nursing today with the new technological developments in nursing. Those who indicated that they did not have adequate skills, specified areas where they thought they needed to acquire more skills in order to use technology more frequently at work as shown in table 1.

**Table 1**
*Areas to acquire   additional skills*
N=48

| Areas | Frequency | Percentage |
|---|---|---|
| Operating the computers and laptops | 22 | 45.8 |
| Health software for example, fun soft | 24 | 50 |
| Electronic health records | 22 | 45.8 |
| Digital equipment like glucometers, BP machines etc. | 11 | 22.9 |

When asked to select which type of the challenges listed below, many nurses (35.2%, n=32), reported that they had to upgrade their skills to incorporate technological changes. Many nurses (33%, n=30) also felt they were being challenged to acquire more skills in technology in order to be effective (See table 2).

**Table 2**
*Challenges on nurses' skills*

| Technological development challenge | Frequency | Percent |
|---|---|---|
| Nurse no longer uses some skills because they have become unnecessary due to technology | 8 | 8.8 |
| Nurse has had to upgrade some skills to incorporate technological changes | 32 | 35.2 |
| Nurse is able to use just a few of the skills she acquired in training | 5 | 5.5 |
| Nurse feels he/she needs to acquire more skills to be effective | 30 | 33.0 |
| Other stated challenge for example, it takes too much time | 1 | 1.1 |
| No answer | 15 | 16.5 |
| Total | 91 | 100.0 |

*General challenges experienced*
The Nurses responded to challenges they experienced in using new technology as shown in Table 3. From the table, network connection being off most of the times was listed as the most common challenge (81.3%, n = 74) followed by few computers therefore limited access 56% (n = 51).

**Table 3**
*General challenges of using computer technology*
N=91

| Challenges | Frequency | Percentage |
|---|---|---|
| Lack of computer navigation skills | 15 | 16.5 |
| Network connection is off most times | 74 | 81.3 |
| There are few computers therefore no access | 51 | 56 |
| Lack of necessary nursing application software in the system | 31 | 34.1 |
| Cannot quantify nursing care given into quantities in the computer system | 27 | 29.7 |
| Not conversant with computer vocabularies/language | 9 | 9.9 |
| Lack of time to operate the computers as one is nursing | 38 | 41.8 |

*Association between challenges faced and level of EHR usage*
A Pearson chi-square test was conducted to examine whether there was a relationship between the type of challenge the nurse was facing and their level of use of EHR. The results revealed that there was a significant relationship between lack of computer navigation skills and level of usage of EHR (Chi square value=16.8, DF=3, P=0.001). Nurses who reported that they lacked skills in navigation of computer and technological gadgets were significantly more likely to report low usage of EHR (2.6 versus 33.3%) while those who had skills reported higher usage (47.4 versus 26. 7%).The results also revealed that there was a significant relationship between non-conversance with computer vocabularies and language and the level of usage of EHR (Chi square value= 11.8, DF=3, P = 0.008). Nurses who were not conversant with computer vocabularies and language were significantly more likely to report lower usage of EHR (4.9 versus 33.3%) as compared to those who reported that they were conversant who were more likely to report higher usage (42.7 versus 55.6%).          (See          table          4).

