

Utilization of Mobile Technology for Knowledge Update among Nurses in Primary and Secondary Healthcare Settings in Osun State, Nigeria

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Abstract: *In spite of the need to continuously update their knowledge, Nigerian nurses face numerous challenges in updating their knowledge. These challenges notwithstanding, the nurses still have a professional obligation for safe practice supported by up-to-date knowledge which mobile technology has great potentials to provide. This study examined the utilization of mobile technology among nurses in primary and secondary healthcare settings in Osun State. It is a descriptive design in which 15 primary and 5 secondary healthcare facilities in Osun State were involved. Proportionate stratified random sampling technique was used to select 266 nurses in Osun State. A self-administered pre-tested questionnaire with 47 close-ended questions and 2 open-ended questions was used to collect the data. The Cronbach alpha reliability co-efficient of $\alpha=0.73$ was achieved for the instrument. There was 56% response rate. The results showed that the level of nurses' knowledge in the States was average (48.0%). There was high adoption of mobile technology among the nurses in Osun State, particularly mobile phone (100%) and laptop PC (72.3%). The nurses' main driving force for the use of mobile technology was general knowledge update (35.8%) and the main factors restricting respondents from the use of mobile technology were lack of appropriate mobile technology, unreliable connection to the network and too many work demands.*

Key words: *Mobile technology, Knowledge update, Nurses, Utilization, Primary and Secondary Healthcare Settings.*

I. Background

The transition towards a knowledge-based society triggers the need and pressure to learn continuously, yet the time available for learning is getting shorter and the knowledge gaps are widening. The rapid development of mobile knowledge supports robust contributions to the development of knowledgeable communities. Mobile and wireless technologies improve significantly the access to knowledge any time from any place through diverse and capable handheld devices. The continued education of nurses in the context of a rapidly changing healthcare system is a prime example of how the mobility of learners within a variety of real life learning environments has posed increasing challenges and where mobile technologies have the potential to support and enhance teaching and learning. The high acuity and pace of practice in institutional environments, combined with an explosion of knowledge and technology, increasingly requires practitioners to access and process clinical data efficiently by drawing on current resources to support safe care and evidence informed practice at the point of care (Richard, Caroline, Joselyne, Pamela, Jan, 2008).

The objectives of this study are to:

- i) examine the extent to which nurses are knowledgeable about the use of mobile technology for knowledge update;
- ii) determine the extent to which nurses use mobile technology; and
- iii) identify factors influencing the use of mobile technology among nurses.

The study is intended to help raise the awareness among key decision makers in the public, private and civil society sectors about the potential importance of the use of low cost mobile devices in updating the knowledge of nurses working in our health facilities. By documenting the existing landscape of initiatives in this area and emerging good practice, it is also hoped that this work will serve as a common base for further analytical work in this area. Mobile technology devices such as mobile phones, laptop, PDA (Personal Digital Assistant) and modem have the potential to address some of the challenges faced by nurses by bringing the most relevant information directly to the point of care. Providing information through convenient electronic sources may address some of the barrier that inhibit access and clinical use of new and relevant research by nurses.

Various studies have been conducted on the use of mobile technology among nurses.

Wagner (2005) reported that evidence of the widespread adoption in North American Society of Mobile wireless technology such as cell phones, Personal Digital Assistants (PDAs), Laptop computers, and MP3 players, is inequitable. Current mobile technologies (especially wireless) – frequently refined to as third generation (3G) – provide an unprecedented opportunity for expensive and beneficial computing power for learners (Hill and Roldan 2005; Wagner 2005).

Richard et al (2009) opined that the education of health care professionals in the context of a rapidly changing health care system is a prime example of how the mobility of learners within a variety of real live learning environments has posed increasing challenges and where mobile technologies have the potential to support and enhance teaching and learning. The high acuity and pace of practice in institutional environments, combined with an explosion of knowledge and technology, increasingly requires practitioners to access and process clinical data efficiently by drawing on current resources to support safe care and evidence informed practice at the point of care.

Moreover, the shift of client care to the community requires that the education of health care professionals take place increasingly in this more autonomous and diverse practice environment where resources are not readily accessible, where client acuity is increasing, and where more traditional methods of directly observing and working with students are not as feasible. These shifts in practice, along with more limited education and practice resources to support students' practice, raise concern for the quality of their education and the safety of their practice. This is particularly significant for rural practice education where resources are limited and geography poses additional challenges (Richard et al 2009).

