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Exploration of knowledge of, adherence to, attitude and barriers toward evidence-based guidelines (EBGs) for prevention of ventilator-associated pneumonia (VAP) in healthcare workers of pediatric cardiac intensive care units (PCICUs): A Quali-Quantitative survey

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ABSTRACT

Implementation of evidence-based guidelines (EBGs) is an effective measure for prevention of ventilator-associated pneumonia (VAP). Appropriate knowledge, attitude and adherence of healthcare workers (HCWs) to EBGs are necessary factors for implementation of EBGs. This study was conducted with objective of evaluation of knowledge, attitude, and adherence of HCWs to EBGs for prevention of VAP and exploration of the barriers of their implementation in clinical practice. Totally, a total number of 45 HCWs of two pediatric cardiac surgery ICU (PCICUs) participated in this quali-quantitative survey. Knowledge, attitude and adherence of participants was evaluated by a validated multiple-choice questionnaire and barriers of implementation of EBGs was extracted from participants' answer to an open-ended question of our self-made questionnaire. Knowledge of HCWs was poor and significantly different between nurse assistants (RAs), nurses (RNs), and physicians (MDs) (respectively, 1.25±0.95, 4.53±1.73, and 5.54±2.01, P=0.001). Likewise, attit ude of HCWs is not positive and significantly different between NAs, RNs, and MDs (respectively, 32.96±2.42, 34.00± 2.44, 36.81±4.35, P=0.003). The adherence of HCWs i s not good and different between RAs, RNs, and MDs (respectively, 11.50±1.00, 13.13±1.83, and 17.18±6.06, P= 0.17). The Barriers of implementation of EBGs was categorized into four category of individual, organizational, social, and educational factors. Unsatisfying status of knowledge, attitude, and adherence of HCWs is a challenging concern of health-care system, especially in PICUs. In addition to these well-known factors, poor implementation of EBGs is related to many other barriers which should recognized and taken into consideration for designation of infection controlling programs.

Keywords: Ventilator-associated pneumonia, evidence-based healthcare management, nosocomial infections, preventive measures, health plan implementation

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INTRODUCTION

Implantation of evidence-based guidelines (EBGs) in clinical practice is an effective measure for prevention of prevalent disease. Development and implementation of EBGs is an important and complex process and need to abundant time and cost. Although the countries and healthcare systems are spending billions of dollars annually for translation of EBGs into clinical practice, this costly efforts have not yielded a brilliant results [1]. Prevention of ventilator associated pneumonia (VAP) by the way of implementation of EBGs, is one of the most common examples of these hard labors. The leading rationale of importance of controlling VAP is because of its high prevalence, increased morbidity and mortality, prolonged ICU and hospital stay, and excessive costs. Although the abundant time and energy which spend for prevention of VAP, this nosocomial infection is still remains a challenging problem in intensive care units (ICUs), especially for pediatric populations [2,3].

Previous studies is shown that preventive strategies of VAP can decrease the rate of VAP and consequently can decrease the burden of costs on healthcare systems. Furthermore, prevention of VAP can improve patients' outcomes and increase quality of care [4]. Despite the prolonged history of EBGs for preventing VAP, knowledge, attitude and adherence of healthcare workers (HCWs) regarding these EBGs is not still unequivocal. In other hand, there is only very limited studies compare these items among all of HCWs such as physicians, nurses and assistant nurses providing direct care for patients underwent mechanical ventilation [4-8]. Additionally, the main focus of available literatures is assessment of VAP in sitting of adult ICUs. Up to now, the status of knowledge, attitude and adherence HCWs of pediatric ICUs (PICUs) is not acknowledged.

Therefore, more studies is required to achieve a better perspective for understanding knowledge, attitudes and adherence of PICUs regarding EBGs for preventing VAP. Consequently, this study was carried out with objective of evaluation of knowledge about, attitude toward, and adherence to EBGs for prevention of VAP as well as investigation of barriers of implementation of these guidelines in practice from HCWs' viewpoint.