**Table 4**

*Association between challenges faced and the level of use of HER*

| | Level of use of HER | | | | Chi(DF) | P |
|---|---|---|---|---|---|---|
| | **10%** | **30%** | **60%** | **90%** | | |
| **Lack of computer navigation skills** | | | | | | |
| Yes | 5(33.3) | 5(33.3) | 4(26.7) | 1(6.7) | 16.8(3) | 0.001 |
| No | 2(2.6) | 31(40.8) | 36(47.4) | 7(9.2) | | |
| **Network connections is off most times** | | | | | | |
| Yes | 6(8.1) | 26(35.1) | 35(47.3) | 7(9.5) | 3.3(3) | 0.354 |
| No | 1(5.9) | 10(58.8) | 5(29.4) | 1(5.9) | | |
| **Few computers therefore no access** | | | | | | |
| Yes | 3(5.9) | 22(43.1) | 22(43.1) | 4(7.8) | 1(3) | 0.8 |
| No | 4(10.0) | 14(35.0) | 18(45.0) | 4(10.0) | | |
| **Lack of necessary nursing application software in the system** | | | | | | |
| Yes | 3(9.7) | 11(35.5) | 15(48.4) | 2(6.5) | 0.9(3) | 0.815 |
| No | 4(6.7) | 25(41.7) | 25(41.7) | 6(10.0) | | |
| **Cannot quantify nursing care given into quantities in the computer system** | | | | | | |
| Yes | 1(3.7) | 8(29.6) | 14(51.9) | 4(14.8) | 3.9(3) | 0.275 |
| No | 6(9.4) | 28(43.8) | 26(40.6) | 4(6.3) | | |
| **Not conversant with computer vocabularies/ language** | | | | | | |
| Yes | 3(33.3) | 1(11.1) | 5(55.6) | 0(0.0) | 11.8(3) | 0.008 |
| No | 4(4.9) | 35(42.7) | 35(42.7) | 8(9.8) | | |
| **Lack of time to operate the computers.** | | | | | | |
| Yes | 3(7.9) | 14(36.8) | 17(44.7) | 4(10.5) | 0.4(3) | 0.949 |
| No | 4(7.5) | 22(41.5) | 23(43.4) | 4(7.5) | | |

*Association between challenges experienced and technological skills*

A Pearson chi-square test was conducted to examine whether there was a relationship between the challenges nurses were facing and their reported presence of effective technological skill. The results revealed that there was a significant relationship between lack of navigation skills on the computer and reported presence of effective technological skills (Chi square value= 7.2, DF=1, P=0.007).

A significant number of nurses who reported that they had adequate technological skills for effective practice also reported that they did not experience the challenge of lacking computer navigation skills (56.6%) as compared to those who reported not having adequate technological skills who also reported that they experienced a challenge of navigation on the computer (6.7%)The study results also revealed a significant relationship between reported presence of effective practicing technological skills and the challenge of lacking necessary nursing application software (Chi square value=9.1, DF=1, P=0.003).

A significant number of nurses who reported that they had adequate technological skills for effective practice also reported that they did not experience the challenge of lacking necessary nursing application software (51.7%) as compared to those who reported not having adequate technological skills who also reported that they experienced a challenge of lacking the necessary nursing application software (16.1%). (See Table 5).
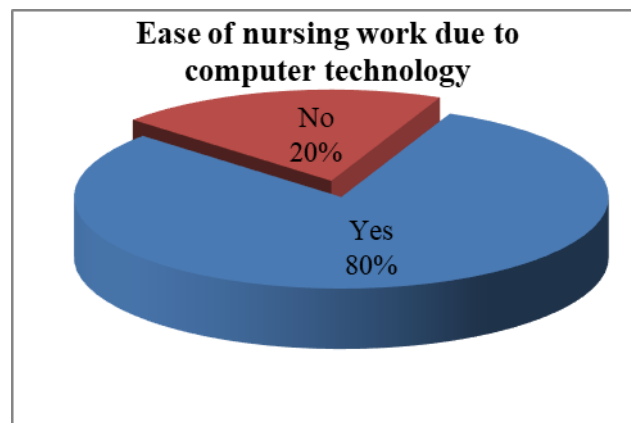
**Table 5**

*Association between challenges experienced and perceived presence of effective technological skills*