Rosenthal (2003) outlines a number of useful functions identified by nurses using PDAs: address book, "to do" lists, date book, memo pad, expense tracking, "find" functions, diagnostic tools, clinical guidelines, medical dictionaries, lab values, and patient, student, and staff management programs. She categorizes these as tools that enhance productivity, promote risk management/error reduction, and through their rapid access to critical information lead to stress reduction.

Cahoon (2002) groups the functions into five categories: clinical services, calculators, data collection, medical record system, and content tools. Newbolt (2003) notes that if the PDA is also a wireless device, the use increase in both number and complexity. She lists potential applications such as: interdisciplinary consultations, electronic ordering and test results, patient histories, progress notes and assessments, references, protocols, and prescription information. Increased PDA wireless capacity to include phone and camera capabilities permits rapid chart access, improved workflow, increased time for patients, cost savings, enhanced productivity and, therefore, boosts professional satisfaction.

The literature reviewed showed that there was high adoption of mobile technology particularly among nurses in western part of the world but in Nigeria little is documented about the extent to which nurses are knowledgeable and the extent to which they utilize mobile technology for knowledge update, hence the need for this study.

II. Methodology

Study design: A descriptive research design is adopted for the study. The descriptive design was chosen to gather and document information on the use of mobile technology for knowledge update among the nurses in primary and secondary healthcare settings in Osun State.

Population: The target population constitutes all the registered nurses working in primary and secondary healthcare settings in Osun state. This constitutes 798 nurses.

Sample and Sampling technique: A proportionate stratified random sampling technique was used for this study. Sample size was determined using the Yamane's formula, $n = \frac{N}{1 + N(e)^2}$ where n =sample size, N =the target population, and e = sampling error at 95% confidence interval=0.05. Using the formula, 266 nurses were selected randomly from five secondary healthcare facilities and seventeen primary healthcare facilities in Osun state.

Method of data collection: A data collection instrument in form of a questionnaire adapted from the Australian Nursing Federation study on nurses and information technology was used to collect the data related to the nurses' utilization of mobile technology for knowledge update. The questionnaire comprised of forty seven closed ended questions and two open-ended questions. A Cronbach alpha reliability co-efficient of $\alpha=0.73$ was established by the researcher. The questionnaire was divided into two sections. Section A collected data on the socio-demographic variables of the nurse-respondents, Section B collected data related to the three objectives of the study. Participants were selected on the criteria of being a nurse or midwife that have worked for at least one year at the study site. A list of all the nurses in a health facility was obtained and the required number of nurses were selected randomly. The two hundred and sixty six questionnaires were given to the randomly selected respondents by face to face contact. One hundred and forty eight(148) nurses in Osun State participated in the study.

Research Ethics: Permission was obtained from the Ethical Review Committee of the Institute of Public Health, O.A.U., Ile-Ife. Approval of the Director of Nursing services of the was sought. Permission from the Department of Nursing Sciences of the Obafemi Awolowo University, Ile-Ife was also obtained. The participants were allowed to participate on their own volition- their consent was obtained. Confidentiality and anonymity of the information collected was assured.

Limitation of the study: The small sample size will no doubt affect the generalization of the study. Reluctance of some nurses to answer the questionnaire items has led to low response rate(56%).

Data analysis: The data was analyzed using both descriptive and inferential statistics. The data was presented in frequency distribution such as percentages to summarize and provide clear description of the data from sample. Statistical package for social sciences (SPSS) was used to analyze the precoded data on an item by item basis. The hypotheses were tested by cross-tabulations using the Pearson’s chi-square. Consistent with other analyses, a relationship was considered meaningful if $p < 0.05$.