MATERIALS AND METHODS

Study design

This cross-sectional survey study with quali-quantitative design was conducted after approval of ethical committee of our university, between February and November of 2015 in sitting of an 8-bed and a 4-bed pediatric cardiac intensive care unit (PCICU). The sample population of study are consisted all HCWs of these PCICUs, including anesthesiologists, pediatricians, cardiac surgeons, nurses, and nurse assistants. Totally, the number of 53 HCW were enrolled in our study and they were divided into 3 groups of physicians (MDs), registered nurses (RNs), and nurse assistants (NAs). The inclusion criteria for participation were: 1) giving an informed consent, and 2) having responsibility of direct care for pediatrics who undergone mechanical ventilation. Totally, a number of 45 questionnaire returned and included in our study.

Questionnaire design

The questionnaire of study was developed based on recommendations of available EBGs. To expert panel's opinion, certain preventive strategies was selected for development of study's questionnaire (included 36 question). In addition to demographic questions (n=6), the other questions of this self-made questionnaire was categorized into 3 area as following: 1) multiple choice questions of knowledge area (n=10), 2) five-point Likert questions of attitude area (n=10), 3) five-point Likert questions of adherence area (n=10). Each question of knowledge questionnaire had a 0.1 point, therefore, total score of knowledge area can be probably ranged from 0 to 10 points. Likewise, each question of attitude's and adherence's questionnaire can be ranged from 1 to 5 point. Consequently, total score of attitude and adherence areas of questionnaire can be ranged from 10 to 50 points for each area. Also, the questionnaire included an open-ended question which asked "Based on your viewpoint, what are the barriers of implementation of EBGs for prevention of VAP in clinical practice?". Then, the barriers of implementation of EBGs was emerged by conventional content analysis on the answers of participants to this question.

Subsequently, face and content validity of the questionnaire was assessed and confirmed, based on the opinion of expert panel. Besides, reliability of questionnaire confirmed using test-re-test analysis. After ensuring acceptable validity and reliability of questionnaire, the instrument was distributed between HCWs of target PCICUs.

Statistical analysis

Continuous variables are presented as mean±standard deviation (SD) and discrete variables as frequency (percent). Pearson's Chi Square or Spearman Rho tests are used (as appropriate) for verification of test-retest reliability. We used one-way ANOVA or Kruskal-Wallis tests (as appropriate) for analyzing the scores of knowledge, attitude and adherence between groups. Statistical analysis was performed by using SPSS software for Windows (Version 20, SPSS Inc., Chicago, Ill.). In all of the tests, *P* value < 0.05 was considered as significant level.

RESULTS

A number of 45 person of a total number of 53 HCWs, participated in our study (84.9%). Demographic characteristics of participants are summarized in table 1. As the table presents, the majority of participants were nurses (n=30, 66.7%), and the rest of them included pediatricians (n=5, 11.1%), anesthesiologists (n=4, 8.9%), nurse assistants (n=4, 8.9%), and cardiac surgeons (n=2, 4.4%). Total professional experience of participants was 13.71±5.58 year and total of their experience in pediatric intensive care area was 11.16±6.16 year.

Table 1: Demographic characteristics of participants

Characteristic of participants (N=45)		Frequency (%) or Mean±SD
Gender	Male	20 (44.4%)
	Female	25 (55.6%)
Profession	Nurse assistant	4 (8.9%)
	Nurse	30 (66.7%)
	Cardiac Surgeon	2 (4.4%)
	Pediatrician	5 (11.1%)
	Anesthesiologist	4 (8.9%)
Highest Qualification	Diploma	4 (8.9%)
	BSn[a]	26 (57.8%)
	MSn[a]	3 (6.7%)
	PhD[a]	1 (2.2%)
	MD[a]	11 (24.4%)
Year OF Experience in pediatrics ICU		11.16±6.16
Total Year of Professional Experience		13.71±5.58

[a] *Abbreviations: BSn: Bachelor of Science in nursing, MSn: Master of Science in nursing, PhD: Doctor of Philosophy, MD: Medical Doctor*

The knowledge's scores of HCWs about EB strategies for prevention of VAP are described in table 2. As the table indicates, Total knowledge's score of HCWs was significantly different between NAs, RNs, and MDs (respectively, 1.25±0.95, 4.53±1.73, and 5.54±2.01, P=0.001).

