Original Paper

Effective Performance of Knowledge Management in Single-Specialty Cardiovascular Hospital

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ABSTRACT

Introduction: Organizations can manage knowledge inside and create organizational learning mechanisms to integrate Knowledge Management (KM) at their core of strategic policies.

Objective: This research was conducted to identify and prioritize influential factors on the effective performance of KM in a specialized cardiovascular on-call hospital.

Materials and Methods: The methodology of this study was cross-sectional analytical. The statistical population included all personnel with Bauchler (BSc) and higher degrees in a specialty cardiovascular hospital in Karaj City, Iran (N=452). The data collection tool was a researcher-made 38-item questionnaire. The reliability of the research tool was estimated as 0.97 using the Cronbach α coefficient. The exploratory and confirmatory factor analyses were performed to analyze the obtained data.

Results: Based on the findings, 64.2% of the participants were females 48.37% had Bauchler degree. Five major factors were identified in the adequate performance of KM in hospitals, and they explained 76.21% of the general variance. Among these variables, technological and cultural factors (0.94) had the most and human factor (0.41) the least regressive weight. The knowledge management situation was lower than the mean score of the questionnaire (P=0.01, Mean±SD= 2.52±1.08).

Conclusion: Organizational culture and technology are more important than other factors to establish KM. Therefore, maintaining and strengthening the cultural components affecting KM and establishing the necessary information technology should be the priorities of universities of medical sciences.

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Highlights

● Knowledge management refers to the administration of processes for the creation, storage, access, and publishing of scholarly information.

● There seems to be a significant relationship between KM and given activities and staff performance.

● In this study, five significant factors were identified in the effective performance of KM in hospitals.

● The technology-cultural factor had the most and the human factor the least regressive weight.

Plain Language Summary

Human resources may not appropriately manage knowledge in organizations. The knowledge of personnel is implicit and is hidden in actions and behaviors. This information is conveyed in the execution of various therapeutic and medical care activities. Rapid access to information and support decision-making in critical healthcare situations is inevitable. Despite the importance of knowledge management, effective knowledge management performance in the hospital has not been appropriately considered. Today, however, hospitals, besides their primary goal, which is to promote health, are constantly interacting with their environment, creating new knowledge and integrating it into communication networks to others who can easily use these data. Using knowledge management, the required knowledge can be made available to the right people at the right time and in the right way. Therefore, hospitals should pay special attention to the issue of knowledge management and acquisition. This goal cannot be achieved without determining the factors affecting the implementation of knowledge management.

Introduction

Knowledge Management (KM) refers to the administration of processes for the creation, storage, access, and publishing of scholarly information in an organization [1]. An enormous proportion of an organization's assets may be latent in the brains of its personnel [2]. Nowadays, organizations concluded that they could utilize their intellectual capability for the improvement of organizational performance by the implementation of KM. Furthermore, the positive and significant relationship between KM and given activities and performance has already been emphasized [3]. Those communities and organizations that devote their more outstanding commitment to knowledge will expect advancement in the future [4].

Human resources may not appropriately manage knowledge in organizations because knowledge of personnel is implicit, and tacit knowledge is hidden in actions and behaviors. This information is conveyed in the execution of various therapeutic and medical care activities. Implicit knowledge may not be easily expressed, but practical learning in academic students and medical team, and healthcare may be transferred mainly by implicit knowledge. However, they can manage the operational climate in an organization to develop and share information. Organizations can manage knowledge inside and create organizational learning mechanisms to integrate KM at the core of their strategic policies [5].

Accordingly, KM contributes to organizations in identifying, selecting, organizing, and publishing important data and skills. These assets are assumed as organizational memory and usually found as unorganized. Findings of researchers, such as Tretiakov et al. have emphasized the necessity and importance of KM [6].

Providing high-quality care for the patient requires effective leadership since medical care for the patient and evidence-based medication are key points [7]. Besides their primary goal that is healthcare improvement, hospitals are organizations that constantly interact with their surrounding environment and create new knowledge and share them with communication networks uniformly so that others can easily use these data [8]. These networks are very popular among medical and paramedical students [9]. KM can play a vital role in transferring research findings to hospital environment. KM can provide the required knowledge and data for the hospital environment at the right time, to the right individuals, and by the right method. Thus, hospitals should pay due attention to the subject of KM and knowledge

Mehrabian-Hassanloo & Keikavoosi-Arani. Performance of knowledge management in Hospital. J Holist Nurs Midwifery. 2022; 32(1):78-87.

