Study of the Psychometric Properties of Persian Version of Barriers and Facilitators Identification Instrument Associated with Hand Washing among Nurses

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Abstract: Health care workers' hands including nurses are regarded as one of the important factors in transmission of microorganisms and nosocomial infections. Considering this matter and the importance of hand washing, some nurses still don't take it seriously and fail to comply with it. Accordingly, the present study was designed and implemented to determine the psychometric properties of Persian version of barriers and facilitators assessment instrument of hand washing among nurses in Medical Training Center affiliated with Tehran University of Medical Sciences.The current study is an applied descriptive one with methodological and validation features. The research population includes nurses working in the Health Center affiliated with Tehran University of Medical Sciences (Dr. Shariati Hospital) of whom 184 subjects were selected through simple random sampling based on inclusion criteria. Validity of instrument was assessed through measuring content validity index (Waltz and Basel), face validity and exploratory factor analysis. Reliability of questionnaire was evaluated using test-retest and internal consistency of instrument. Exploratory factor analysis was conducted using SPSS 21 Software. To determine content validity of instrument, CVI and CVR of items were measured 84 and 58%, respectively. After exploratory factor analysis, number of items was reduced from 25 to 22 and all items were classified in five dimensions including personal and environmental barriers, surveillance and work ethic, physical conditions and receiving benefits, infection control and winning patient's trust and observing his rights. The total intra-class reliability of instrument was calculated from 68-89% and its average 80%. In addition, reliability of instrument was assessed 80% for the whole instrument through internal consistency. Persian version of barriers and facilitators instrument associated with hand washing among nurses constitutes acceptable and applicable features to evaluate hand washing among nurses and it can be applied as an authentic tool in various domains related to nursing practice.

Key words: Psychometric, hand washing, barriers and facilitators, instrument and nurse, medical training

INTRODUCTION

Nosocomial infections are among the most significant health problems all over the world which cause increased mortality, patients' duration of hospitalization and prevalence of antimicrobial resistance and have imposed high costs on healthcare sector (Dyson *et al.*, 2013). Noscomial infections are infections that are acquired in hospitals provided that individuals have shown no signs of infection before and at the time of patient's admission in the hospital (Amini *et al.*, 2014). These infections are the most common causes of implications resulted from

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patient's hospitalization in the hospital that threaten patients' health (Huis *et al.*, 2013) and the most prevalence of nosocomial infections has been reported in intensive care, surgery and orthopedic units (Shinde and Mohite, 2014). According to the researches conducted in this field in Europe, about 7.1% of patients are at risk of hospital-acquired infections and this figure is between 3.5 and 10.5% on average (Huis *et al.*, 2013). According to the world health organization, 1.7 million infections annually occur in hospitals and one out of every 20 hospitalized patients contracts hospital-acquired infection. These infections result in 99 thousands deaths annually and impose a cost of about 26-32 billion dollars into the economy about 5-10% of all patients experience this infection throughout their hospitalization in hospitals of the United States while this amount is higher in developing countries (Megeus *et al.*, 2015; Shinde and Mohite, 2014; Huis *et al.*, 2013). Therefore, it can be said that nosocomial infections lead to increased duration of patient's hospitalization, decreased quality of care, imposing heavy costs on patients and national health system and at last patients' deaths (Najafi *et al.*, 2015). The studies conducted in Iran indicated that the rate of these infections is much higher compared with developed countries (Jahani *et al.*, 2015). The results of other researches show that most of nosocomial infections are transmitted through the hands of health care workers and it has been for a long time that the effectivness of hand hygiene compliance by health care staff is known in preventing hospital-acquired infections (Najafi *et al.*, 2015, Mohmmadi *et al.*, 2014). In fact, regarding the results of studies, hand washing can be considered as an important factor in prevention and control of infection (Dyson *et al.*, 2013). Statistics has shown that nurses are the ones spending the most time with patients. Therefore, hand washing among nurses has a leading role in preventing nosocomial infections due to providing the most direct care and spending more time with patients (Najafi *et al.*, 2015). Accordingly, to maintain patients' safety, custodians of nosocomial infection control have recommended constant hand washing to all health care providers as the primary step in preventing and controlling hospital-acquired infections (Fuller *et al.*, 2010; Mertz *et al.*, 2011; Ziapour *et al*, 2015).