Table 2: Level of HCW's knowledge about EB strategies for prevention of VAP

Item	Score of knowledge (Mean±SD)			P value
	NA[a]	RN[a]	MD[a]	
Total score of Knowledge about strategies	1.25±0.95	4.53±1.73	5.54±2.01	0.001
Oral Intubation	0.25±0.50	0.43±0.50	0.36±0.50	
Using antibacterial HMEs [a]	0.25±0.50	0.33±0.47	0.45±0.52	Post Hoc
Changing ventilator circuits for every new patients	0.00±0.00	0.23±0.43	0.45±0.52	M>R>>N
Close suction system	0.00±0.00	0.27±0.45	0.55±0.52	
Continuous subglottic suctioning	0.00±0.00	0.47±0.50	0.64±0.50	
Semi-recumbent positioning	0.25±0.50	0.57±0.50	0.64±0.50	
Chlorhexidine oral rinse	0.00±0.00	0.43±0.50	0.55±0.50	
Sedation vocation	0.00±0.00	0.50±0.50	0.64±0.52	
Early removal of nasal feeding tubes	0.00±0.00	0.30±0.46	0.27±0.46	
Standard precautions (gloves, hand washing, etc.)	0.50±0.57	1.00±0.00	1.00±0.00	

[a] *Abbreviations: NA (or N): Nurse Assistant, RN (or R): Registered Nurse, MD (or M): Medical Doctor, HME: Heat-moisture exchanger*

Comparison of knowledge's score between HCW professions is shown that the poorest score of knowledge was related to NAs and the highest score were related to MDs (MD>RN>NA).

The Scores of attitude of HCWs toward EB strategies for prevention of VAP are described in table 3. As the table indicates, total score of attitude of HCWs was significantly different between RAs, RNs, and MDs (respectively, 32.96±2.42, 34.00±2.44, 36.81±4.35, P=0.003). Likewise knowledge area, MDs have a better score in attitude area

which indicate more positive attitudes toward EB strategies for prevention of VAP in MDs rather than RAs and RNs.

Table 3: Level of HCW's attitude toward EB strategies for prevention of VAP

Item	Score of attitude (Mean±SD)			P value
	NA[a]	RN[a]	MD[a]	
Total score of attitude toward strategies	32.96±2.42	34.00±2.44	36.81±4.35	0.003
Oral Intubation	3.03±1.15	4.00±0.81	3.27±0.90	
Using antibacterial HMEs[a]	3.77±1.19	3.75±0.95	4.00±0.89	Post Hoc M>R>N
Changing ventilator circuits for every new patients	3.23±1.00	3.00±0.00	3.36±1.50	
Close suction system	3.73±1.33	3.00±0.00	3.82±0.98	
Continuous subglottic suctioning	3.03±1.32	3.00±0.00	3.27±1.34	
Semi-recumbent positioning	3.47±1.25	3.50±1.73	4.45±0.93	
Chlorhexidine oral rinse	3.47±1.13	3.00±0.00	3.73±1.19	
Sedation vocation	3.30±1.39	3.00±0.00	3.18±1.25	
Early removal of nasal feeding tubes	3.33±1.47	3.25±1.50	3.27±1.55	
Standard precautions (gloves, hand washing, etc.)	3.60±0.72	4.50±1.00	4.45±1.21	

[a] *Abbreviations: NA: Nurse Assistant, RN: Registered Nurse, MD: Medical Doctor, , HME: Heat-moisture exchanger*

Table 4: Level of HCW's adherence to EB strategies for prevention of VAP

Item	Score of adherence (Mean±SD)			P value
	NA[a]	RN[a]	MD[a]	
Total score of Adherence to strategies	11.50±1.00	13.13±1.83	17.18±6.06	0.17[c]
Oral Intubation	NR[b]	1.67±1.51	2.82±2.08	
Using antibacterial HMEs[a]	N/A[b]	N/A[b]	N/A[b]	
Changing ventilator circuits for every new patients	5.00±0.00	5.00±0.00	NR[b]	
Close suction system	N/A[b]	N/A[b]	N/A[b]	
Continuous subglottic suctioning	N/A[b]	N/A[b]	N/A[b]	
Semi-recumbent positioning	3.25±2.06	3.77±1.54	4.55±0.82	
Chlorhexidine oral rinse	N/A[b]	N/A[b]	N/A[b]	
Sedation vocation	NR[b]	3.73±1.59	3.45±1.96	
Early removal of nasal feeding tubes	NR[b]	1.53±1.04	2.55±1.80	
Standard precautions (gloves, hand washing, etc.)	3.25±1.50	4.37±0.61	3.82±0.98	

