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Knowledge, Attitude and Practice of Primary Health Care Providers Regarding E-health: A Validation Study

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ABSTRACT

Background: E-health refers to internet-based health care and information delivery and seeks to improve health service locally, regionally and worldwide. Health care providers must be equipped with the necessary knowledge, training and experience. We developed a questionnaire to obtain information from the physicians and nurses on various aspects of e-health.

Objectives: The aim of this study was to test the reliability and validity of this questionnaire to evaluate knowledge, attitude and practice of physicians and nurses towards e-health.

Methods: This study was carried out in Al-Sabah general hospital on 22 physicians and 20 nurses who were asked to complete a self-administered close-ended questionnaire that included 3 main aspects relevant to e-health, namely Knowledge, attitude, and practice. Each domain consisted of a number of questions (items). Test-retest reliability was tested by Spearman's correlation coefficients. To evaluate for internal consistency, parity co-variances were used to estimate Cronbach' alpha. Discrimination between participant groups (physicians and nurses) was tested by Mann-Whitney test. Spearman's correlation was utilized to test the correlations between different domains to evaluate the convergent validity.

Results: Test re-test reliability of the questionnaire revealed that all scales were reliable, with significant strong correlation for overall knowledge score ($r = 0.89$), and overall attitude score ($r = 0.80$) and intermediate significant correlation for practice score ($r = 0.46$). Testing the internal consistency revealed that coefficients of Cronbach's α were ≥ 0.80 for all domains except for items of participants' attitude towards themselves (0.77) and practice (0.74). Overall, the scales of the questionnaire could discriminate between physicians and nurses with higher scores among physicians than nurses. Within each studied aspect, the scores of different domains in the questionnaire were positively correlated with each other significantly.

Conclusion: The questionnaire was reliable and valid for assessing knowledge, attitude and practice of e-health among health care providers.

Keywords: Questionnaire, validation, e-health

Short title: Validation of an e-health questionnaire.

INTRODUCTION

Information technology has radically changed the way that many people work and think. Over the years, technology has touched a new acme and now it is not confined to developed countries. Healthcare professionals can no longer ignore the application of information technology to healthcare, because it is a key to e-health. (Gour N. and Srivastava D., 2010).

In 1997, the World Health Assembly considered fostering the use of science and technology for health as one of the essential functions of sustainable health systems (WHO, 1997). In 2000, the United Nations General Assembly called upon all member countries to cooperate with the private sector to "make available the benefits of new technologies, especially information and communication" (United Nations, 2000). In May 2005, the 58th World

Health Assembly adopted a resolution on e-health to leverage the use of e-health in the pursuit of health-for-all vision (WHO, 2005).

E-health emerged early in the 21st century including the combined use of electronic information and communication technology in the health sector. This term refers to that technology used for clinical, educational, preventative, research, and administrative purposes, both at the local site and remotely. (CashenM. et al., 2004). The term broadly refers to any electronic exchange of health related data collected or analyzed through an electronic connection to improve efficiency and effectiveness of health care delivery, though some definitions associate e-Health strictly with the internet. Therefore, it is frequently used to describe everything related to computers and medicine (CashenM. et al., 2004; Deluca J. and Enmark R., 2000; Kwankam S., 2004).

The ultimate goals of e-health can be summarized in increasing efficiency in health care, improving quality of care, increasing commitment to evidence-based medicine, empowering of patients and consumers, and developing of new relationships between patients and health professionals (Austin C. and Boxerman S., 2003). Nursing support is important to the development and implementation of e-Health initiatives. Therefore, nurse leadership must understand the technical characteristics of health information technology as well as the clinical capabilities of e-health within the health care system. (Harrison J.P. et al., 2004; Ramsey C. et al., 2001). The essential change in focus required to improve healthcare delivery using e-health technologies has to be on clinical care. To achieve this change, clinicians must be involved at all stages of e-health implementations. (Hannan T.J. and Celia C. 2013)

The digital revolution will have a profound impact on how physicians and health care delivery organizations interact with patients and the community at-large. Over the coming decades, face-to-face patient/doctor contacts will become less common and exchanges between consumers and providers will increasingly be mediated by electronic devices. (Weiner J.P., 2012) As health care workers have the opportunity and obligation to deal with e-health in all field of health care, they must be equipped with the necessary knowledge, training and experience. Health care institutions can make significant contributions to addressing e-health implementation by supporting the required materials and equipment as well as supporting training programs for health care givers.