|  | Individual assessment of technological skill to effectively practice nursing | | | | |
|---|---|---|---|---|---|
|  | Yes | No | Chi | DF | P |
| **Lack of computer navigation skills** |  |  |  |  |  |
| Yes | 14(93.3) | 1(6.7) | 7.2 | 1 | 0.007 |
| No | 43(56.6) | 33(43.4) |  |  |  |
| **Network connections is off most times** |  |  |  |  |  |
| Yes | 48(64.9) | 26(35.1) | 0.8 | 1 | 0.359 |
| No | 9(52.9) | 8(47.1) |  |  |  |
| **Few computers therefore no access** |  |  |  |  |  |
| Yes | 33(64.7) | 18(35.3) | 0.2 | 1 | 0.645 |
| No | 24(60.0) | 16(40.0) |  |  |  |
| **Lack of necessary nursing application software in the system** |  |  |  |  |  |
| Yes | 26(83.9) | 5(16.1) | 9.1 | 1 | 0.003 |
| No | 31(51.7) | 29(48.3) |  |  |  |
| **Cannot quantify nursing care given into quantities in the computer system** |  |  |  |  |  |
| Yes | 18(66.7) | 9(33.3) | 0.3 | 1 | 0.606 |
| No | 39(60.9) | 25(39.1) |  |  |  |
| **Not conversant with computer vocabularies/language** |  |  |  |  |  |
| Yes | 8(88.9) | 1(11.1) | 2.9 | 1 | 0.086 |
| No | 49(59.8) | 33(40.2) |  |  |  |
| **Lack of time to operate the computers.** |  |  |  |  |  |
| Yes | 21(55.3) | 17(44.7) | 1.5 | 1 | 0.218 |
| No | 36(67.9) | 17(32.1) |  |  |  |

***Effect of technology on nursing* work**

Most participants reported that despite the challenges, computer technology had helped to make their nursing work easier. (See Figure 1).

**Figure 1**

*Effect of computer technology on nursing work*



Regarding areas that computer technology had helped to make nursing work easier, most nurses reported areas like, billing patients (87.7%), ordering of supplies (75.3%) and ordering of drugs (41.1%) (See table 6).

**Table 6**

*Areas where nursing work has been made easier by use of computers*

| Areas | Frequency | Percentage |
| --- | --- | --- |
| Admission of patients | 29 | 39.7 |
| Drug dosage calculations | 6 | 8.2 |
| Ordering of supplies | 55 | 75.3 |
| Off/on duty rosters | 23 | 31.5 |
| Computer assisted instructions | 8 | 11 |
| Drug ordering | 30 | 41.1 |
| Wards report | 2 | 2.7 |
| History taking guidelines | 2 | 2.7 |
| Nursing care plans | 3 | 4.1 |
| Nursing cardex | 1 | 1.4 |
| Observation and vital signs | 5 | 6.8 |
| Health education to patients | 9 | 12.3 |
| Billing patients | 64 | 87.7 |

*Coping Strategies*
Some of the reported strategies used by nurses to handle challenges brought by technology were grouped into themes. They were as presented in Table 7.

**Table 7**
*Strategies that nurses have used to handle technological changes in nursing*

| Strategy | Frequency | Percent |
|---|---|---|
| Getting more knowledge/skills, e.g., through attending seminars and conferences, getting exposure to use of technology | 37 | 40.7 |
| Reporting any technical defaults to ICT department/asking for their help | 8 | 8.8 |
| Consulting the Nursing ICT champions in KNH | 9 | 9.9 |
| Practicing more on computer use | 12 | 13.2 |
| Continue using manual skills | 4 | 4.4 |
| Building a teamwork/Co-operate/consulting with fellow nurses to handle the technical issues | 7 | 7.7 |
| No answer | 14 | 15.4 |
| **Total** | **91** | **100.0** |

## DISCUSSION

The study found that the challenges faced by nurses due to technology could be classified as challenges related to nurse's technological skills and general challenges related to the introduced technology.

The challenges related to the technology itself were reported more by majority of the nurses. For example, (81%) reported that network connection was off most of the time, 56% of the nurses reported that there were few computers therefore limited access, 41.8% indicated that there was limited amount of time to work on the computers due to the workload. Study findings concurred with findings by De Veer et al 2011, in which the respondents who mostly reported about challenges with introduction of electronic information system most often talked of challenges relating to the organizational and technology context such as network problems and lack of enough computers more than the challenges related to the users. Challenges related to nurse's technological skills were indicated by 53% of the nurses who wished to acquire more skills in use of computers and laptops, use of soft wares, and digital equipment at work, and mostly in use of EHR. The study found a significant relationship between lack of computer navigation skills and level of usage of EHR (Chi=16.8, DF=3, P=0.001) and also between non-conversance with computer vocabularies/language and the level of usage of EHR (Chi= 11.8, DF=3, P = 0.008).

