INTERNATIONAL JOURNAL of NURSING PRACTICE

International Journal of Nursing Practice 2014; ••: ••–••

JOURNAL OF NURSING INTERVENTIONS

Nurses' computer literacy and attitudes towards the use of computers in health care

Sati Gürdaş Topkaya MSc BSN

Unit Charge-Nurse, Orthopaedics and Traumatology Clinic, Taksim Training and Research Hospital, Istanbul, Turkey

Nurten Kaya PhD BSN

Associate Professor, Health Sciences Faculty, Istanbul University, Istanbul, Turkey

Accepted for publication March 2014

Gürdaş Topkaya S, Kaya N. *International Journal of Nursing Practice* 2014; ••: ••–••

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This descriptive and cross-sectional study was designed to address nurses' computer literacy and attitudes towards the use of computers in health care and to determine the correlation between these two variables. This study was conducted with the participation of 688 nurses who worked at two university-affiliated hospitals. These nurses were chosen using a stratified random sampling method. The data were collected using the Multicomponent Assessment of Computer Literacy and the Pretest for Attitudes Towards Computers in Healthcare Assessment Scale v. 2. The nurses, in general, had positive attitudes towards computers, and their computer literacy was good. Computer literacy in general had significant positive correlations with individual elements of computer competency and with attitudes towards computers. If the computer is to be an effective and beneficial part of the health-care system, it is necessary to help nurses improve their computer competency.

Key words: attitude towards computers, computer competency, computer literacy, nursing.

INTRODUCTION

The nursing profession advances in step with the health necessities of a society, and it is regulated in accordance with the prevailing health-care system, with provision of quality services to patients being a top priority. The role and responsibilities of nurses in health-care services can change when new technology is introduced or existing roles are redefined.[1] The use of technology and computers in health care has been reported to improve nurses' decision-making and competencies and to increase the quality of health-care practice as a result. Computer-based information systems can provide assistance to nurses in health-care environments.[2,3] To ensure efficient and effective use of computers in health-care environments, it is necessary to determine nurses' attitudes towards the use of computers.[3–6]

The most important determinant of attitudes towards computer use in health care is thought to be computer literacy. Computer literacy is briefly defined as the ability to use a computer. Nevertheless, various definitions have been given for computer literacy, such as 'the ability to control [a] computer in achieving certain goals', 'the ability to use different computer applications', 'the ability

Correspondence: Nurten Kaya, Health Sciences Faculty, Istanbul University, Demirkapı Cad. Karabal Sk. Bakırköy Ruh ve Sinir Hastalıkları Hastanesi Bahçesi içi 34740 Bakırköy, Istanbul, Turkey. Email: nurka@istanbul.edu.tr, nurtenkaya66@gmail.com, nurtenkaya66@hotmail.com

This article was originally written as a master's thesis for the Fundamentals of Nursing programme at Istanbul University Institute of Health Sciences.

doi:10.1111/ijn.12350

to comprehend [the] economic, psychological and social effects of computer[s] on [the] individual and society', and 'the ability to use [a] computer [for] access to information, [for] communication and [in the] problem solution process'.[7–9] The ability to use computers is an important prerequisite for nurses and nurse candidates, who can benefit in clinical practice from acquiring health and nursing information via computer. We should address the factors that might affect nurses' computer literacy levels and attitudes towards computer use in health care. Using these analyses, we should develop strategies to help nurses benefit from computer use in health care.[1–3]

Several studies in the international literature have analysed nurses' computer literacy, their attitudes towards computer use and the determinants of these attitudes.[4,5,10–20] Shoham and Gonen,[5] Brumini *et al.*,[18] Simpson and Kenrick,[20] McNeil *et al.*[21] and Laramee *et al.*[22] reported that nurses' computer-related attitudes were generally positive. On the other hand, Campbell and McDowell[23] reported that the nurses in their study had little to no experience with nearly half of the items in the Gassert/McDowell Computer Literacy Survey. Aside from that study, it was not possible to access any study that analysed nurses' computer literacy. In addition, studies analysing nurses' attitudes towards computer use in Turkey are limited.[1,3]

This descriptive and cross-sectional study aimed to address nurses' computer literacy and attitudes towards the use of computers in health care and to determine the correlation between these two variables.