In a study conducted in China it was indicated that paying specific attention to improving the way of hand washing among health care workers while taking care of high-risk patients in an epidemic of severe acute respiratory syndrome will remarkably result in reducing infection transmission among staff and patients (Morrison and Yardley, 2009). In bulletin of the world health organization, hand hygiene was introduced as the most important priority in the prevention of hospital-acquired infections while there is a low compliance with this matter (Mertze *et al.*, 2011). Trying to improve hand hygiene practice among health care workers is considered by health care policymakers of all countries as a main priority and in some countries, national standards are formulated and implemented accordingly (Megeus *et al.*, 2015). However, despite the international recommendations for hand hygiene compliance and commitment, there is still a low level of implementation among health care workers (Dyson *et al.*, 2013) this issue needs to be investigated further in order to identify the reason why in spite of the importance of hand washing, some nurses have not yet taken it seriously and failed to comply with it so that in this regard, the importance of hand hygiene assessment through appropriate tools has been emphasized. In Iran, no standard tool in this field has been introduced to date and in the studies conducted on hand washing among nurses in Iran, mainly the associated evidence to evaluating the psychometric properties of research tools has not completely been rendered. Among valid and reliable instruments available abroad is the instrument of assessing barriers and facilitators of hand hygiene practice which was developed and evaluated in terms of psychometric properties by Dyson *et al.* (2013) in England was introduced as an instrument with appropriate validity and reliability for assessing hand hygiene which was designed and applied by him and the related experts using Delphi method. Since, according to the study of texts and domestic researches, the necessity of the availability of an appropriate instrument to investigate the barriers and facilitators of hand washing among nurses working is felt, the current study was designed and implemented with the aim of determining the psychometric properties of Persian version of barriers and facilitators instrument associated with hand washing among nurses working in medical training center affiliated with Tehran Univerity of medical sciences in 2015.

MATERIALS AND METHODS

The present research is an applied descriptive one with methodological and validation characteristics. Research population includes nurses working in different inpatient departments of Medical Training Center affiliated with Tehran University of Medical Sciences (Dr. Shariati Hospital). Nurses with BS or MS degree in

nursing who had worked full time at least for a year were eligible to enter the study. The minimum acceptable sample for factor analysis proper to the number of the items of instrument was considered 5 subjects for every item; regarding the fact that the intended instrument in this study included 33 items, the minimum sample size was estimated 165 subjects. Considering a possibility rate of 10% for the lack of complete response to questionnaires, a sample size of 184 was required in this research; sampling was done in a simple random form on employed nurses and 184 qualified nurses filled out the questionnaire. Dyson *et al.* (2013) designed a version of instrument related to the barriers and facilitators of hand hygiene in health care workers including 33 items and 11 dimensions and it was scored using Likert scale ranging 1-7 from strongly agrees to strongly disagree. The applied method in the study was that after corresponding with designer of questionnaire and obtaining the licence, first instrument related to the barriers and facilitators of hand hygiene was translated from English to Persian using standard Backward-forward method. To do so, first the original version was translated by two freelance translators simultaneously from English into Persian and then it was translated back into English by the first two freelance translators and finally through comparing texts and after discussing possible differences and adapting the original version to untranslated version from Persian to English, the questionnaire of instrument associated with barriers and facilitators of hand hygiene among nurses was formulated. To measure face validity of the Persian version of instrument, the views of 30 nurses were collected about clarity and comprehensibility of questionnaire items and necessary reforms were made accordingly. Content validity of questionnaire was determined using comments of 12 experts and based on Waltz and Basel index throughout which the relevancy, clarity and simplicity of each item were assessed according to a four-option index and content validity index of instrument was measured through the ratio of the total agree responses for each item rating 3 and 4 to the total number of responses for each of the items and the whole instrument as well. If a question gained the point 79% or higher, it would be approved (Ott and French, 2009). For collecting data, ethical approval and necessary agreements were obtained. Research participants were informed about the aim and procedure of the study and they were assured that information will be kept confidential. Finally, after providing necessary explanations on how to complete the questionnaire, they were distributed and data were collected. Demographic

data of sample was gathered using personal statement form (age, sex, education, nursing work experience and place of work). Construct validity of Persian version of barriers and facilitators identification instrument of hand washing among nurses was assessed via SPSS 21 software and exploratory factor analysis test. In the present study, 33 items was determined to confirm belonging so that following the above mentioned steps, the number of items reduced to 25 and then after confirming exploratory factor the number of items decreased from 25-22 and to 5 dimensions. To determine the reliability via test-retest method and Intra Class Correlation report (ICC), a total of 30 nurses working full-time in medical center of Dr. Shariati were selected and they were asked to answer the Persian version questions related to instrument in two times within a period of two weeks; this number was not included in sample size and also internal consistency of instrument was assessed by calculating Cronbach's alpha. The software used in the current study was SPSS 21.