III. Results:

Table 1: Socio-Demographic Characteristics of Nurse-Respondents

Socio-demographic Characteristics	Frequency	%
SEX		
Female	120	81.1
Male	28	18.9
AGE(years)		
21-25	20	13.5
26-30	20	13.5
31-35	20	13.5
36-40	14	9.5
41-45	15	10.1
46-50	28	18.9
51-55	25	16.9
56-60	6	4.1
PROFESSIONAL QUALIFICATION		
RN	36	24.3
RN/RM	30	20.3
Post basic	60	40.5
BNSc/BSc	22	14.9
TYPE OF HEALTH FACILITY		
Primary Healthcare Facility	56	37.8
Secondary Healthcare facility	92	62.2
RANK/POSITION		
Nursing Officer II	28	19.7
Nursing Officer I	27	19.0
Senior Nursing Officer	10	7.0
Principal Nursing Officer	10	7.0
Assistant Chief Nursing Officer	21	14.2
Chief Nursing Officer	46	31.1
Deputy Director Nursing Service	4	2.7
WORKING EXPERIENCE		
1-5 years	33	22.3
6-10 years	23	15.5
11-15 years	19	12.8
16-20 years	8	5.4
21-25 years	43	29.1
26-30 years	22	14.9

The table above showed that majority of the nurse-respondents were females(81.1%). High proportion of the respondents were within the 46-50 years(18.9%) and 51-55 years(16.9%) age range. Significant proportion(40.5%) possessed post-basic qualification in psychiatry, ophthalmic, perioperative, orthopaedic, paediatric, and public health nursing. Most of the respondents(62.2%) work in Secondary healthcare settings. Significant proportion of the respondents have attained the rank of Chief Nursing Officer (31.1%) and that the highest proportion of the respondents have worked for 21-25 years(29.1%). This indicates that most of the respondents are approaching their retirement age.

Table 2: Summary of the respondents’ level of knowledge about the use of mobile technology for knowledge update:

Level of knowledge	Frequency	%
Excellent (80-100%)	25	16.9
Good (60-79%)	43	29.1
Average (50-59%)	71	48.0
Poor (40-49%)	8	5.4
Very poor (0-39%)	1	0.6

Table 2 above shows that over 90% of the respondents have their level of knowledge on the use of mobile technology for knowledge update as average or better. This indicates that nurses in Osun State are knowledgeable about use of mobile technology for knowledge update.

Table 3: Utilization of Mobile Technology among nurse-respondents

Variables	Frequency	%
A. TECHNOLOGY USED		
Mobile phone	148	100.0
Laptop PC	107	72.3
Internet	79	53.4
PDA	8	5.4
Modem	55	37.2
E-library	4	2.7
B. WHAT THE RESPONDENTS USED THE TECHNOLOGY FOR		
I. MOBILE PHONE		
General Communication	142	95.9
Professional knowledge update	39	26.4
General knowledge update	38	25.7
Game/Leisure	55	37.2
Income generation	6	4.1
Client/patient care	16	10.8
Improvement on job	14	9.5
Storage of information	30	20.3
Nursing skills improvement	20	13.5
II. LAPTOP PC		
General Communication	40	27.0
Professional knowledge update	73	49.3
General knowledge update	83	56.1
Game/Leisure	22	14.9
Client/patient care	28	18.9
Improvement on job	31	20.9
Storage of information	67	45.3
Nursing skills improvement	18	12.2
I don't use the Laptop	39	26.4
III. PDA		
Professional knowledge update	6	4.1
General knowledge update	6	4.1
Game/Leisure	2	1.4
Client/patient care	4	2.7
Improvement on job	2	1.4
Storage of information	2	1.4
Nursing skills improvement	4	2.7
I don't use PDA	140	94.6
IV. MODEM		
Professional knowledge update	33	22.3
General knowledge update	50	33.8
Game/Leisure	12	8.1
Client/patient care	14	9.5
Improvement on job	19	12.8
Storage of information	16	10.8
I don't use modem		

Table 3 shows that all the respondents indicated that they use mobile phone, followed by 72.3% who said that they use laptop PC. The usage level of laptop PC was highest among the male nurses (78.6%). Among nurses at different age groups, nurses within 21-25 years (68.7%) demonstrated high level of laptop PC usage. Nurses working in secondary healthcare facilities tend to use laptop PC more than the nurses working in secondary healthcare facilities. However, there was no significant association between type of health facility and usage of laptop PC. Results also revealed that usage level of laptop PC was highest among nurses with higher qualification especially among those with BSc/B.N.Sc. (83.4%).