79

acquisition. This objective is impossible without determining effective factors in implementing KM [8].

As mentioned before, knowledge management is precious and effective in providing hospital care, especially in hospitals facing an influx of emergency patients. This study was performed to identify and prioritize influential factors on the effective performance of KM in a specialized cardiac hospital affiliated with Alborz University of Medical Sciences, which deals with several cardiac emergency patients in Karaj City, Iran.

Materials and Methods

The methodology of this study was cross-sectional analytical. The study population included all personnel with Bauchler (BSc) or higher working in a specialty cardiovascular hospital in Karaj City, Iran, in 2018. This hospital has 108 physicians, 293 nurses, 10 paramedics (5 operation room specialists and 5 anesthetic experts), 12 experts in administrative affairs, 12 experts in financial activities, 7 educational and research experts, and 10 experts in para-clinical activities (N= 452). The sample size was estimated according to Krejcie and Morgan's table as 215 subjects, and a simple stratified method was used for sampling by the observance of a proportional number of members in the statistical population. Accordingly, 51 physicians, 139 nurses, 5 members of paramedic staff, 6 administrative employees, 6 financial personnel, 3 members of educational and research unit, and 5 members of para-clinical staff were recruited.

A researcher-made questionnaire was used as a data collection tool. The questionnaire initially included 38 items scored on a 5-point Likert scale (1= very low through 5= very high). First, we developed this questionnaire by reviewing the literature [10-14]. The questionnaire of KM was measured by explicit variables of leadership (8 questions), human (4 questions), process (8 questions), technology (6 questions), culture (6 questions), and structure (6 questions).

Then, the face validity, content validity, and construct validity of the items generated from the qualitative phase were assessed. The score of face validity was computed based on the impact score of each item, and a score equal to or greater than 1.5 was considered reasonable by 10 experts. The Content Validity Index (CVI) and Content Validity Ratio (CVR) of items were also investigated by 10 experts in education management, medical education, and hospital administration. The score of CVI was calculated based on the simplicity/clarification and relevancy of each item, and a score equal

to or higher than 0.79 indicated an appropriate content validity. Moreover, the score of CVR was computed based on the necessity of each item, and a CVR score equal to or higher than 0.52 was envisaged a good content validity. After content and face validity were used to examine the validity of the questionnaire, 2 questions that did not meet the criteria were subsequently eliminated. The reliability of the items was assessed by internal consistency and test-retest. The Cronbach α coefficient (0.7) indicated a good internal consistency for this questionnaire. Next, the Kaiser-Meyer-Olkin (KMO) and Bartlett's Test of Sphericity indicated that the use of factor analysis and classification of questions were permissible (Bartlett= 7506.824, P≤0.01). Also, the results of the KMO test (0.894) showed that research data were suitable for factor analysis. The descriptive statistics results were presented as frequency, percentage, mean and standard deviation, and these data were used in the inferential statistics of exploratory and confirmatory factor analysis (Principals Factor Analysis). The exploratory factor analysis was performed using SPSS v. 21 and confirmatory factor analysis with LISREL 8.8 software. The exploratory factor analysis was performed with the maximum probability approach to identify the rate of loading of variables identified in the component, and the varimax orthogonal approach was used to interpret the variables. The confirmatory factor analysis was used to verify the fitness of factors achieved during the explanatory factor analysis. The fitness indexes were as follows: the Chi-square index, Goodness of Fit Index (GFI), Comparative Fit Index (CFI), Normed Fit Index (NFI), Non-normed Fit Index (NNFI), Incremental Fit Index (IFI), Related Fit Index (RFI), Adjusted Goodness of Fit Index (AGFI), Root Mean Square Error Of Approximation (RMSEA), and Root Mean Square Residual Index (RMSRI). If CFI, GFI, NFI, NNFI, IFI, RFI, and AGFI are higher than 0.90 and RMSEA and RMSRI less than 0.05, there is a desirable and appropriate fitness. Finally, a One-Sample t-test was used to compare knowledge management scores with the mean score of the tool.

Results

Based on the results, the study participants comprised 138 females (64.2%) and 68 males (31.6%). However, the gender of 4.2% of participants has not been reported. Also, 48.37% of the participants had BSc, and 26.04% had MSc. However, the educational degree of 3.73% of the participants was not reported. The Mean±SD age of study participants was 32.55±7.50 years. Moreover, 64 participants (29.77%) had more than 10 years of experience, and 32 (14.88%) had 1 to 3 years of experience.