METHODS

Population and sample

This study was conducted between September and December 2011 with nurses who worked at two university-affiliated hospitals (referred to as A and B) in Istanbul. The population consisted entirely of nurses from hospitals A and B. For 95% reliability, 95% power and ± 3% sampling error margin, the necessary sample size was determined to be 688 nurses by statistical methods. An additional 50 nurses were included in the sample population as a backup plan in case of missing data. Accordingly, 384 nurses from Hospital A and 354 nurses from Hospital B were included in the study. Thus, the total sample population consisted of 738 nurses.

Nurses included in the study were chosen using the stratified random sampling method. The sample was stratified according to nurses' working units. The only inclusion criterion for participation in this study was consent to participate. There was no exclusion criterion.

A total of 688 nurses from the sample of 738 were included in the final analysis; 34 nurses could not be reached for reasons such as annual leave or maternity leave, and 16 surveys could not be evaluated because of incomplete data. Consequently, the survey response rate was 93.22%. The necessary sample size calculated was already 688. Thus, the target nurse number was reached.[24]

Instruments

Nurse identification form

Nurses' gender, age, educational attainment, nursing experience, working unit and job title were recorded on a nurse identification form.

Multicomponent Assessment of Computer Literacy

The Multicomponent Assessment of Computer Literacy (MACL) was developed by Robin Kay[25] in 1990 and was translated into Turkish by Kılınç and Salman[9] in 2006. The MACL is a seven-point Likert-type scale that consists of four subscales, and each subscale consists of six statements about attitudes towards computers. The subscales are 'Basic Skills' (BS), 'Application Software Skills' (ASS), 'Programming' (P) and 'Computer Awareness' (CA).[25] To determine scale reliability, Kay[25] calculated Cronbach's alpha coefficient for each subscale; the following coefficients were found: 0.93 for BS, 0.91 for ASS, 0.90 for CA and 0.95 for P. Kılınç and Salman[9] calculated the alpha coefficients 0.91, 0.93, 0.94 and 0.91 for BS, ASS, CA and P, respectively. In the present study, the general reliability coefficient was 0.96; the coefficient varied between 0.88 and 0.94 for the subscales (Table 1). The reliabilities of the scale and subscales were observed to be fairly high, and a similarity in study findings was noticed between the studies of Kay[25] and Kılınç and Salman.[9]

Pretest for Attitudes Towards Computers in Healthcare Assessment Scale

The Pretest for Attitudes Towards Computers in Healthcare (PATCH) Assessment Scale was developed by

Table 1 Cronbach's alpha and Kolmogorov-Smirnov analysis results for MACL and PATCH Assessment Scale ($n = 688$)

	Number of items	Cronbach's alpha	Kolmogorov–Smirnov	
			Z	*P*
MACL				
Basic Skills	6	0.94	3.77	0.000
Application Software Skills	6	0.93	2.61	0.000
Programming	6	0.94	3.97	0.000
Computer Awareness	6	0.88	2.13	0.000
Total	24	0.96	1.87	0.002
PATCH Assessment Scale	40	0.93	0.93	0.354

MACL, Multicomponent Assessment of Computer Literacy; PATCH, Pretest for Attitudes Towards Computers in Healthcare.

Kaminski,[26] and its second version was released in 2007. In this study, we used the second version. The scale consists of 40 questions to determine nurses' feelings and attitudes towards the use of computers in environments where health-care services are provided. Possible scores range from −40 to 40. Additionally, the classification and interpretation of the findings were performed according to Table 2. The validity and reliability of the Turkish version of PATCH v.2 were established by Kaya and Aştı.[1] The adaptation of the scale to the Turkish language was performed via back-translation, and the translated scale was submitted for expert review to determine the content validity. Its test–retest reliability, internal consistency and criterion-related validity (concurrent validity) were examined. The test–retest reliability ranged from 0.20 to 0.77 for individual PATCH items and was 0.85 for the total scale. For internal consistency, corrected item–total correlations ranged from 0.06 to 0.68, and Cronbach's alpha was 0.92. Concurrent validity was examined with correlation between the Attitudes Towards Computers Questionnaire and PATCH Assessment Scale scores, and there was a significant positive correlation ($r = 0.66$, $P < 0.01$). The findings concerning the reliability and validity of the Turkish version of the PATCH Assessment Scale indicate that this instrument can be used in studies conducted in Turkey.[1] In the present study, Cronbach's alpha was determined to be 0.93 for the PATCH Assessment Scale (Table 1). The data in the present study paralleled those in the study by Kaya and Aştı.[1] Therefore, the PATCH Assessment Scale data obtained from the sampling group in the present study were concluded to be reliable.