RESULTS AND DISSCUSION

According to the obtained results, content validity of instrument was generally measured as CVI 84% and CVR 58% through Waltz and Basel content index. The results of Bartlett's test shows that index of sampling in the factor analysis model is 0.863. Moreover, Bartlett's test of sphericity is significant with the value of 1354.508 at the level of 0.0001 shown in (Table.1).

The results of Table 2 indicates that implementation of factor analysis according to correlation matrix can be justified in the sample under study.

Based on the results shown in Table 3, five factors with eigenvalue of higher than 1 can be extracted before rotation and this explains 50.595% of questionnaire variance in total. These data show that a large proportion of variance is explained through 5 factors and other factors have a small proportion in explaining variance.

According to Fig.1: related to Scree test, 5 factors will be considered for this questionnaire.

According to the results represented in Table 4, removing the questions 2, 14, 19 which were related to none of the factors and also based on theoretical foundations of the research was permitted. Consequently, the three questions were removed from the total number of questions and 22 items were remained. Afterwards, according to the content of the questions related to each factor, factors were named according to Table 5. In measuring the degree of agreement between assessors, the value of Intra-class Correlation Coefficient (ICC) was

Table 1: Frequency distribution and demographic characteristics of nurses participating in the research

Parameters	Variable	Frequency (percent)
Sex	Female	154
		83/70
	Male	30
		16/30
Education	BS	164
	MS	20
		10/87
		89/13
Shift	Rotating)	88
	(the highest	47/82
Age	Minimum	23
	Maximum	52
Work history	Minimum	1 year
	Maximum	28 year

Table 2: Keiser-Meyer-Elkin sampling index and the results of bartlett's test on factor analysis (barriers and facilitators assessment instrument of hand washingin nurses)

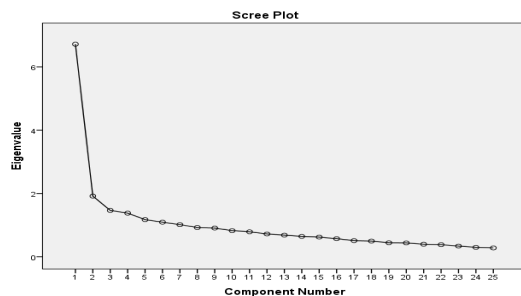| Parameters	Values
Keiser-Meyer-Elkin statistic	0./863
Bartlett's test	1354/508
Degrees of freedom	300
Significance	p=0./0001

Fig. 1: Scree plot for determining factors included in barriers and facilitators identification instrument of hand washing among nurses

measured r = 95% with p = 0.0001 which proves that questionnaire has enough validity. The importance of hand washing as the first primary key way to prevent diseases is patently obvious therefore, hand washing is regarded as a criterion in health promotion evaluation in a country and among the most appropriate and best helpful methods in controlling diseases (Dyson *et al.*, 2013; Convert and Gibson, 2016). Accordingly, efforts to improve hand hygiene conditions in health care and medical staff is considered as a key priority by health and medical policymakers in the countries and some national standards have been developed and implemented in several countries (Huise *et al.*, 2013). Therefore, the need for the presence of a valid and reliable instrument for nurses was being felt more than ever for evaluating hand hygiene for this reason, the current study was conducted with the aim of evaluating psychometric characteristics of Persian version of barriers and facilitators identification instrument of hand washing among nurses.

The instrument contained 25 items and 5 dimensions as follows: "personal and environmental barriers" includes 9 questions referring to the nature of deficiencies and work-related difficulties the second dimension is associated with "surveillance and work ethic" including 5 questions; the third dimension includes "physical conditions and receiving benefits" containing 3 questions; the fourth dimension is "infection control and winning patient's trust" including 4 question and the fifth dimension is "observing patient's rights" containing just 1 question. Furthermore, questions 2, 14 and 19 were omitted since they were not related to any of the factors and their omission was permitted according to theoretical foundations of research. Therefore, it can finally be stated that barriers and facilitators assessment instrument of hand washing among nurses includes 5 factors along with 22 items. Comparing translated and localized version with Judith's original instrument (the main designer of instrument), they was found to have some similarities and differences in several aspects. Judith's instrument comprises 33 items and 11 dimensions as follows: 1, 2-knowledge and skill of items (4 questions), 3- professional roles (4 questions), 4-beliefs about capabilities (5 questions), 5-beliefs about consequences (4 questions), 6-motivations and goals (3 questions), 7- memory and attention (3 questions), 8-environmental resources (3 questions), 9-social influences (4 questions), 10-emotions (4 questions), 11-operational plan (2 questions). The difference between this research and Judith's study is related to items so that Judith's main instrument has 33 items while there is 22 items in this research; additionally, there are 11 dimensions in Judith's instrument whereas 5 modified domains are included in the present study. The two studies also differ in terms of classification of items, for instance there are 4 items in the first dimension while the first domain in the current study includes 9 items. In addition, the number of samples in Judith's research is 354 and encompasses all healthcare workers while 184 samples exclusively among nurses are included in this research which makes it more specified. This research can be compared with Dyson (2013)'s original study from other aspects; Cronbach's alpha score of instrument in Judith's study was measured 84% indicating that questionnaire has got a good internal consistency and also questions has good construct validity due to the obtained value of p<0.01 which is regarded significant. Compared with hand washing instrument among nurses, Cronbach's alpha was 88% and p = 0.001 was significant which suggests that instrument has a good internal consistency. Furthermore, reliability of instrument was calculated 80% for the whole