There are many surveys which have assessed the knowledge, attitude, and practices regarding e-health in different health care providers. (George J.T. Et al., 2007; Glinkowski W. et al., 2013; Weiner J.P. et al., 2013; Ernstmann N. et al., 2009). In Kuwait, to our knowledge, no study has been conducted to evaluate health care providers' knowledge, attitude, and behaviors about e-health.

Several knowledge-attitude-behavior models have been developed to assess health care provider characteristics in relation to e-health, which have resulted in some refined tools that may guide future e-health policy interventions and training programs. (George J.T. Et al., 2007; Glinkowski W. et al., 2013; Weiner J.P. Et al., 2013; Ernstmann N. et al., 2009)

We developed a questionnaire to obtain information from the physicians and nurses on various aspects of e-health. It was derived from other published studies dealing with the same topic as well as from our own experience. In particular, the questionnaire was aimed at evaluating the overall attitude, willingness, internet/computer education status, PC computer access, internet access, and general attitude toward telemedicine/telenursing and knowledge about it. The aim of this study was to test the reliability and validity of this questionnaire to evaluate knowledge, attitude and practice of health care givers towards e-health.

SUBJECTS AND METHODS

Setting and design

There is an excellent level of healthcare and medical treatment in Kuwait, and the country is considered to be on a par with the facilities which are provided in the United States and Western Europe. Kuwait has one of the most modern health care infrastructures in the region, the history of healthcare of which is much older. The country has relatively strong basic health care indicators, but there is increasing pressure on its facilities. Despite its achievements, Kuwait faces tremendous challenges in its health sector. This study was carried out in July 2015 in Al-Sabah general hospitals in Kuwait. The study design is a cross-sectional descriptive one. The study sample included 22 physicians and 20 nurses who were asked to participate in the study.

Data collection

A self-administered close-ended questionnaire was used to obtain data from the participants. It included 3 main aspects relevant to e-health, namely Knowledge, attitude, and practice. Among the knowledge aspect, 3 domains were included namely definition domain (13 items), fields of use domain (7 items), and method of use domain (6

items). Under the attitude aspect 2 domains were included, namely attitude towards regarding him/herself (4 items) and regarding system attitude (5 items). The aspect of practice included only one domain.(5 items).

Scoring for knowledge was "1" for right answer and "0" for wrong answer or do not know. Percentage score for each domain equals the number of right answers / total number of domain items * 100. Scoring for attitude: participants indicated their answer for each item using a 5-point, Likert-scale ranging from "4" (Strongly agree) to "0" (strongly disagree). For each participant, the scores were summed and transformed into percentage score by the formula; score /(total number of domain items* 4) * 100. Scoring for practice was "1" for yes and "0" for no and the percentage score equals the number of right answers / total number of items * 100

Statistical analysis

To test for intra-subject variations, physicians and nurses, who participated in the study, received the same questionnaire twice, separated by a mean time interval of 2 weeks. In order to measure short-term test-retest reliability, Spearman's correlation coefficients for the subscales were calculated. (Siegle S., 1957)

To evaluate for internal consistency, parity co-variances were used to estimate Cronbach' alpha that summarized the inter-item correlations of all items in each domain scale in the questionnaire. Subscales are considered internally consistent when value of Cronbach' alpha for these subscales that comprise more than one questions per scale equal 0.80 or more.(Cronbach LJ., 1951)

Discriminative validity evaluated whether the questionnaire could discriminate between different groups. Discrimination between participant groups (physicians and nurses) was tested by Mann-Whitney test. Convergent validity ensured that domains of the questionnaire correlated positively with one another. Spearman's correlation was utilized to test these correlations between different domains. (Siegle S., 1957) Data were analyzed using a "SPSS for Windows" statistical package.

RESULTS

Median age was 38 for physicians and 35 years for nurses and female gender was presented in 27.3% of physicians and predominated in nurses (79.8%) ($p = 0.001$). Physicians had insignificant longer periods of experience than nurses (median = 11 versus 8 years). Kuwaiti nationality was presented in 18.2% of physicians and in 30.0% of nurses, and married subjects represented 90% and 100% of physicians and nurses respectively without a significant difference (Table I).

