

Nurses' ehealth literacy and associations with the nursing practice environment

George Kritsotakis^{1,2}PhD, MA, RN , Eirini Andreadaki^{1,3}RN, MSc,
Manolis Linardakis⁴PhD, MPH , George Manomenidis⁵PhD, RN ,
Thalia Bellali^{1,6}PhD, RN & Petros Kostagiolas^{1,7}PhD 

1 Assistant Professor in Public Health Nursing – Social Epidemiology, School of Social Sciences, Hellenic Open University, Patras, **2** Assistant Professor in Public Health Nursing – Social Epidemiology, Department of Business Administration & Tourism, Institute of Agri-Food and Life Sciences (Agro-Health), Hellenic Mediterranean University, Crete, **3** Head of the Vocational Nursing Training Center of Aghios Nikolaos Hospital, Aghios Nikolaos General Hospital, Crete, **4** Biostatistician, Clinic of Social and Family Medicine, Department of Social Medicine, Faculty of Medicine, University of Crete, Heraklion, Crete, **5** Head, Orthopedics Department, General Hospital of Ptolemaida, Ptolemaida, **6** Professor, Faculty of Nursing, International Hellenic University, Thessaloniki, **7** Associate Professor, Department of Archives, Library Science and Museology, School of Information Science and Informatics, Ionian University, CORFU, Greece

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Aim: To report on ehealth literacy levels in nurses and to explore its associations with the nursing practice environment.

Background: Nurses increasingly use the Internet and associated technologies to seek health-relevant information and manage their health.

Introduction: High ehealth literacy is a predictor of better health outcomes in diverse populations but its levels and work-related determinants have not been adequately explored in direct-care nurses.

Methods: The sample for this cross-sectional study consisted of 200 staff nurses and nursing assistants in Greece. Participants reported during February–March 2019 their sociodemographic and work-related characteristics on a self-administered questionnaire which included the “electronic Health Literacy Scale”—eHEALS, and the “Practice Environment Scale of the Nursing Work Index”—PES-NWI. Crude and adjusted logistic regressions were performed.

Findings: In adjusted models, participants that scored higher on the “Collegial nurse–physician relationships” and “Nurse participation in hospital affairs” dimensions of the clinical environment had higher odds of reporting better ehealth literacy. The lowest item score in eHEALS was related to not being able to make health decisions using Internet information.

Discussion: Nurses' ehealth literacy was positively associated with some dimensions of the hospital practice environment. Nurses reported higher ehealth literacy scores in comparison to other studies; however, they were not confident in distinguishing reliable health information from Internet sources. This is quite alarming because it can directly impair the ability of nurses to provide relevant and up-to-date evidence-based care.

Conclusion: This is the first study to report internationally on the positive associations of a good working environment with nurses' ehealth literacy levels.

Implications for Nursing and Nursing Policy: Nursing policy should address the ehealth literacy of nurses and integrate it into continuing professional education initiatives. Special focus should be put on nurses' ambiguity in distinguishing which ehealth information is reliable and can guide nursing practice. This should be combined with efforts to improve the nursing clinical environment and increase nurses' participation in hospital decisions.

Keywords: eHEALS, ehealth literacy, electronic Health Literacy Scale, Greece, hospital, PES-NWI, Practice Environment Scale of the Nursing Work Index

Correspondence address: George Kritsotakis, Assistant Professor in Public Health Nursing – Social Epidemiology School of Social Sciences, Hellenic Open University, Patras, Department of Business Administration & Tourism, and Institute of Agri-Food and Life Sciences (Agro-Health), Hellenic Mediterranean University, Crete, Greece. Tel.: +30 2810 379552, +30 6944 319783; E-mail: gkritis@hmu.gr