Nurses who reported that they lacked computer navigation skills were significantly more likely to report low usage of EHR (2.6%) while those who had skills reported higher usage (26.7%). Similarly, nurses who were not conversant with computer vocabularies/language were significantly more likely to report lower usage of EHR (33.3%) as compared to those who reported that they were conversant who were more likely to report higher usage (55. 6%).

Therefore, to increase the usage level of EHR nurses needed to acquire more skill. They

experienced challenges with the EHR system and had low usage levels because they did not have adequate skills. This was also proven through chi-square test which showed a significant relationship between reported presence of adequate technological skills and the challenge of lacking computer navigation skills (Chi square value= 7.2, DF=1, P=0.007) and another significant relationship between reported presence of effective practicing technological skills and the challenge of lacking necessary nursing application software (Chi square value=9.1, DF=1, P=0.003).

Nurses who reported that they had adequate technological skills for effective practice also reported not experiencing the challenge of lacking computer navigation skills (56.6%) and also reported not experiencing the challenge of lacking necessary nursing application software (51.7%) and those who reported not having adequate technological skill also reported that they experienced a challenge of navigation on the computer (6.7%) and they also experienced a challenge of lacking the necessary nursing application software (16.1%). This indicated that having the required technological skills made nurses to experience less challenges because those who had the skills experienced less challenges. Other studies indicated that challenges related to users included lack of required skills and technology that was perceived by the nurses to be difficult to use was not easily up taken (De Veer et al 2011).

Despite the challenges, 80% of the participants reported that computers had helped to make their work easier especially in the areas of billing patients 87.7% and ordering of supplies 75.3% concurring with findings that EHR had been useful in accurately capturing patient charges in a timely manner (Menachemi & Collum 2011).On strategies to handle technological changes in nursing, majority 40.7% had to acquire more skills in technological applications. Mostly out of their own initiative through seminars and conferences and through practicing on the computers. Significantly, a small number of participants 4.4%, continued to use manual skills despite the introduction of computers for the selected processes. This could be interpreted as resistance to technological changes in the nursing practice.

## REFERENCES

1. Brooker, C & Waugh, A (eds) 2007, 'Legal issues that impact on nursing practice. The NMC Code of conduct and applied ethical principles' in Foundations of Nursing practice. Fundamentals of holistic care, pp. 147

2. Huston, C 2013, 'The impact of Emerging Technology on Nursing Care', Online journal of Issues in Nursing, vol. 18, no. 2,

3. Millard, S.P Bru, J & Berger A.C 2012, 'Open-source point-of-care electronic medical records for use in resource limited settings: systematic review and questionnaire surveys', British Medical Journal, Vol. 2, No. 4

4. World Health Statistics 2012, World Health Organization ISBN 978 92 4 156398 7

5. Onu, FU & Agbo, SI 2013, 'Factors that affect the use of ICT in nursing Profession in Ebony state Nigeria', Journal of Information Engineering and Applications ISSN 2224-0506, Vol. 3, No. 11

6. Kenyatta National Hospital, ICT Master Plan PPP, Expression of interest, January 2014, www.knh.or.ke

7. Kivuti-Bitok, L W 2009, 'What do nurse managers want computerized? Needs based assessment study of middle and functional level nurse managers at Kenyatta National Hospital, Kenya?', Journal of Health Informatics in Developing Countries, vol. 3, no.

2,pp511.www.jhidc.org/index.php/jhidc/issue/view/

8. De Veer, AJ Fleuren, MAH Bekkema, N & Francke, A 2011, 'Successful implementation of new technologies in nursing care: a questionnaire survey of nurse-users', BMC Medical Informatics and Decision Making 10.1186/1472-6947-11-67

9. Powell, J Inglis, N Ronnie, J & Large, S 2011, 'The Characteristics and Motivations of Online Health Information Seekers: Cross-Sectional Survey and Qualitative Interview Study', Journal of Medical Internet Research, vol. 13, no. 1, e20. ISSN 1438-8871