Table 1. The results obtained from exploratory factor analysis using varimax rotation

Factor	Question	Factors Loading				
		1	2	3	4	5
Cultural and information technology factor	q_{29}	0.789	-	-	-	-
	q_{31}	0.787	-	-	-	-
	q_{30}	0.778	-	-	-	-
	q_{32}	0.777	-	-	-	-
	q_{26}	0.75	-	-	-	-
	q_{28}	0.712	-	-	-	-
	q_{27}	0.702	-	-	-	-
	q_{25}	0.686	-	-	-	-
	q_{19}	0.671	-	-	-	-
	q_{20}	0.645	-	-	-	-
	q_{24}	0.614	-	-	-	-
	q_{23}	0.592	-	-	-	-
	q_{22}	0.582	-	-	-	-
	q_{21}	0.578	-	-	-	-
Leadership	q_{2}	-	0.824	-	-	-
	q_{6}	-	0.806	-	-	-
	q_{7}	-	0.803	-	-	-
	q_{3}	-	0.792	-	-	-
	q_{4}	-	0.789	-	-	-
	q_{1}	-	0.764	-	-	-
	q_{5}	-	0.751	-	-	-
	q_{8}	-	0.659	-	-	-
Process	q_{16}	-	-	0.761	-	-
	q_{13}	-	-	0.757	-	-
	q_{15}	-	-	0.74	-	-
	q_{17}	-	-	0.732	-	-
	q_{14}	-	-	0.713	-	-
	q_{33}	-	-	0.693	0.541	-
	q_{18}	-	-	-	-	-
Structure	q_{36}	-	-	-	0.734	
	q_{35}	-	-	-	0.72	
	q_{34}	-	-	-	0.657	
	q_{37}	-	-	-	0.609	
	q_{38}	-	-	-	0.584	
Human	q_{10}	-	-	-	-	0.883
	q_{11}	-	-	-	-	0.872
	q_{12}	-	-	-	-	0.842
	q_{9}	-	-	-	-	0.506

Mehrabian-Hassanloo & Keikavoosi-Arani. Performance of knowledge management in Hospital. J Holist Nurs Midwifery. 2022; 32(1):78-87.
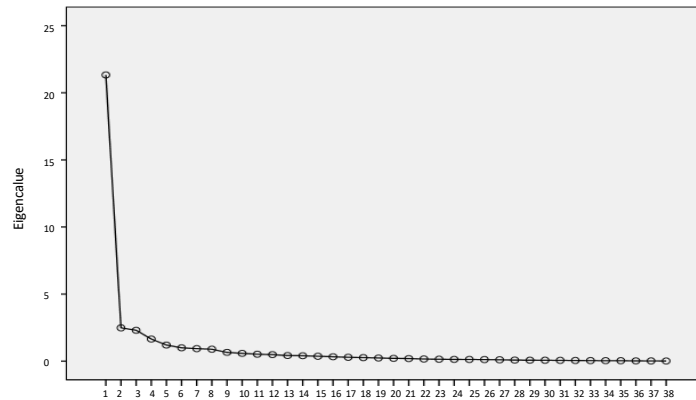
81

Figure 1. Screen plot diagram based on exploratory factor analysis to determine the correlation between items

Also, the service record was not reported for 9.77% of them. In terms of position, most of the participants (64.65%) were paramedics, and 3 (1.39%) were employed in the educational and research unit.