Table 3: Eigenvalue of variance percentage of the extracted variables

Components	Eigenvalue			Sum of extractedloads before rotation			Sum of extractedloads after rotation		
	Eigenvalue	Percentage of variance	Percentage of variance density	Eigenvalue	Percentage of variance	Eigenvalue	Eigenvalue	Percentage of variance density	variance density
1	6/719	26/875	26/875	6/719	26/875	26/875	4/794	19/176	19/176
2	1/916	7/662	34/537	1/916	7/662	34/537	2/414	9/654	28/830
3	1/464	5/856	40/393	1/464	5/856	40/393	2/307	9/226	38/056
4	1/378	5/512	45/906	1/378	5/512	45/906	1/907	7/629	45/685
5	1/172	5/595	50/595	1/172	4/689	50/595	1/228	4/910	50/595

Table 4: Rotated matrix of extracted components based on factor load

Questions

	Factor				
	1	2	3	4	5
16	0.693	0.169	0.124	0.193	0.137
17	0.689			./190	
3	0.676		0.125		0.178
11	0.656	0.153	0.363		
15	0.634			0.270	0.179
10	0.631	0.162	0.304		0.107
12	0.617		280		
5	0.617		0.399	0.173	
14	0.612	0.285	0.215		
21	0.579	0.223	0.118	0.156	0.499
19	0.498	0.191	0.339	0.318	0.195
22		0.724			
23	0.196	0.596			0.152
25		0.540	0.130	0.209	
24	0.122	0.509	0.214		0.337
6	0.118	0.485	0.398		0.170
2		0.383	0.218	0.116	0.213
7	0.198	0.196	0.669		
8	0.347		0.614	0.104	
4	0.338	0.109	0.550		
18	0.131			0.784	
20	0.131	0.149		0.616	0.131
13	0.174		.306	0.541	0.100
9		0.329	0.346	0.440	
1	0.104	0.373	0.110	0.143	0.746

Table 5: Number of factors and questions

Row No	Name of factor	Number of question	Total Cronbach's alpha in the event of factor removing
1	"Personal and environmental barriers"	9	./88
2	"Surveillance and work ethic"	5	
3	"Physical conditions and receiving benefits"	3	
4	"Infection control and winning patient's trust"	4	
5	"Observing patient's rights"	1	
6	Total test	22	

instrument through internal consistency (Chronbach's alpha) using CVI and CVR indexes. CVI was confirmed in this questionnaire due to the obtained score of 79% or higher. Moreover, according to Lawshe Table (Lawshe, 1975) for determining the minimum value of content validity ratio index, cases with CVR score higher than 56% (based on 12 experts assessment) were retained (p<0.05) and compared with Judith's research in which the total consistency of instrument designed by her was assessed 84%, statistical results show that both studies have got a good consistency.

Therefore, psychometric characteristics of this questionnaire indicate its reliability and validity; consequently, the instrument can be applied by healthcare and infection control practitioners in various medical centers to improve and promote hand hygiene quality and prevent infection.

CONCLUSION

The valid persian version of hand washing assessment instrument can be applied for evaluating the existing conditions in order to provide feedback and self-awareness in nurses and help nurse managers in the area of professional practice evaluation. This instrument which includes 22 items and 5 dimensions, despite having features such as simple scoring, acceptable reliability and validity, small number of questions, short expressions and the capability of deploying at a short time and applying in various researches is an appropriate tool that can be simply used within the other areas such as epidemiology, training, research and clinical studies.

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