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Introduction

In recent years, there is an ever-growing percentage of the world population that uses Internet-associated technologies to seek health-relevant information and manage their health (Kim & Xie 2017, Kostagiolas et al., 2016, Garner et al. 2021). Building on existing conceptualizations and various definitions of health literacy (Ayaz-Alkaya et al. 2020; Griebel et al. 2018), we can describe as electronic health (ehealth) literacy, all essential skills needed to locate, understand, use, and evaluate electronic, web-based and mobile resources to make informed choices regarding health promotion and disease prevention and management. High ehealth literacy is a predictor of better health outcomes in nurses and medical professionals (Cho et al. 2018; Kostagiolas, et al. 2014), better health outcomes in patients (Heiman et al. 2018; Park et al. 2014), and the general population (Kim & Son 2017; Mitsutake et al. 2016), although the results are not consistent across all outcomes, and their relationship is not fully understood yet (Han et al. 2018; Neter & Brainin 2019).

Background

Nursing-related information is rapidly increasing, and the need for nurses to stay up to date is growing. This has a profound impact on daily nursing routines and practices. As a result, attention is being devoted to how nurses become aware of their information needs and information-seeking behaviors in their work environment. The work and health information-related interplay in nursing requires health information literacy skills and competencies. For example, a common theme that emerges in ehealth literacy research is that both professionals and lay users cannot always distinguish which information is reliable or relevant and which is not, even if they can locate it (Heiman et al. 2018; Rathnayake & Senevirathna 2019; Richtering et al. 2017). This is very problematic, especially when it comes to nurses and other health professionals that may use unreliable data to inform their clinical practice (Kostagiolas et al. 2014). In this evolving context, it is important to reveal cultural and country-specific determinants of ehealth literacy to better inform nursing and health practice.

Some recent studies report on the ehealth literacy levels and its determinants in nursing students (Holt et al. 2020; Park & Lee 2015; Tubaishat & Habiballah 2016), yet there is a paucity of relevant research in direct-care nurses, with a few exceptions (Cho et al. 2018). In general, both nursing students and nurses are not always very apt in using new technologies, such as smartphones and health apps, in their clinical practice and they need to increase their ehealth literacy (Andreou 2017; Stergiannis et al. 2017). Nursing students

in Greece reported as sources of information mainly the nurses and doctors in their clinical placements, printed materials, and to a lesser extend scholarly databases/e-journals, and seminars (Intas et al. 2017). Nevertheless, it has been shown that contextual factors, such as the type of the university they study, in addition to personal self-efficacy factors, for example, attitudes toward the Internet, self-rated Internet skills etc., were determinants of ehealth literacy (Rathnayake & Senevirathna 2019; Tubaishat & Habiballah 2016).

Electronic health information literacy competences are likely to improve work practices and the quality of care, together with meeting the needs of patients (Intas et al., 2017; Kostagiolas et al., 2014; Kostagiolas et al. 2015). Therefore, it is important to point out these factors that may foster such nurses' behaviors. However, the literature stops short regarding the associations of electronic health literacy competencies with work-related parameters of the nursing profession. This study aims to report ehealth literacy levels in a sample of nurses and to explore its associations with characteristics of the nursing practice environment. The possible contextual-level disparities are an interesting addition to current literature, given that literacy-related, personal, health, and sociodemographic differences in the ehealth literacy literature are adequately reported.

Methods

Study setting, design, and population

The study was cross-sectional. The population consisted of all 269 nurses and nursing assistants of three secondary and one primary general-care hospitals in Greece. Two-hundred questionnaires were returned from February–March 2019 (response rate 74.34%).

Instrument

Participants reported on their sociodemographic and work-related characteristics on a self-administered questionnaire. They also completed the “electronic Health Literacy Scale”—eHEALS (Norman & Skinner 2006), and the “Practice Environment Scale of the Nursing Work Index”—PES-NWI (Lake 2002).