Study variables

In this study, the independent variable was the MACL score and the dependent variable was the PATCH Assessment Scale score.

Procedure

Numbers of working nurses, with their names, the units they worked in and task lists, were obtained from two hospitals for sample estimation. Nurses were selected for the study using numbers from these lists. The nurses' working schedules were obtained from the unit head nurses. Nurses were interviewed individually face to face. The study was explained to them, and they were asked whether they wanted to participate in the study. It was emphasized that they could withdraw from the study, and those who agreed to participate gave oral and written informed consent. Participants were given a specific date for the completion of questionnaires, and these questionnaires were collected on the due date by a researcher. Each participant nurse was rewarded with a gift after data collection.

Statistical data analysis

The SPSS 17 software package was used to perform statistical analysis of the findings obtained in the study. The median, minimum and maximum values, arithmetic mean and standard deviation were used to evaluate ordinal data, whereas frequency and percentage values were used to evaluate nominal data. To determine whether the distribution was normal or not, we used the Kolmogorov–Smirnov distribution test. We observed that PATCH Assessment Scale scores displayed normal

Table 2 PATCH Assessment Scale score interpretations

Points	Interpretation
−40 to −28 (Group 1)	Positive indication of cyberphobia. Beginner-stage in experience with computer basics or applications. Ambivalence or anxiety may occur related to the use of computers in health care. May appreciate help in learning basic computer skills.
−27 to −15 (Group 2)	Indicates some uneasiness about using computers. Very basic knowledge of computer basics and applications. Unsure of usefulness of computers in health care.
−14 to −4 (Group 3)	Moderate comfort in using computers. Has basic knowledge of computers and applications. Limited awareness of applications of computer technology in health care.
−3 to 12 (Group 4)	Feels comfortable using user-friendly computer applications. Aware of the usefulness of computers in a variety of settings. Has a realistic view of current computer capabilities in health care.
13 to 26 (Group 5)	Confident of ability to use a variety of computer programs. Sees computers as beneficial in the development of society. Enthusiastic view of the potential of computer use in health care.
27 to 40 (Group 6)	Very confident that they can learn to use a computer to boost creativity and perform routine functions. Recognizes the unique value of using information technology in society. Idealistic, positive view related to computer applications in health care.

PATCH, Pretest for Attitudes Towards Computers in Healthcare.

distribution ($P = 0.354$; $P > 0.05$), whereas MACL total and subscale scores did not ($P < 0.05$) (Table 1). To determine the interscale correlation, we used Spearman's correlation analysis. Averages of the two groups were compared using the independent-samples *t*-test for normally distributed variables and Mann–Whitney *U*-test for comparison of non-normally distributed variables. Pearson's $\chi 2$-test was used for comparison of nominal data. A 95% confidence limit and a significance level of $P < 0.05$ were used for the analysis.

Ethical and legal aspects

We obtained written permission to conduct the study from the Istanbul University Faculty of Medicine Clinical Research Ethics Committee. We obtained institutional permission to conduct the study in hospitals A and B. Permission for the use of the scales was obtained from Kay,[26] Kılınç[10] and Kaya.[5]

RESULTS

Nurses' demographic variables are shown in Table 3. The nurses at hospital A and B were compared in terms of these variables and were found not to be statistically different in terms of gender, age, educational attainment, nursing experience, working unit or job title (Table 3).