Table 1: General description of the study sample

Variable	Physicians No. = 22	Nurses No. = 20	P
Age: median (IQR)	38 (7)	35 (9)	0.08*
Years of experience median (IQR)	11 (11)	8 (5)	0.51*
Gender (females)	6 (27.3%)	16 (79.8%)	0.001
Nationality (Kuwaiti)	4 (18.2%)	6 (30.0%)	0.37
Marital status (married)	20 (90.0%)	20 (100.0%)	0.49**

*: Mann-Whitney U Test **: Fisher's Exact Test

Reliability

Test re-test reliability of the questionnaire revealed that all scales used were reliable. Regarding knowledge score, all domains showed significant strong correlations between basal and re-test readings. Intra-class correlation coefficients between item scores were 0.76 for definition of e-health domain, 0.92 for fields of use of e-health domain, and 0.79 for methods of using e-health domain. Regarding the attitude scales, there was a significant strong correlation between basal and re-test reading for attitude towards participants' themselves (0.92) and significant intermediate correlation for attitude towards health system (0.63). In respect to participants' practice, correlation coefficients between item scores were significant intermediate (0.46). That is there was a high degree of repeatability and reliability of the questionnaire (Table II).

Table 2: Basal and re-test percentage score (median and Inter-quartile range), with spearmans' correlation coefficients

Scale readings	Basal reading		Re-test reading		Correlation coefficients	
	median	IQR	median	IQR	r	p
Knowledge:						
Definition of E-heath	69.23	63.46	61.54	57.69	0.76	0.001
Fields of applications	71.43	75.00	57.14	64.28	0.92	0.001
Methods of use	50.0	66.67	50.00	50.00	0.79	0.001
Overall	59.62	32.75	59.62	52.89	0.89	<0.001
Attitude						
Regarding him/herself	59.67	20.00	56.25	12.5	0.92	<0.001
Regarding health system	77.17	35.00	75.00	17.5	0.63	0.001
Overall	77.78	27.78	63.89	12.50	0.80	0.001
Practice	60.0	25.0	58.0	40.0	0.46	0.011

Internal consistency

Regarding knowledge score, Coefficients of Cronbach's α were 0.91, for 13 definitions of e-health items, 0.89 for 7 fields of use of e-health items, and 0.79 for 6 methods of use of e-health items. Regarding the attitude scale, Coefficients of Cronbach's α were 0.77 for 4 items related to participants' attitude toward him/her selves and 0.87 for 5 items related to participants' attitude towards health system. However, a lower coefficient (0.74) was detected in case of 5 items of practice domain. (Table III).

Table 3: Scale headings and values of Cronbach's alpha

Scale headings	Number of items	Cronbach's alpha
Knowledge:		
Definition of E-heath	13	0.91
Fields of applications	7	0.89
Methods of use	6	0.80
Attitude:		
Regarding him/herself	4	0.77
Regarding health system	5	0.87
Practice	5	0.74

Discriminant validity

Overall, the scales of the questionnaire could discriminate between physicians and nurses. Scores were significantly higher in physicians than in nurses regarding the overall knowledge score (78.37 versus 19.23) as well as the three domains of the knowledge score: definition of e-health (73.96 versus 15.38), fields of application of e-health (100.0 versus 21.42), and methods of use of e-health (66.67 versus 19.23).

Also, a higher overall attitude score was found in physicians than nurses (81.94 versus 65.17) as well as individual domains: attitude towards participants themselves (70.00 versus 55.00) and attitude towards health system (90.00 versus 67.50). Practice score was significantly higher in physicians (80.00) than in nurses (50.00). (Table IV).

Convergent validity

Within each studied aspect, the scores of different domains in the questionnaire were positively correlated with each other significantly (Table V).

Table 4: E-health score in physicians and nurses, median and inter-quartile range are presented

Scale headings	Physicians (n = 22)		Nurses (n = 20)		Mann-Whitney test	
	Median	IQR	Median	IQR	Z	P
Knowledge:						
Definition of E-health	73.96	21.15	15.38	46.15	3.72	< 0.001
Fields of applications	100.00	28.57	21.42	27.37	4.36	< 0.001
Methods of use	66.67	45.83	16.67	37.50	3.82	< 0.001
Overall	78.37	21.15	19.23	44.23	4.20	< 0.001
Attitude						
Regarding him/herself	70.00	10.00	55.00	20.00	3.01	0.003
Regarding health system	90.00	25.00	67.50	25.00	3.26	0.001
Overall	81.94	16.67	65.17	18.75	3.31	<0.001
Practice	80.00	20.00	50.00	30.00	3.03	0.002

Table 5: Correlation between different scales among 22 physicians and 20 nurses, Spearman's correlation co-efficient is presented

Scale headings		
Knowledge:	Definition	Fields
Fields	0.82**	
Methods	0.87**	0.84**
Attitude	Regarding health system	
Regarding him/herself	0.63**	

**** : P < 0.01**

DISCUSSION

E-health has become an important field in which health professionals create and seek information to improve health service locally, regionally and worldwide. (Eysenbach G.,2001) We are intended to assess knowledge, attitude and practice of health care providers towards e-health. A variety of different measures have been applied in this issue. Since none of these measures had been used in Kuwait before the beginning of our study, it was useful to develop a valid, rapid, and easy to complete one. One of our aims was to appraise the suitability of this questionnaire. The questionnaire was assessed regarding its reliability, internal consistency, and discriminant and convergent validity.