Factor loading with a coefficient of 0.505 was selected as an acceptable quantity in this study after conducting computerized analysis several times using SPSS v. 21 to obtain a simpler structure. As a result, if factor loading of a variable was lower than 0.505 over varimax rotation on all factors, it would be excluded from the test. In other words, a variable remained in the test if it had a factor loading of 0.505 or higher at least after rotation on one of the
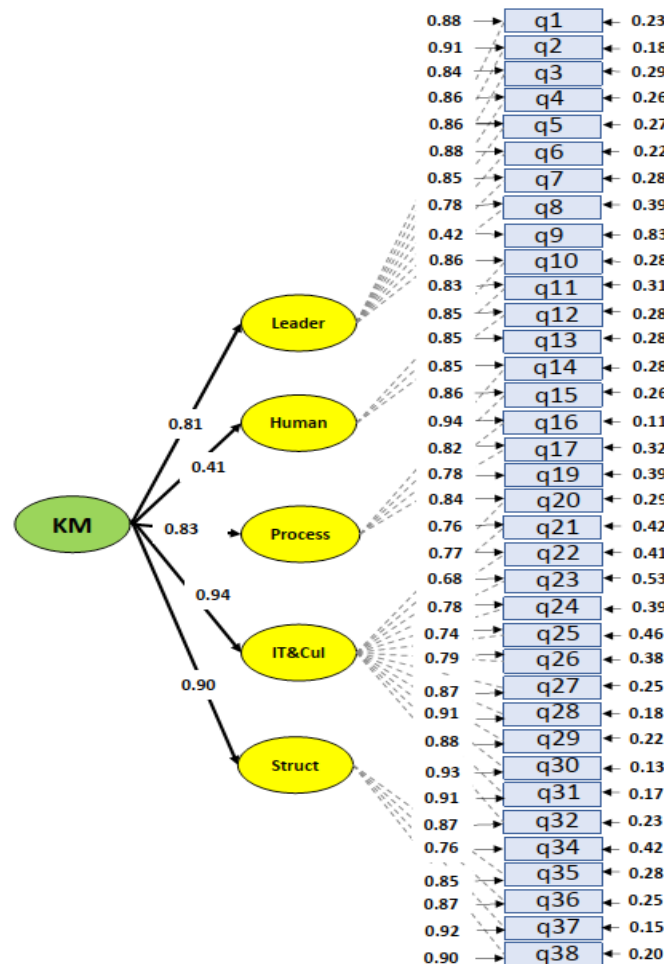

Figure 2. Standard estimation model based on standardized coefficients for knowledge management (km) variables

Mehrabian-Hassanloo & Keikavoosi-Arani. Performance of knowledge management in Hospital. J Holist Nurs Midwifery. 2022; 32(1):78-87.

factors. Therefore, 2 questions (q18 and q33) were deleted from 38 questions. Accordingly, the KM scale included 36 variables and scored on a 5-point Likert scale, and total scores vary from 36 to 180 (Table 1).

The five factors were extracted due to eigenvalues and scree plot (Figure 1). Overall, the suitable KM model in-cluded 5 factors of leadership (8 variables), human (4 variables), process (5 variables), technology-cultural (14 variables), and structure (5 variables). These factors ex-plained 76.21% of the general variance with an eigen-value higher than one (Table 2).

Table 2. Results of confirmatory factor analysis using LISREL software

Factor	Variable	Beta Coefficient (β)	t
Leadership	q1	0.88	14.76
	q2	0.91	18
	q3	0.84	15.88
	q4	0.86	16.07
	q 5	0.86	15.81
	q6	0.88	16.85
	q7	0.85	15.63
	q8	0.78	13.41
Human	q9	0.42	5.52
	q10	0.89	5.44
	q11	0.83	5.41
	q12	0.85	5.43
Process	q13	0.85	13.72
	q14	0.85	14.31
	q15	0.86	14.69
	q16	0.94	17.39
	q17	0.82	13.58
Information Technology and Culture	q19	0.78	12.35
	q20	0.84	12.74
	q21	0.76	11.19
	q22	0.77	11.26
	q23	0.68	9.75
	q24	0.78	11.55
	q25	0.74	10.69
	q26	0.79	11.65
	q27	0.87	13.28
	q28	0.91	14.09
	q29	0.88	13.62
	q30	0.93	14.75
	q31	0.91	14.21
	q32	0.87	13.42
Structure	q34	0.76	11.39
	q35	0.85	12.06
	q36	0.87	12.38
	q37	0..92	13.35
	q38	0.9	12.92

All are significant at the 0.05 level.

Mehrabian-Hassanloo & Keikavoosi-Arani. Performance of knowledge management in Hospital. J Holist Nurs Midwifery. 2022; 32(1):78-87.

83

Table 3. Analysis of general fitness indices in Knowledge Management Model

Index or Indicator	Index Value	Fitness
λ^2	2045.33	-
RMSEA	0.041	Good
df	584	-
χ^2/df	3.5	Medium
GFI	0.9	Perfect
AGFI	0.84	Medium
NFI	0.9	Perfect
NNFI	0.91	Perfect
CFI	0.98	Perfect
IFI	0.93	Perfect

RMSEA: Root Mean Square of Error of Approximation; df: Degree of Freedom; χ^2/df: Chi-square to df ratio; GFI: the Goodness of Fit Index; AGFI: Adjusted GFI; NFI: Normed Fit Index; NNFI: Non-Normed Fit Index; CFI: Comparative Fit Index; IFI: Incremental Fit Index.