Nurses' computer literacy levels and attitudes towards the use of computers in health care

We found the following average scores for each MACL subscale: 32.52 for the BS subscale, 29.11 for the ASS subscale, 15.20 for the P subscale and 24.42 for the CA subscale. The total average score for the MACL was 101.26. Nurses' average score on the PATCH Assessment Scale was 15.18 (Table 4).

When nurses' PATCH Assessment Scale scores were interpreted according to the classification categories in the scale manual (Table 2), the majority of nurses were in group 4 (36.6%) and group 5 (43.2%), whereas a small percentage of nurses were in groups 1 (0.6%), 2 (1.3%) and 3 (1.5%). The percentage of nurses in group 6, which accounted for the most positive attitudes towards the use of computers in health care, was 16.9%, which was interpreted to be favourable (Fig. 1).

Correlations between nurses' computer literacy and attitudes towards the use of computers in health care

There was a significant positive correlation between PATCH Assessment Scale and MACL total scores ($r = 0.454$). The PATCH Assessment Scale also had significant positive correlations with the ASS, BS, CA and P subscales ($r = 0.478$, 0.476, 0.358 and 0.185, respectively; Table 5). These data showed that as MACL total and subscale scores increase, PATCH Assessment Scale scores increase.

Table 3 Personal and professional characteristics of nurses (percentage and mean)

Personal and professional characteristics	Hospital A (n = 359)		Hospital B (n = 329)		Total (n = 688)		Statistical analysis results	
Gender	*n*	%	*n*	%	*n*	%	$\chi^{2\dagger}$	*P*
Female	348	96.9	314	95.4	662	96.2	1.055	0.304
Male	11	3.1	15	4.6	26	3.8		
Age group (years)	*n*	%	*n*	%	*n*	%	χ^2	*P*
20–29	150	41.8	143	43.5	293	42.6	0.974	0.615
30–39	111	30.9	107	32.5	218	31.7		
40 and above	98	27.3	79	24.0	177	25.7		
Age (years) (range 20–63)	Mean	SD	Mean	SD	Mean	SD	$t^{\ddagger}$	*P*
	33.88	9.68	32.56	8.50	33.25	9.15	−1.899	0.058
Educational attainment	*n*	%	*n*	%	*n*	%	χ^2	*P*
High school	20	5.6	16	4.9	36	5.2	4.872	0.181
Two-year degree	64	17.8	49	14.9	113	16.4		
Bachelor's degree	231	64.3	205	62.3	436	63.4		
Master's or higher	44	12.3	59	17.9	103	15.0		
Nursing experience group (years)	*n*	%	*n*	%	*n*	%	χ^2	*P*
0–6	153	42.6	153	46.5	306	44.5	4.594	0.204
7–13	51	14.2	59	17.9	110	16.0		
14–20	72	20.1	54	16.4	126	18.3		
21 and above	83	23.1	63	19.1	146	21.2		
Nursing experience (years) (range 1 month to 40 years)	Mean	SD	Mean	SD	Mean	SD	$Z^{MW\S}$	*P*
	11.98	10.00	10.32	8.87	11.18	9.51	−1.838	0.066
Working unit	*n*	%	*n*	%	*n*	%	χ^2	*P*
Internal unit	126	35.1	134	40.7	260	37.8	3.281	0.350
Surgical unit	92	25.6	70	21.3	162	23.5		
Operating room and intensive care unit	85	23.7	80	24.3	165	24.0		
Management and other units	56	15.6	45	13.7	101	14.7		
Job title	*n*	%	*n*	%	*n*	%	χ^2	*P*
Nurse	225	62.7	199	60.5	424	61.6	1.195	0.550
Head nurse of unit	43	12.0	35	10.6	78	11.4		
Other (nursing director, educator, etc.)	91	25.3	95	28.9	186	27.0		

† Pearson's chi-squared test. ‡ Independent-samples *t*-test. § Mann–Whitney *U*-test.