If test scores are to be used to make accurate inferences about an examinee's ability, they must be both reliable and valid. Reliability of the questionnaire was examined using test-retest procedure and conducted on all participants included in this study. This estimate refers to the degree of overlap between two measurements taken at two different points in time using the same scale and with the same respondents. The correlation between basal and retest overall readings, as well as for different domains in the studied aspects were strong and statistically significant. However, the basal and retest answers for participant' attitude towards health system showed significant intermediate direct correlation. This could be due to the wide range of topics mentioned in this domain. As the reliability correlation for the different domains of the questionnaire were as consistent and high as for the overall score of the questionnaire, it could be considered flexible regarding presentation of data. It could be presented as overall score or individually for each domain which would be of value in practical and research fields. (Morgan M. et al., 1994; Finlay AY. And Khan GK.; 1994)

Reliability is a prerequisite for validity. However, tests can be highly reliable and still not be valid for a particular purpose. Determining the reliability of a test is an important first step, but not the defining step, in determining the validity of a test (Croker L. and Algina J, 1986; Zikmund WG.,2003). Validity was defined as an integrated evaluative judgment of the degree to which empirical evidence and theoretical rationale support the adequacy and appropriateness of inferences and actions based on test scores and other modes of assessment. It is a matter of degree, not absolutely valid or absolutely invalid. There are many different methods that can be used to establish the validity of a test's use. (Croker L. and Algina J, 1986)

Internal consistency of a scale refers to the degree to which items of the scale "hang together" and was assessed in our study by inter-item correlation. The questionnaire demonstrated good internal consistency where coefficients of Cronbach's α were ≥ 0.80 for all domains of all aspects of the questionnaire except for participants'

attitude towards themselves (0.77) and practice (0.74). This means that each domain except participants' attitude towards themselves and practice included a closely related or a homogeneous group of items. This could be due the small number of items in these two domains or the scaling of the response for items particularly in attitude domain. The items within each domain should be retained as they were in the questionnaire without modification or replacement between domains. The two domains where Cronbach's α were < 0.80 should be evaluated and modified to improve the internal consistency of these domains. Direct questioning in our study indicated that participants regarded the items as comprehensive, easy to understand and of considerable relevance to themselves.

Discriminant validity is designed to test, in our case, the ability of the questionnaire to prove the predetermined hypothesis that there was a difference between physicians and nurses regarding impact knowledge, attitude and practice towards e-health. In terms of discriminant validity, significant differences between groups were observed in all domains of the studied aspects with higher scores in physicians than nurses.

This went with the findings reported by other studies that supported the premise that in spite of expanded nursing roles emphasizing nursing authority, there are disagreements between nurses' and physicians' perceptions of the current and ideal authority of nurses as well as areas of dissatisfaction within each professional group. Implications of continuing conflicts between nurses and physicians as barriers to professional nursing role enactment, as well as strategies to address the problem are discussed. (Gour N. and Srivastava D., 2010; Katzman EM., 1989). Overall, the questionnaire could differentiate between both groups with higher score for the physician group.

Convergent validity of the questionnaire was tested, by analyzing correlation between scores of different domains. Our results revealed that the scores of the studied domains correlated together positively and significantly. It is possible, if required, to maintain and use the detailed information given in the replies, by analyzing either each question or groups of questions which form a domain.

Test validity or the validation of a test explicitly, means validating the use of a test in a specific context. Therefore, when determining the validity of a test, it is important to study the test results in the setting in which they are used. Hence, it is apparent that the questionnaire is an easily administered scale that could rapidly capture data related to knowledge, attitude and practice towards e-health among health care providers. This study further showed the reliability, internal consistency and construct validity of this scale that could be applicable and used in Kuwait. It was easy to use in this study as indicated by its completion by all participants who were selected for this validation study. It could account for the degree of knowledge of the participants and their attitude and practice towards e-health, and can differentiate between physicians and nurses. Furthermore, it allowed assessment of relevant e-health specific aspects.

CONCLUSIONS

The studied questionnaire is reliable and valid. It was proved to be a suitable tool for assessing knowledge, attitude and practice of health care providers towards E-health.

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