Electronic Health Literacy Scale—eHEALS

EHEALS was created by Norman & Skinner (2006) to measure the ability to find and assess health-related information online at the individual level. It consists of 8 questions on a 5-point Likert scale (score 8–40). A higher score is indicative of higher ehealth literacy. Indicative questions are as follows: “I know what health resources are available on the Internet”

and “I have the skills I need to evaluate the health resources I find on the Internet.” EHEALS is published online and free to use with the requirement to reference the initial study of Norman & Skinner (2006). The eHEALS scale has been also employed in other studies in Greece for the general population (e.g., Xesfingi & Vozikis, 2016).

Practice Environment Scale of the Nursing Work Index (PES-NWI)

Nurses evaluated their clinical work environment by responding to the widely used 31-item PES-NWI revised (Lake 2002). In this study we obtained permission to use the 32-item scale developed in the RN4CAST study (Sermeus et al. 2011). PES-NWI is a robust predictor of hospital care quality and nurse and patient outcomes across the globe (Lake et al. 2019; Swiger et al. 2017). PES-NWI comprises 5 subscales measuring “Nurse participation in hospital affairs” (8 questions); “Nursing foundations for quality of care” (9 questions); “Nurse manager ability”/“Leadership and support of nurses” (4 questions); “Staffing and resource adequacy” (4 questions); and “Collegial nurse–physician relationships” (7 questions). Higher scores in the 4-point Likert-type scale (1: strongly disagree, 4: strongly agree) are indicative of a better hospital environment, with a mean cutoff point of 2.5/4. In 2006, Lake and Friese also proposed categorical references for unfavorable (scores of >2.5 on one or none of the 5 subscales), mixed (scores of >2.5 on two or three out of 5 subscales), and favorable (scores of >2.5 on all or four out of 5 subscales) nursing practice environments. PES-NWI has been translated and adapted in Greek by Zikos et al. (2012) and has been used to evaluate hospital care in various settings (Prezerakos et al. 2015, Brofidi et al. 2018).

Scales’ reliability

Internal reliability, as measured by Cronbach’s alpha, was 0.93 both for eHEALS and the total PES-NWI, well-above the recommended minimum of 0.70. For the five PES-NWI dimensions, Cronbach’s alpha was 0.54 for Resources; 0.90 for Collegial Relations; 0.79 for Nurse Participation; 0.73 for Nurse Manager; and 0.81 for Quality of Care. The lower value for the “Staffing and Resource Adequacy” subscale mirrors the values reported by Brofidi et al. (2018) and Prezerakos et al. (2015) in Greece (0.60 in both studies).

Ethical considerations

The research protocol was reviewed and approved by the Scientific Boards of all participating hospitals and the 7th Regional Health Administration of Crete (approvals: 3036/11-2-2019, 3354/14-2-2019, 3638/18-2-2019, 3639/18-2-2019). In

the questionnaire was included an information sheet stating the purpose of the study, the anonymity of the participants, the statistical analysis of the responses as a total, and the voluntary nature of the participation. The contact details of the researcher and the study supervisor were also provided. The participants’ verbal consent to contribute to the study was formally approved by the ethics committees and it was assumed by returning the questionnaires.

Statistical analysis

IBM SPSS 25.0 was used for the statistical analysis. Descriptive statistics of the work and sociodemographic characteristics of the 200 participants are presented as means, standard deviations, medians, percentages, and minimum and maximum values. Non-parametric rho-Spearman correlation coefficients were calculated to estimate the associations of the eHEALS and the PES-NWI with participants’ characteristics. Due to the strong asymmetry of the eHEALS, the scores were divided at the 75th percentile (score = 33), as high and low ehealth literacy. Crude and adjusted logistic regressions were performed to establish the odds ratio coefficients and the 95% confidence intervals of the PES-NWI with eHEALS. In the adjusted model were included a priori as confounders: gender (1: female; 2: male); age (per 10 years); and educational level (1: up to high school; 2: post-secondary education (both 1 and 2 give the possibility to work as an assistant nurse); 3: 4-year: university-level degree; 4: master/PhD). In an additional regression model were also included: financial status (1: very low, low; 2: middle; 3: high, very high), profession (1: nurse; 2: assistant nurse), leadership status (1: no; 2: yes), and years working in the current department (1: until 1, 2: 2-5, and then per 5 years). However, the associations remained largely unchanged compared to the 1st adjusted model and the results are not presented.