Table 4 Distribution of the MACL and PATCH Assessment Scale scores (n = 688)

Scales		Potential score range	Minimum	Maximum	Median	Mean ± SD
MACL	BS	6–42	6	42	35	32.52 ± 8.90
	ASS	6–42	6	42	31	29.11 ± 9.19
	P	6–42	6	42	13	15.20 ± 8.06
	CA	6–42	6	42	25	24.42 ± 8.22
	Total	24–168	24	168	104	101.26 ± 28.78
PATCH Assessment Scale		−40 to 40	−33	39	15	15.18 ± 10.94

ASS, application software skills; BS, basic skills; CA, computer awareness; MACL, Multicomponent Assessment of Computer Literacy; P, programming; PATCH, Pretest for Attitudes Towards Computers in Healthcare.

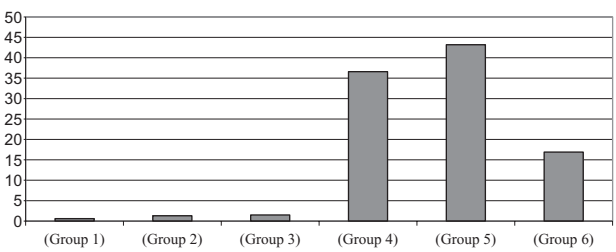

Figure 1. Nurses' attitudes towards computers in health care by number per group (n = 688).

DISCUSSION

Several studies in the Turkish and international literature have aimed to determine nurses' attitudes towards the use of computers in health care.[3–6,27] Although there are studies in the international literature that have examined nurses' computer literacy[11–14,28,29] and have associated it with computer use in health care,[15,30] there are no studies focused on our subject.

Nurses' computer literacy levels and attitudes towards the use of computers in health care

The average score that participant nurses received on the MACL was 101.26. In a study regarding computer literacy among teacher candidates conducted by Kılınç and Salman,[9] participants scored highest on the BS subscale, followed by ASS, CA and P. In a study conducted with university students, Tasa[31] used this scale and found that the average MACL total score was 99.17. Tasa[31] reported that a vast majority of the students were competent in BS, followed by ASS and CA. P ranked last on the list. Our results are in agreement with both studies. Additionally, Konan[32] and Özçelik and Kurt[33] found teachers' computer literacy to be at the intermediate level.

Işık and Akbolat[34] conducted a study to determine health-care personnel's level of competence in information technology and reported that 61.8% of them were competent in office programmes, whereas 61.2% were competent in operating systems and 59.2% were competent in operating computer hardware. Malo *et al.*[35] discovered that nurses' computer literacy level was 2.58 out of a maximum score of 4. Hsu *et al.*[13] used a five-point Likert-type scale and found that nurses' average computer literacy score was 3.15; they stated that the nurses' computer literacy was at an intermediate level. The numbers above all represent the averages of scores that nurses received for specific skills.

Saba[36] suggested that computer technology plays a significant role in professional nursing practices and will shape the future of nursing. Sherwood[37] stated that health-care information systems will contribute to the planning of evidence-based nursing and treatment practice strategies. As described in the study by Pine,[38] information technology is an integral component of the restructuring of health-care for individuals who need health care and those who provide such services. In summary, we should consider health-care and nursing information systems with regard to nursing knowledge and practice. Therefore, we should include this type of information in continuing education and in in-service training programmes, starting with nurse candidates' education.

In a study conducted by Gassert and McDowell,[28] newly graduated nursing students' grasp of health-careinformation technology was not at a sufficient level to meet the requirements of nursing practice. Much of the literature suggests that nurses must be knowledgeable about such computer-related issues.[13,21,35,39] However, newly graduating nurses are reported to lack such skills in

Table 5 Correlations between the MACL and PATCH Assessment Scale scores ($n = 688$)

Scales		MACL	BS	ASS	P	CA
BS	*r*	0.846	—	—	—	—
	P	0.000*	—	—	—	—
ASS	*r*	0.913	0.833	—	—	—
	P	0.000*	0.000*	—	—	—
P	*r*	0.737	0.375	0.532	—	—
	P	0.000*	0.000*	0.000*	—	—
CA	*r*	0.842	0.580	0.654	0.600	—
	P	0.000*	0.000*	0.000*	0.000*	—
PATCH Assessment Scale	*r*	0.454	0.476	0.478	0.185	0.358
	P	0.000*	0.000*	0.000*	0.000*	0.000*

* $P < 0.01$. ASS, application software skills; BS, basic skills; CA, computer awareness; MACL, Multicomponent Assessment of Computer Literacy; P, programming; PATCH, Pretest for Attitudes Towards Computers in Healthcare.

clinical practice.[10] Cruz *et al*.[12] found that nursing students were aware of the need for information systems and skills in using them, but a majority of the students were at a beginner level in simple skills such as using Word and the Internet. Hwang and Park[17] revealed that more than half of the students participating in their study had below-average computer skills.

