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The impact of lean management components on improved quality of public hospitals in Kohgiluyeh and Boyerahmad and Bushehr provinces

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ABSTRACT

The objective of this study was to investigate the impact of lean management components on improved service quality in public hospitals of Kohgiluyeh and Boyerahmad and Bushehr provinces. Fifty thousand employees of public hospitals of Kohkiloyeh-Boyer Ahmad and Bushehr provinces were selected using single-stage random cluster sampling method. Then, a researcher-made questionnaire was used to respond all employees of these hospitals. Structural equation modeling was used to analyze data. Structural equation modeling analyses confirmed the match between research model and experimental data. The results showed that the standard coefficient of all paths of communicative, processes, management, technology, structure, and human components of lean management to improved quality is significant. This means that all components of lean management have a direct impact on improved quality. Lean management leads to improved quality of services in public hospitals of Kohgiluyeh and Boyerahmad and Bushehr provinces.

Key words: lean management, improved quality, public hospitals

INTRODUCTION

In the past decade, health care professionals around the world have considered improved quality of services in priority of their plans. In the public sector of health care, improved quality of services emerged as a new phenomenon and a rapid shift was observed from low-cost paradigm of provision of health care to a new paradigm that encompasses the low cost, continuous improvement, and enhanced quality [1]. Recent reports in the UK and Europe showed that despite the focus on quality, few service organizations have violated from some basic standards, performance objectives agreed at international level, and expectations of patients [2].

In Iran, weak management and reduced efficiency of hospitals, skyrocketing health care costs, shortage of work force, the budget deficit, reduced quality of health services, and lack of satisfaction among patients and healthcare employees are some of challenges that hospitals, especially public hospitals, are involved with them. Many of

private hospitals and a few numbers of public hospitals have taken step in recent years to increase the tariffs received from patients by changing the management attitude and increasing health service quality. In this regard, they have achieved to considerable profitability. However, most of public hospitals run with government budget and managers appointed by medical sciences universities are constantly faced with loss, waste of medical resources, reduced service quality [3]. In response to these reports and procedures, health care organizations around the world have adopted and tested new systems such as lean management [4] in an effort to improve the quality of health care, to ensure patient safety, and to provide more services using fewer resources.

Lean was introduced for the first time among car manufacturing organizations in 1980. It was spread by a book titled as "a car changed the world" [5]. Since then, it was developed in the health care and public sector industries [6 and 7]. Lean management, as a modern management approach, is considered as an effective method to improve the quality of performance in organizations evolved health care area widely. This approach plays an effective role in reducing loses and errors, improvement of processes, increasing the patients and employees' satisfaction. Some of tangible results of the implementation of lean approach in hospitals include reduced time to determine patients' task in emergency, reduced hospital infections, reduced throw of non-consumable medical supplies, increased productivity of service forces, mean reduction of patients' hospitalization, reduced number of operating room cancellation ,increased productivity of hospital clinics, reduced energy consumption, etc. In addition to improved quality and delivery of services, they can be followed by large amount of financial resources and saving in costs [8]. Kolberg et al [2006] also reported very successful results of lean in health care. Because, since lean management contributes to increased value for patients by reducing unnecessary activities through optimization of service delivery process [9]. Finally, it will lead to simple and effective processes with fewer errors and higher quality, better use of resources, and consequently improved financial performance [10 and 11]. Lean management determined the value of certain process by distinguishing value-added activities from activities without value-added such as waste [12].

The implementation of lean management in health care could guide health care organizations to improvement of performances and outcomes, lower costs, and increased patients and employees' satisfaction [13]. Improvements and developments resulting from the application of lean health care include reduced hospitalization of patients, increased patients' satisfaction, reduces patient waiting time, reduces inventory level, increased visit number of patients to their doctor, eliminating waste, reduced costs, increased quality of services and patient safety, reduced overtime of employees, mistakes and accidents, reduced patient care period, patient recovery, reduce workload, increased employee satisfaction, reduced distances, and creation of a calmer and more orderly working environment [14]. Although health sector followed the lean services later, this thinking has been expanded in recent years in many medical centers and it could create significant improvements in providing high-quality services to patients and reducing costs and damages by reducing losses and wastes. This has been achieved by promoting appropriate culture and continuous improvement [15].

Therefore, researchers was to identify the lean management components and to predict the services quality improvement through these components. He also aimed to respond the question that if lean management components can predict the service quality of public hospitals.

MATERIALS AND METHODS

This study was correlational. The study population included all employees of public hospitals in Kohgiluyeh and Boyerahmad and Bushehr provinces. Using single-stage random cluster sampling, 500 of people were selected among population of study. Among all public hospitals of Kohgiluyeh and Boyerahmad and Bushehr provinces, 10 hospitals were selected randomly and questionnaires were delivered to staff of these hospitals to respond them. To collect data, a researcher-made questionnaire was used that contains 60 items and 7 sub-scales (human dimension, technology dimension, management dimension, improved quality dimension, process management dimension, communicative dimension, and structural dimension). Responses were scored based on five-choices Likert scale from very low (0), low (1), moderate (2), high (3), and very high (4). The questionnaire was developed based on research objective and its theoretical framework. After developing the questions and their subscales, questionnaire was delivered to three experts in the field of lean management to investigate its content validity. Content validity of the questionnaire was approved by three experts after reviewing. After confirming the validity of the questionnaire, to determine construct validity, exploratory factor analysis was used.