Results

Participants’ characteristics

Most participants were female ($n = 181$, 91%), with middle-level financial status ($n = 132$, 66%). Of them, 121 (60.5%) were nurses and 79 (39.5%) assistant nurses. There was a generally even distribution across all age categories with the most ($n = 70$, 35%) between 45–54 years old. In terms of educational level, 99 (49.5%) had a 4-year university-level degree, and 20 (10%) had a master’s or PhD. Leadership status was present at 158 (79%) of the participants. Most of the participants ($n = 98$, 49%) work in the current department for less than five years, whereas 28 (14%) work for more than 20 years.

Table 1 presents the descriptive statistics of the eHEALS and PES-NWI scales. The mean value for eHEALS was 30.7 and for total PES-NWI 2.62. In PES-NWI, the lowest value (2.15) was in the dimension “Staffing and resource adequacy” and the highest (2.82) in the “Collegial nurse–physician relationships.” Regarding eHEALS, the lowest value was 3.24, for the confidence in using information from the Internet and the highest 4.08 on how to find helpful health resources on the Internet.

Table 2 reports the associations of the eHEALS and the PES-NWI with sociodemographic and work-related characteristics. eHEALS was not related to any of the examined characteristics. Education and financial status had the most associations with different PES-NWI dimensions. Interestingly, the higher educational level was associated with worse assessment of the total practice environment and the “Collegial relationships,” “Nurse participation,” and “Quality of care” subscales. Higher financial status was associated positively with the total score and the dimensions “Collegial relationships” and “Nurse participation.” Being an assistant nurse and not having a Leadership status was also related to better “Collegial nurse–physician relationships” scores.

In both crude and adjusted hierarchical logistic regression models to establish the odds ratio coefficients and the of the PES-NWI with eHEALS (high eHEALS score vs low), higher scores on “Collegial nurse–physician relationships” and “Nurse participation in hospital affairs” are associated with higher eHEALS scores (Table 3).

DISCUSSION

In this study, we explored the associations of the nursing practice environment with the ehealth literacy in nurses and nursing assistants in Greece. Participants that scored higher on the “Collegial nurse–physician relationships” and “Nurse participation in hospital affairs” dimensions of the clinical environment had higher odds of reporting better ehealth literacy. This is the first study to report internationally such a finding, adding to the literature on the positive impact of a positive working environment on nurse outcomes (Albshayreh et al. 2019; Topçu et al. 2016).

Higher “Collegial nurse–physician relationships” were associated with higher ehealth literacy. This may come as no surprise as Alving et al. (2018) concluded in their review that Google and peers were the main source for information for hospital nurses in many different and diverse countries in North America, Southeast Asia, and Africa. Stergiannis et al. (2017) reported that in Greece, doctors own more smartphones and also use them more frequently for clinical issues than nurses. Intas et al. (2017) reported as sources of

Table 1 Descriptive statistics of the eHEALS and PES-NWI scales

	Mean	SD
<i>eHEALS total score (range: 8–40)</i>	30.7	5.8
<i>eHEALS items (range: 1–5)</i>		
“I know how to find helpful health resources on the Internet”	4.08	0.76
“I know how to use the Internet to answer my questions about health”	3.93	0.91
“I know what health resources are available on the Internet”	3.91	0.87
“I know where to find helpful health resources on the Internet”	3.97	0.83
“I know how to use the health information I find on the Internet to help me”	3.87	0.86
“I have the skills I need to evaluate the health resources I find on the Internet”	3.86	0.83
“I can tell high-quality from low-quality health resources on the Internet”	3.85	0.85
“I feel confident in using information from the Internet to make health decisions”	3.24	1.07
<i>Total PES-NWI (range for total and items: 1–4)</i>	2.62	0.51
“Staffing and resource adequacy”	2.15	0.57
“Collegial nurse–physician relationships”	2.82	0.65
“Nurse participation in hospital affairs”	2.56	0.52
“Nurse manager ability”	2.77	0.63
“Nursing foundations for quality of care”	2.62	0.55