Items were categorized in the extracted factors after determining optimal number factors among a group of factors using factor loading values and after rotation. Among these variables, the technology-cultural factor (0.94) had the most regressive weight while the human factor (0.41) had the least regressive weight.

KM, Leader, Human, Process, IT & Cul, and Struc terms present respectively knowledge management, leadership, human, process, information technology and culture, and structure in Figure 2.

All first- and second-order measurement equations were tested using 1-sample t test. The calculated values of the test for each factor load were above 1.96. All factor loadings were significant at a 95% confidence level. Since all coefficients became significant, all components and variables are necessary to implement KM.

General fitness indices, including absolute and incremental indices, were utilized to examine the model's validity and confirm the conceptual model by research data. The Chi-square value was significant, and the relative value of Chi-square was good (2-3) in the first-order single-factor model. Values of adjustment index (>0.90) were interpreted as acceptable quantities. Since NFI and CFI values were higher than 0.5, they are assumed acceptable. Finally, the value of RMSEA was close to 0.05 and acceptable. Generally, this model could be considered acceptable (Table 3).

The knowledge management situation was lower than the mean score of questionnaires in a specialized cardiovascular on-call hospital (P=0.01, Mean±SD= 2.52 ±1.08).

Discussion

The results obtained by factor analysis with varimax rotation confirmed 36 items that are classified into 5 factors: leadership, human, process, information technology-culture, and structure. Then, the accuracy of measuring structures by model fit indices was examined using structural equation measurement models.

These findings were consistent with the study of Soto-Acosta et al. regarding factors of culture, leadership, and infrastructure [10] and the study of Fernandes about factors of leadership and culture and motivation (human) [15] and also investigation done by Chang and Lin [16].

Culture had been assumed as a factor and Information Technology (IT) as another factor in conceptual research factor; however, these two factors were integrated into an appropriate model for this hospital. Information technology may affect and transform culture. In other words, it acts as a strong enabler and provides effective and adequate tools for the whole KM process.

The research findings of technological factors were consistent with the studies done by Soto-Acosta et al. [10], Turulja et al. [11], and Barros et al. [17] that have addressed technological factor in their studies. Regard-

ing the interpretation of this research finding, it should be mentioned that technological development aims to solve problems or obstacles in society and or utilize better sources and to create opportunities for growth and development. The managers in leading and knowledge-based organizations employ IT as an incentive, efficient, and effective factor in the development and achievement of KM. In other words, technology is one of the achievement factors of KM. Concerning the cultural factor of KM, the study findings were consistent with the study of Dilmaghani et al. [12]. They have implied that organizational culture was the most original barrier against KM and the creation and application of knowledge capitals in the organization. The importance of organizational culture and its effect on KM performance has been proved in Hsu and Sabherwal study, too [18].

As long as the governing organizational culture is not transformed in organizations, creating and guiding new knowledge will not result in a favorable outcome. This feature prepares the ground for other successful changes in the hospital, and it may help the directors to predict systematic preferences of change and better formulation of strategies to perform the management process successfully.

Hospital management plays an essential role in developing, preserving, and maintaining organizational culture. Also, the administrative characteristics of a director may form an organizational culture in a hospital. Similar to other organizations, managers of medical and healthcare services should be implicitly aware of the beliefs and values governing the organization. These values typically form the behavior of personnel and stimulate them.

The research findings of leadership factor were consistent with the results of many studies [7, 8, 13, 19], which have focused on the leadership factor for KM performance. It is also implied that one of the achievement factors in the realization of the organization's objectives is the way of implementation of management and leadership styles. In the position of organizational leadership, a director can use different styles to guide the human resources and increase the knowledge assets of the organization. Directors also move organizations toward favorable performance utilizing KM and suitable behavioral patterns. Supporting by and commitment to KM by top authorities can be very efficient in the effective performance of KM. As long as management does not commit to and notice KM, no activity starts, and if it begins will not have successful outcomes. Such support may appear in various forms, e.g., raising salaries

and wages for IT workers, preparation of the ground for personnel's involvement in making decisions, encouragement of new ideas, employment of appropriate workforce and formulation of strategy, etc.