Table 4: Professional knowledge sought by the nurse-respondents with the use of mobile technology

KNOWLEDGE	Frequency	%
Day to day Nursing Care practice	94	63.5
Nursing Education	63	42.6
Nursing Research	77	52.0
Nursing Administration	24	16.2
I don't seek any professional knowledge with Mobile technology	22	14.9

Table 4 above shows that in Osun state most of the nurse-respondents(63.5%) stated that they sought day to nursing care knowledge with the use of mobile technology, followed by nursing research information(52.0%).

Table 5: Factors motivating nurse-respondents’ use of Mobile Technology

Variables	Frequency	%
DRIVING FORCE FOR THE USE OF MOBILE TECHNOLOGY		
Professional knowledge update	55	37.2
General knowledge update	53	35.8
Communication	39	26.4
Storage of information	27	18.2
Nursing skills improvement	30	20.3
Game/Leisure	1	0.7
Income generation	3	2.1
Improvement on job performance	9	6.1
Patient/client care	2	1.4
Office administration	2	1.4

Table 5 above shows that high proportion of nurses (37.2%) stated that professional knowledge update was their main driving force for the use of mobile technology, followed by 35.8% of the respondents who indicated that general knowledge update was the main driving force for the use of mobile technology. Significant proportion of the respondents (26.4%) indicated that communication is their main driving force for the use of mobile technology.

Table 6: Factors Restricting Respondents from use of Mobile Technology

Factors restricting respondents	Never		Rarely		Sometimes		Very often		Always	
	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%
Lack of appropriate Mobile tech.	28	18.9	31	20.9	46	31.1	13	8.8	30	20.3
Time to log on is too long	32	21.6	30	20.3	57	38.5	23	15.5	6	4.1
Unreliable connection to Network	32	21.6	24	16.2	47	31.8	20	13.5	25	16.9
Response time of the mobile tech.	46	31.1	42	28.4	40	27.0	14	9.5	6	4.1
Discouragement by others	69	46.6	45	30.4	20	13.5	12	8.1	2	1.4
Too many other work demands	22	15.1	18	12.3	63	43.2	35	24.0	8	5.5
My age	119	80.4	17	11.5	8	5.4	2	1.4	2	1.4
Lack of employers support	55	37.2	36	24.3	25	16.9	8	5.4	24	16.2
Lack of money	40	27.0	48	32.4	40	27.0	8	5.4	12	8.1
Lack of interest	110	75.3	26	17.8	8	5.5	0	0.0	2	1.4
Concern about my health	62	43.1	51	35.4	27	18.8	2	1.4	2	1.4
Erratic power supply	40	27.0	48	32.4	40	27.0	8	5.4	12	8.1

Table 6 presents the data results of the factors militating against effective use of mobile technology by the nurses. Significant proportion of respondents (31.1%) stated that lack of appropriate mobile technology sometimes restrict their use of mobile technology. Considerable proportion of the respondents (38.5%) opined that too long logging time sometimes restrict their use of mobile technology. Considerable proportion of the respondents in Osun state(31.8%) stated that un reliable connection to the network sometimes restrict their use of mobile technology.

IV. Discussion

The results of this study revealed high adoption of mobile technology particularly mobile phone and laptop PC. These findings were in agreement with the findings of similar studies among health personnel in Nigeria. Idowu, et al 2003 reported that while ICT capabilities(personal computers, mobile phones and internet) were available in Nigerian hospitals, mobile phone were spreading fastest. As in this study also, various studies in developed countries demonstrated high adoption of mobile technology among nurses (Newbolt,2003; Mucano,2007; Jefe, 2011). However, earlier studies by Adeyemi and Ayegboyin(2004) have presented a contrasting results. In their surveys involving four general hospitals, 10 primary healthcare centres and 6 private hospitals in Nigeria, only 5% of the health workers possessed personal computers and just 65% had access to mobile phones but not necessarily their own. The least used technology was PDA with very few number of the respondents who use the technology. This low adoption of PDA among nurses might be as result of the high cost of the technology. Nurses in Nigeria received meagre amount of money as salary, so affording a technology like PDA would be extremely difficult. The sex differentials among respondents on the use of mobile technology, showed that both male and female nurses equally use mobile phones. Slightly high proportion of male nurses use laptop PC as compared to proportion of female nurses . Also male respondents use PDA and modem more than the female respondents. However, there was no significant difference between male and female nurse- respondents in the use of these mobile technologies. The findings of this study gives some credence to the results of previous studies that technology is a male sphere. Various researches have also shown that boys have greater interest in technology than females(Enochsson,2005).The use of mobile technology across the different qualifications showed that nurse- respondents across the different qualifications level use mobile phone equally. The average usage level of laptop PC was higher among nurses with BNSc/BSc . This might be because of the encouragement at undergraduate level to make use of mobile technology such as laptop especially during presentations. Statistical analysis also showed that nurses' highest qualification in nursing had a significant relationship with their level of confidence in the use of mobile technology. The use of modem and PDA also followed a similar trend.