SD, standard deviation.

information of nursing students the people working in their clinical placements, and to a lesser extent web-based material. Our results may in fact echo their results, in that nurses may ask their medical colleagues for ehealth-related information, and they, in their turn, help them to increase their ehealth literacy. Additionally, higher “Nurse participation in hospital affairs” (e.g., participation in health and policy decisions, nurses involvement in the hospital’s internal governance), may provide the motive to nurses to enhance their ehealth literacy, to be able to successfully represent nursing and nurses in various committees and provide satisfactory service to their organizations. This last finding is in line with literature stating that nursing professional autonomy and involvement in the decision-making and administrative procedures are related to better nurse outcomes (Esteban-Sepúlveda et al. 2019; Nantsupawat et al. 2017).

Regarding the eHEALS, the mean is 30.7 in this sample. One of the very few studies reporting on the ehealth literacy of nurses is that of Cho et al., (2018) in South Korea. Their mean eHEALS score is 28.21 (SD 3.95), comparable to the

Table 2 Association of the eHEALS and the PES-NWI with sociodemographic and work-related characteristics

	Gender	Age	Education	Financial status	Profession	Leadership status	Years work in Dep
	<i>rho-Spearman</i>						
eHEALS	0.112	-0.120	0.124	0.029	-0.135	-0.005	-0.047
Total PES-NWI	0.007	0.028	-0.142*	0.155*	0.111	-0.077	0.036
“Staffing and resource adequacy”	0.082	-0.042	-0.103	0.048	0.072	-0.063	0.069
“Collegial nurse–physician relationships”	0.012	0.010	-0.186**	0.166*	0.177*	-0.209**	-0.030
“Nurse participation in hospital affairs”	0.059	0.110	-0.140*	0.163*	0.120	-0.024	0.048
“Nurse manager ability”	-0.019	0.060	-0.111	0.128	0.092	-0.009	0.056
“Nursing foundations for quality of care”	0.093	0.076	-0.186**	0.108	0.131	-0.035	0.062

* $P < 0.05$, ** $P < 0.01$. PES-NWI: “Practice Environment Scale of the Nursing Work Index.” Bold numbers indicate statistically significant associations at the $p < 0.05$ level.

Gender (1: female; 2: male); age (per 10 years); educational level (1: up to high school; 2: 2-year post-secondary education (both 1 and 2 give the possibility to work as assistant nurse); 3: 4-year: university-level degree; 4: master/PhD); financial status (1: very low, low; 2: middle; 3: high, very high), profession (1: nurse; 2: assistant nurse), leadership status (1: no; 2: yes), and years working in the current department (1: until 1, 2: 2-5, and then per 5 years).

Bold numbers indicate statistically significant associations at the $p < 0.05$ level.

Table 3 Crude and adjusted logistic regressions to establish the associations of the PES-NWI with eHEALS (high eHEALS score vs low)

	<i>Crude model</i>	<i>Adjusted model</i>
	<i>Odds ratios (95% CI)</i>	
Total PES-NWI	1.79 (0.95–3.39)	1.89 (0.98–3.64)
“Staffing and resource adequacy”	1.32 (0.75–2.30)	1.31 (0.74–2.31)
“Collegial nurse–physician relationships”	2.04 (1.21–3.44)*	2.13 (1.25–3.64)*
“Nurse participation in hospital affairs”	2.03 (1.08–3.79)*	2.16 (1.13–4.14)*
“Nurse manager ability”	1.43 (0.86–2.40)	1.49 (0.88–2.53)
“Nursing foundations for quality of care”	1.28 (0.71–2.30)	1.31 (0.71–2.40)

Adjusted for age, gender, and education. 95% CI: 95% confidence intervals. * $P \leq 0.05$, ** $P \leq 0.001$.