In summary, information technology competencies are not acquired at the undergraduate and graduate levels of nursing education, and ensuring the acquisition of such competencies is a significant problem. Nevertheless, the results of this study regarding computer literacy levels of nurses can be interpreted as favourable and might lead us to believe that nurses improve their computer skills through their own initiative.

In this study, the nurses' average score was 15.18 for the PATCH Assessment Scale. In their studies, Kaya,[3] Huryk,[4] Shoham and Gonen[5] and McLane[6] stated that nurses adopted positive attitudes towards computer use in health care. However, Huryk[4] indicated that nurses feared the dehumanizing effect of technology on patient treatment. André *et al*.[40] suggested that the best predictor of nurses' use of computers was a positive attitude towards computers. It is possible to give more examples from the literature to show that nurses' attitudes towards the use of computers in health care are generally positive. Our study, similarly to previous studies, showed the positive attitudes that nurses generally adopt towards the use of computers in health care.

Correlation between nurses' computer literacy levels and attitudes towards the use of computers in health care

Significant positive correlations were found between participant nurses' total MACL score and their scores on the MACL subscales and PATCH Assessment Scale. Computer-literate nurses displayed positive attitudes towards the use of computers in health care. Similarly, Hsu *et al*.[13] and Malo *et al*.[35] found that there was a statistically significant and positive correlation among nurses between computer literacy and positive attitude towards computers. Nkosi *et al*.[41] indicated that nurses had limited access to information technology and computer use in the clinic, and their lack of computer skills played a role in this situation. Chan *et al*.[42] suggested that nurses with little computer experience should undergo basic computer literacy training before being accepted to a training programme about using electronic health records. Whittaker *et al*.[30] described absence of experience in computer use as the biggest obstacle to the use of electronic health records. André *et al*.[40] said that educational programmes need to be well organized if they aim to apply information technology in health care successfully. Hwang and Park,[17] Huryk,[4] Hegney *et al*.,[16] and Nabirye and Moss[43] stated that the most important reason for nurses' not using information technology was that they were not sufficiently computer-literate. In summary, nurses display positive attitudes towards the use of computers in health care. However, certain

problems arise in regard to translating such attitudes into clinical practice. One of the most important problems is that nurses' computer literacy levels must be considered. If nurses are required to use information technology in information recording and acquisition and in clinical practice, their level of computer literacy should be determined first, and problems with this issue should be resolved.

Limitations

The study results can only be generalized to the institutions where this study was conducted. This study is the first in Turkey to address nurses' computer literacy. However, it is essential to determine the factors that affect computer literacy.

Implications for nursing practice

Recently, various 'literacies', such as information, technology, digital, media, Internet and computer literacy, have been defined as important in lifelong learning.[44] The present study aimed to determine nurses' computer literacy and guide nurses in determining institutional strategies for effective computer use and improving computer skills as part of lifelong learning. Nurses' attitudes towards the use of computers play an important role in the successful use of information technology in health care. The present study confirmed the fact that it is necessary to have adequate computer skills to be able to adopt a positive attitude towards the computer. Therefore, it is necessary to provide assistance for nurses to improve their computer skills if we aim to use computers in health care efficiently. Nurses might benefit from this present study and should request support from their institutions to enable them to improve their computer skills.

CONCLUSION

This study showed that nurses had adequate skills in computer use and positive attitudes towards the use of computers in health care. Additionally, there was a positive correlation between attitudes towards computer use in health care and computer literacy.

ACKNOWLEDGMENTS

We thank the Istanbul University Scientific Research Projects (IUBAP) Unit, which contributed to our study (Project No. 15435).

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