Our findings of process factor were consistent with the results obtained by Qi and Chau [20] Kavalić [14], in which they have investigated process factor in their studies. It is necessary to consider the process factor of KM further. In other words, hospital directors should take duly measures in the process of identifying explicit and implicit knowledge among personnel, databases, documentation, suitable storage, sharing, and utilization from the acquired knowledge toward higher organizational objectives and knowledge creation. This process includes the acquisition, discovery, and development of knowledge.

The study findings of structural factor were consistent with the studies done by NooriSepehr and Keikavoosi-Arani [21]. Similarly, these findings were consistent with the studies conducted by Chaurasia et al. [22] and Anzures-García et al. [23], who addressed the structural factor. To interpret this finding, it should be said that two factors of structure and concentration are assumed as key and infrastructural variables that can affect KM implementation. KM implementation is related to the structural level and rules and regulations governing occupational decisions and relations in structure factor. The lower structure allows the organizational members to interact and communicate suitably for KM implementation. Alternately, structuralism may reduce ambiguities and improve cooperation among organizational personnel since it can form the regulations of interactions. Thus, it can be implied that structure is related to KM implementation.

KM implementation is concerned with decision-making power in an organization with a centralization factor. Decentralized structures distribute decision-making power. The rate of creative solutions seriously increases in such structures. Communicative canals are very slow and time-consuming in centralized structures. Therefore, the presence of a flexible and non-hierarchical structure is suitable for knowledge sharing.

The factors relating to human resources, such as motivation in personnel, may be another variable, which affects KM implementation. In other words, personnel is considered the KM heart and infrastructural factor. In other words, personnel create, store, transfer, and use the knowledge, and therefore they should enjoy the expertise, inclination, and motive (intention toward the

Mehrabian-Hassanloo & Keikavoosi-Arani. Performance of knowledge management in Hospital. J Holist Nurs Midwifery. 2022; 32(1):78-87.

85

behavior) for this action [24]. Thus, rising motive in personnel is vital for the realization of KM. Many researchers in their studies have noticed human factors [25, 26], and the results of this study were consistent with the findings of their investigations.

One of the limitations of this study was using self-reported questionnaires. On the whole, our findings suggest that organizational culture and technology are more important than other factors to establish KM. Therefore, maintaining and strengthening the cultural components affecting KM and establishing the necessary information technology should be the priorities of Alborz University of Medical Sciences.

Because of the significant role of technological, cultural, and structural factors, it is recommended that the following measures be taken in the hospitals: 1) upgrading of existing software in hospital, observing transparency in technical and infrastructural upgrading processes, updating of know-how and infrastructural knowledge, providing encouraging rules for enthusiastic personnel to get involved in the knowledge sharing process. The presence of KM is one of the requirements in educational environments that can constantly provide organizational learning by proposing feedback for all personnel at different levels and from various groups. Knowledge is created by conducting studies in teaching hospitals, and knowledge is transferred by the performance of theoretical and clinical training programs to change and improve medical practices.

KM provides opportunities for teachers, students, and beneficiaries in teaching hospitals to acquire knowledge from the environment. Thus instead of adding knowledge to various factors of their professional activities, they may keep their knowledge updated, create new knowledge and share it with other sources. Having knowledge, information, and educational techniques and rules and strategies is not sufficient for hospital personnel. This information must be organized, timely, and duly used in academic and medical settings.

It is suggested that KM be considered in the mission, outlook, and strategic plan of hospitals. Besides doing educational research and healthcare activities for patients, the medical teachers, personnel, and beneficiaries should engage in systematically creating, acquiring, sharing, and applying knowledge. Whereas the practical techniques perform the major part of healthcare and treatment, it is better to convert implicit medical knowledge into explicit knowledge at hospitals and put it forth

as clinical guidelines available to the users at appropriate levels.

Ethical Considerations

Compliance with ethical guidelines

This study was approved by the Ethics Committee of Alborz University of Medical Sciences (Code: IR.ABZUMS.REC.2018.002).

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Authors' contributions

Conceptualization and design: Nepton Mehrabian-Hassanloo and Leila Keikavoosi-Arani; Preparing all parts of the research and approval of the article's final version: All authors.

Conflict of interest

The authors declared no conflict of interest.

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86

Mehrabian-Hassanloo & Keikavoosi-Arani. Performance of knowledge management in Hospital. J Holist Nurs Midwifery. 2022; 32(1):78-87.

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Mehrabian-Hassanloo & Keikavoosi-Arani. Performance of knowledge management in Hospital. J Holist Nurs Midwifery. 2022; 32(1):78-87.

87