Bold numbers indicate statistically significant associations at the $p < 0.05$ level.

one reported in this study. In other countries, total eHEALS is somewhat lower both in patients and nursing students (Rathnayake & Senevirathna 2019; Richtering et al. 2017). Regarding the eHEALS items, it is worth noting that the lowest score both in Greece and South Korea was in how confident nurses felt to make health decisions using Internet information (3.24 & 3.31, respectively) meaning that nurses

may lack a vital component of ehealth literacy skills. It may also be an indication that nurses feel more comfortable doing what they have already been doing in their clinical practice, not having the skills, autonomy, or self-efficacy needed to include new elements of care. The same inability to differentiate between the quality of evidence found online is also reported in nursing students (Park & Lee 2015; Tanaka et al. 2020; Tubaishat & Habiballah 2016). This needs immediate attention in terms of nursing policy because it directly impairs the ability of nurses to use Internet resources to provide up-to-date care.

For the most part, nurses evaluated above the recommended threshold of 2.5/4 (Lake & Friese 2006) their clinical working environment except for the sufficient resources. This may come as no surprise, given the severe economic crisis that was present in Greece the previous years and the fact that Greece usually reports the lowest number of nurses per 1000 population in Europe, irrespective of the crisis (Brzezinski, 2019; OECD/EOHSP 2019). Nevertheless, this is a common finding in most studies across the globe and the dimension “Staffing and resource adequacy” usually scores lower than the other quality dimensions of the PES-NWI, even if it is higher than the 2.5/4 threshold that signifies high quality of care (Swiger et al., 2017).

Limitations

This study reports novel findings on nurses’ ehealth literacy and its association with their clinical practice environment.

However, the results should be interpreted in light of some limitations. The study design was cross-sectional, and we cannot know the direction of the association. Nevertheless, given that structural contextual characteristics are more likely to influence individual-level variables, the proposed influence of the practice environment to ehealth literacy is the most plausible. The sample consisted of all the nurses of four small Greek hospitals. Although a high response rate was achieved, results should be generalized with caution. Future research in other countries and big tertiary university hospitals would be very useful in validating our findings.

Implications for nursing & health policy

Over the last decades, the availability of online health information has become a decisive factor in empowering “evidence-based” practices in nursing (Sortedahl et al, 2018) by adopting online learning programs and collaboration technologies (Button et al, 2014), and by developing computer-based nursing information (Ferdousi et al, 2021). The acceptance of the Internet among nurses is growing due to several noteworthy advantages when compared with the printed counterparts which might be outdated and may contain obsolete information (Clarke et al, 2013). The nursing policy should address the ehealth literary skills of nurses and integrate it into continuing professional education initiatives. Special focus should be put on nurses’ ambiguity in distinguishing which ehealth information is reliable and can guide nursing practice. This should be combined with efforts to enhance the nursing working environment and increase nurses’ participation in hospital decisions.

Conclusions

In conclusion, the hospital practice environment was associated with higher levels of nurses’ ehealth literacy and this effect was more profound for the “Nurse participation” and “Collegial relationships” dimensions. This finding adds to the ever-growing literature that supports the influence of a positive working environment on nurses’ outcomes. Although the ehealth literacy was reported higher than in other studies, nurses were lacking confidence in using Internet sources for health information. This is quite alarming because it can directly impair the ability of nurses to provide relevant and up-to-date care.

Author contributions

Study design: GK, PK, EA, TB

Data collection: EA

Data analysis and interpretation: ML, GK, EA, PK, TB, GM

Study supervision: GK, PK

Manuscript writing: GK

Critical revisions for important intellectual content: GK, PK, EA, ML, TB, GM.

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