[a] *Abbreviations: NA: Nurse Assistant, RN: Registered Nurse, MD: Medical Doctor, , HME: Heat-moisture exchanger*

[b] *Reason of inapplicability: NR: Not responsibility, N/A: Not availability*

[c] *Calculated based on only two strategies of standard precautions and semi-recumbent positioning*

Table 5: Barriers to implementation of EBGs for prevention of VAP from participants' viewpoint

Domain	Barriers [a]
Individual Factors	Negative personality traits
	Negative attitude
	Lack of Moral responsibility
	Low levels of knowledge
	Inappropriate personal values
	Irreligiousness
Organizational factors	Lack of time
	Lack of facilities
	Lack of enough supports
	Weak leadership
	Lack of supervision
	Cost-effectiveness issues
	Lack of Collaboration
	Ethical issues
Educational factors	Complication in recommendations
	Ineffective academic educations
	Curriculum issues
	Post-graduation education limitations
Social factors	Economic problems
	Lack of governmental support

[a] *This barriers extracted from the open-ended question of questionnaire of study*

The Scores of adherence of HCWs toward EB strategies for prevention of VAP are described in table 4. As the table indicates, Total score of self-reported adherence of HCWs to EB strategies for prevention of VAP is not

significantly different between RAs, RNs, and MDs (respectively, 11.50±1.00, 13.13±1.83, and 17.18±6.06, P=0.17).

As Hsieh and Shannon have described [9], The barriers of implementation of EBGs for prevention of VAP was emerged by conventional content analysis of participants' answers to the open-ended question. The barriers was interpreted and thematic categories was emerged as four key domains including, Individual, Organizational, educational, and social factors. The extracted domains and barriers of implementation of preventive EBGs of VAP are listed in the table 5.

DISCUSSION

It is well-known that HCWs play a pivotal role in prevention of VAP. Despite numerous studies that have addressed knowledge of nurses or physicians about preventive strategies of VAP, there is only a few studies that undertaken to assess and compare knowledge of mix groups of HCWs. In addition, although the prolonged history of EBGs for prevention of VAP, there is not enough information about level of knowledge, attitude and adherence of HCWs, regarding VAP preventive strategies. Our results revealed that the knowledge of HCWs, including RAs, RNs, and MDs is not satisfying. Previous studies indicate HCWs have poor knowledge about EBGs for prevention of VAP [4-6]. An important difference between findings of our study and other studies is that these studies is only limited to assessment of some healthcare professionals (mainly nurses), but our results are extended to assessment and comparison of more professionals (including, RAs, RNs, and MDs). To our results, the level of knowledge of our participants was relatively poor and the poorest level of knowledge was respectively related to nurse assistants, nurses, and physicians. Poor to medium level of knowledge about EBGs for prevention of VAP is a common result in previous studies and good level of knowledge is a less reported finding [7-10].

The cognitive factors, such as attitude and beliefs are strongly influenced by thinking, reasoning and knowledge of HCWs. Therefore, poor knowledge can potentially lead to negative attitude of healthcare professionals toward EBGs of VAP and vice versa [11]. Our results is shown that the attitude of HCWs toward preventive strategies of VAP was not very positive. The poorest scores of attitude were related to nurse assistants, and higher scores was related to physicians, but overall score of HCWs was not indicate positive attitude for any professions. The association between knowledge and attitudes was previously experienced and confirmed earlier [12]. Then, we speculate from our results that the low scores of our participants' knowledge maybe link with their low scores of attitude toward preventive strategies of VAP.