To implement exploratory factor analysis, the quality of correlation matrix of questions and the content sampling capability of questionnaire were evaluated. KMO coefficient was equal to 0.88, which implies that the information contained in the data matrix is significant and sample size is satisfactory. Based on the results of exploratory factor analysis using principal components analysis method and varimax rotation, 7 factors with eigenvalues greater than 1

were extracted explaining 64.54% of the total variance explained of scale. Confirmed factors in terms of variance percentage of eigenvalue include respectively human dimension, technology dimension, management dimension, improved quality dimension, process dimension, communicative dimension, and structural dimension. These findings confirmed the construct validity of the management model dimensions questionnaire.

In addition, to examine the reliability of this instrument, Cronbach's alpha coefficient was obtained as follows. Reliability of coefficient of human criterion (0.86), technology criterion (0.89), management criterion (0.92), improved quality criterion (0.89), process criterion (0.86), communicative criterion (0.88), and structural criterion (0.80). The total reliability of the instrument was obtained 0.95 using split-half method.

Findings

In general, 500 people participated in this study, which 50.2% of them were female and the remaining was male. In terms of age of subjects, 49.2% of them aged 41-50. In terms of educational level, 25.2% of them had graduate education, and terms of organizational status, 37.8% of them were expert. In terms of location, 42.4% of them belonged to Kohgiloyeh and Boyerahmad and 57.6% of them belonged to Bushehr province. Work experience of them was mainly in the range of 6-10 years.

After implementing the factor analysis and varimax rotation, 7 factors were finally identified that table (1) shows the total amount of variances explained by these seven factors.

Table (1)- the variance explained by the seven factors of lean management model

Factors	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	21.492	35.820	35.820	21.492	35.820	35.820	11.723	19.539	19.539
2	6.021	10.035	45.855	6.021	10.035	45.855	6.252	10.419	29.958
3	3.160	5.266	51.121	3.160	5.266	51.121	4.770	7.949	37.907
4	2.464	4.107	55.228	2.464	4.107	55.228	4.275	7.125	45.033
5	2.196	3.660	58.888	2.196	3.660	58.888	4.245	7.075	52.107
6	1.822	3.036	61.924	1.822	3.036	61.924	3.880	6.467	58.574
7	1.571	2.619	64.543	1.571	2.619	64.543	3.581	5.969	64.543
8	1.553	2.588	67.131						
9	1.379	2.298	69.429						
10	1.278	2.129	71.559						
11	1.108	1.846	73.405						
12	1.060	1.766	75.171						
13	.917	1.528	76.698						

The table above shows the eigenvalues and the variance associated with the factors. Eigenvalue of for each factor is ratio of total variable of the variables explained by that factor. According to results of table, research items are divided in 7 factors that the first factor and the seventh factor explain 19.539% and 58.574% of the variance respectively. Total these seven factors explain 64.543% of the variance.

Table 2.Mean of lean management factors after exploratory factor analysis

Factors	Minimum	Maximum	Mean	SD
human	9	25	18/418	3/977
Technology	13	39	28/290	4/567
Management	15	50	32/534	7/011
Improved quality	10	35	23/050	2/612
Process management	5	20	13/340	5/130
Communicative	11	40	27/108	5/130
Structural	8	32	21/162	3/761

As seen in the table above, management factor has the highest response mean with mean of 32.534 and standard deviation of 7.011, while the process factor had the lowest response mean with mean of 13.340 and standard deviation of 5.130.

Table 3- calculated correlation between quality improvement and lean management components

Components	1	2	3	4	5	6	7
1- Human	__						
2-technology	-0/58**	__					
3-Management	0/54**	0/60**	__				
4. Quality Improvement	0/47**	0/61**	0/62**	__			
5-process	0/58**	0/86**	0/63**	0/64**	__		
6-Communicative	0/48 **	0/72**	0/58**	0/66**	0/72**	__	
7-structural	0/41**	0/60 **	0/49**	0/57**	0/60**	0/64**	__

As shown in Table 1, calculated correlation among variables of study is statistically significant at 0.01 level.