Majority of the nurse-respondents used mobile phone for general communication and professional knowledge update. More than half of the respondents used laptop PC for general knowledge update and about half of the respondents also used it for professional knowledge update. Findings from this study are in contrast with findings from Rosenthal's work(2003). Rosenthal's findings showed that nurses used mobile technology for healthcare services as diagnostic tools, clinical guidelines, lab values etc. Similarly, cahoon, 2002 reported that nurses used mobile technologies mostly for clinical services. Lack of practical application of mobile technology in this study might be related to poor knowledge of the nurses on the clinical applications of these technologies. However, findings from this study are in agreement with results of Davenport's study. Davenport (2004) reported that nurses identified 68 uses of mobile technology which include access to current information and improved team communication.

Furthermore, this study indicates high level of knowledge among the nurse-respondents in Osun State on the use of mobile technology. Findings on the level of nurse –respondents' knowledge in this study are in disagreement with Adeyemi and Ayegboyin(2004) opinion. Their findings revealed that only 7% of the surveyed health workers in Lagos, Nigeria have good knowledge of ICT. The improved knowledge level as demonstrated in this study might be as a result of the growing awareness of the importance of mobile technology in healthcare delivery.

With respect to the factors influencing the use of mobile technology among the nurse- respondents, various factors were identified as influencing their use of mobile technology. Professional knowledge update was the main driving force for the use of mobile technology followed by general knowledge update. Most of the nurse- respondents used mobile technology for knowledge update because their work require continues knowledge update. This study has demonstrated that the most important factors encouraging the use of mobile technology by the nurse respondents are knowledge update. Nursing is a knowledge intensive profession, therefore nurses considered it important to make use of mobile technology to update their knowledge continuously.

On the factors restricting respondents from the use of mobile technology, significant numbers of nurse-respondents were restricted by lack of appropriate mobile technology, too long logging time, unreliable connection to the network, and too many work demands.. Some of the identified restricting factors in this study has shown credence to the study conducted by Olatokun&Adeboyejo(2009). However, their study reported that erratic power supply is a major constraint to the effective use of the technology. Nigerians including nurses have adjusted themselves to counteract the effects of poor power supply. Many now have standby generators in their homes and places of work. This might be the reason why erratic power supply is not a major factor restricting nurse-respondents in this study.

V. Conclusion

Distance learning, as a technology-mediated strategy, can play a vital role of bridging the educational gap that exists between the disadvantaged nurses working in hard to reach settings and their counterparts in urban settings. With high adoption of mobile phone and laptop PCs as demonstrated in this study, distance learning programme in nursing can be promoted through the adoption of these technologies in nursing education.

VI. Recommendations

The nursing and midwifery council of Nigeria should adopt the use of mobile technology in its MCPDP for nurses i.e. the programme should be taken online in order to encourage nurses to make use of mobile technology for their professional knowledge update. In liaison with the mobile networks in the country, the Nursing and Midwifery Council of Nigeria should be updating nurses with current findings of research studies conducted in nursing. This can be achieved through text messages or e-mail messages to all the nurses in the country. Therefore, the council should collect the mobile phone numbers and e-mail addresses of all the nurses in the country. The National Association of Nigerian Nurses and Midwives (NANNM) should produce and disseminate range of resource demonstrating ways that mobile technology can be used for the purpose of nursing care. This will facilitate the adoption of mobile technology by nurses for clients/patients care. The NANNM should also source for research grants for nurse researchers to investigate the impact of mobile technology on nursing care. This will give guide to areas that need adjustment with regard to use of mobile technology in nursing care.

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