Based on behavioral theories, intentions and individual behaviors are basically determined by many personal factors such as knowledge, perception, and beliefs [12,13]. As predicted, Likewise previous studies that demonstrated a poor implementation of preventive strategies of VAP by HCWs in clinical practice, the self-reported adherence of our participants to preventive strategies of VAP was not high enough [12,14]. In contrast to other studies that reported a greater adherence for nurses rather than physicians, our results is shown a greater non-adherence for nurses rather than physicians [14]. This significant difference can be cause by distinct responsibilities of HCWs that make complicated to compare the adherence of these HCWs together. Some of preventive strategies for VAP are not a routine responsibilities for every HCWs. In the other words, some strategies of EBGs directly address physicians (mainly pharmacological strategies), or nurses (mainly non-pharmacological strategies) and a few strategies are accounted as common practice between all of HCWs. Our study analyzed level of adherence to EBGs for prevention of VAP based on only two common strategies of standard precautions and semi-recumbent positioning which are common responsibilities for all HCWs. Consequently, the adherence level of our participants were different with reports of other studies which included other strategies in their analyses.

Adherence is a multifactorial health behavior. In order to implementation of EBGs for prevention of VAP, these factors should be recognize and take into account for designing of any preventive intervention. Evidences suggest that the maximum effectiveness of any infection control programs increase when originations of health-behaviors is considered [15]. As mentioned before, we categorized the barriers toward implementation of EBGs for prevention of VAP in practice into the four key domain of individual, organizational, social, and educational factors. To participants' viewpoint, Individual barriers are one of the reasons of non-adherence to preventive strategies of VAP. In this perspective, resistance from HCWs to EBGs can significantly decrease adopting evidence-based strategies in clinical practice. In coherent with our participants, available evidences suggest that these individual factors are powerful motivational variables and major determination of whether an intention take place into an action or not [15].

Based on our participants' viewpoint, organizational and social factors are another important variables that can potentially work as a barrier for implantation of EBGs. Given that every effort to bridging the gap between EBGs and practice should be executed through organizational and social bed, these factors assumed as key infrastructures for adapting any EBGs by healthcare professions [16]. Therefore, these aspects should take into consideration when health decision makers, managers, and opinion leaders decide to enhance adherence of HCWs to EBGs [1].

It is well known that there is a "theory practice gap" between evidence-based knowledge and routine clinical practice [5,17]. To our participants' perspective, another domain of barriers of adherence to EBGs is related to educational factors. Although clinical guidelines are essentially designed for translation of evidence-based knowledge into clinical practice, this process sometimes is problematic and source of non-adherence, itself. In any way, we can turn the barriers into facilitators to increase adherence to EBGs for prevention of VAP by successful identification and controlling of these barriers [17].

CONCLUSION

Previous studies on knowledge, attitude and adherence behavior of HCWs regarding EBGs for prevention of VAP, was typically focused on limited group of professions (i.e., nurses or physicians) and rarely assess and compare mixed groups of HCWs. Our study is shown that the scores of our participants (including, MDs, RNs, and NAs) in three areas of knowledge, attitude and adherence was not satisfying. Having good knowledge, positive attitude, and great adherence regarding preventive EBGs of VAP by HCWs is extremely important health concern because of following reasons: Firstly, VAP is costly disease that associated with high morbidity and mortality in hospitalized patients. Secondly, the HCWs are key elements of development of VAP that play an important role in controlling this complication by adherence to recommendation of EBGs. Thirdly, the HCWs are most key element of development, planning and tailoring EBGs to use in clinical practice. Lastly, the most effective, inexpensive, and easiest way of improvement of adherence to preventive evidence-based guidelines is interventions, targeting HCWs who have responsibility of direct care of patients [1,10,17].

Implementation of EBGs is a costly and complex process aimed to increase adoption and adherence of HCWs to evidence-based strategies in routine clinical practice. The human behavior is affected by numerous variables which can reinforce or inhibit a human being, to do or not to do an intention. In other word, existence or lack of some conditions can work as a facilitator or in contrary as a barrier for HCWs to adopt and adhere to EBGs. These pivotal variables are the subject of researches in some areas of neuropsychology. The main focus of these sciences has been on individual factors but according to our results there is another influential variables such as organizational, social, and educational factors which neglected in these researches [1,18]. Hence, these powerful factors are discarded in design of preventive interventions especially for prevention of VAP. In this perspective, we suggest that researchers, infection control nurses, health managers and decision makers should take the potential barriers of implementation of EBGs into consideration for planning preventive interventions aimed VAP.

Contribution Details
HB and GM: concept, design, definition of intellectual content, literature search
LJ: data acquisition
GM and LJ: data analysis, statistical analysis, manuscript preparation
DM and HB: manuscript editing and manuscript review

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