Table 4- comparing fit indices of experimental model of study

Model	NFI	CFI	AGFI	GFI	RMSEA	P-Value	Chi-square
experimental model	0/88	0/95	0/81	0/73	0/81	0/000	45/05

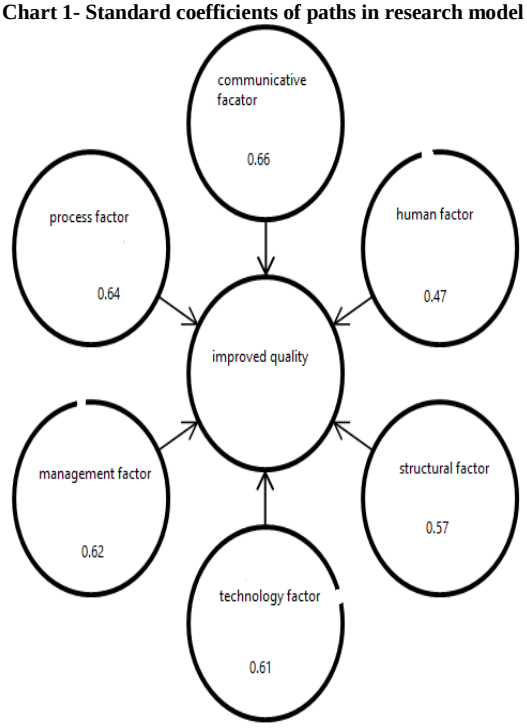
According to the findings of the Table (2), the proposed model of research in all fit indices such as NFI, CFI, AGFI, and GFI has relatively good fit. Fit indices of experimental model suggest that obtained data match with conceptual model (proposed). In other words, the data and experimental model are consistent with each other data support experimental model. As can be seen in the above table, two indices of GFI=0. 73 and AGFA = 0.86 are approximate to each other. As these indices are close to one, they represent complete fit of experimental model.

Table 4. Results of structural modeling for research model

Final model paths	Direct effects	T value
Communicative component → improved quality	0/66	18/03
Process component → improved quality	0/64	17/56
Management component → improved quality	0/62	17/21
Technology component → improved quality	0/61	14/28
Structural component → improved quality	0/57	12/44
Human component → improved quality	0/47	10/37

As can be seen in the table, the standard coefficient of all paths of communicative, processes, management, technology, structural, and human components of lean management on quality improvement is significant. This means that all components have a direct impact on improving the quality of lean management.

Chart 1- Standard coefficients of paths in research model



As can be seen in the chart above, all components of management lead to improved service quality of public hospitals.

DISCUSSION

The results of this study showed that communicative and human components of lean management have positive and significant relationship with improved quality. Additionally, communicative and human components have a direct impact on improved quality. The findings of this study are in line with findings of research conducted by Sheikhi [2013], Bani-Asadi, Vatankhah and Hosseini [2013], DiGioia, Greenhouse, Chermak & Hayden [2015], Andreamatteo, Lanni, Lega & Sargiacomo [2015], Farjam et al [2010], and Globenko & Sianova [2012]. All

researchers found that lean management improves service quality and they examined mostly human and communicative dimensions of lean management in their studies [3, 16-20].

It was also revealed that there is positive and significant relationship between technology and management components and improved quality, and these components have direct impact on improved quality. Considering the effect of technology on improved quality, we can refer to study conducted by Ker, Wang, Hajli, sang & Ker [2014] that is in line with the current study. Results of their study highlighted the impact of technology component of lean management on improved services quality and reduced waste, and it showed significant reduction in the time processes by selecting scan digital technology [21]. Considering the impact of management component on improved service quality of public hospitals, Abdullah, Uli & Tari [2008], Atkinson [2004] and Cotte, Farber, Merchant, Paranikas & Sirkin, [2008] stressed on the importance of management component and its impact on improving the quality .These researchers concluded that increasing the relationship among employees, and the relationship among employees and management will be one of the benefits of lean implementation. Clear and effective communication as one of the success factors in the application of lean management in the service sector is useful in providing feedback by employees to manager in order to improve the quality [22, 23, and 24].

Finally, the findings showed that there is a significant positive relationship among process and structural components with improved quality, and process and structural components have direct impact on improved quality. In this regard, Cotte et al [2008] emphasized on creation of changes in processes and structures in order to easier understanding of them leading to employees' motivation and improved quality [24]. Westwood et al. [2007] emphasized the creation of smaller changes in the improvement process, reducing waste and increasing employees and patients' satisfaction [25]. It should be noted that the main challenge of lean management is the lack of a standard process in the service sector. Identifying the processes in the service sector is extremely difficult because they are not obvious as much as processes available in the manufacturing sector. Additionally, due to size and complexity, it is difficult for organizations to deal with processes to minimize waste. Hence, processes must be recorded constantly in order to keep track of performance [26].

According to what was said above, lean management is considered as very important concept since it requires a wide understanding, high commitment, and difficult deep analysis. Many organizations used lean management in the long-term to improve quality, reduce costs, and provide faster service. To be successful in the application of lean management in public hospitals, the presence of a committed manager is necessary to support organization, participating and commitment of all employees. Lean management focuses on identifying root problems so that it prevents from their recurrence. Its success is result of participation of management and employees at all levels of organization, organizational structures and procedures and the use of new technologies. Understanding these factors before implementing lean will help advantages to be realized and lean culture to be created.

CONCLUSION

In the current study, after analyzing data, seven components were identified for lean management. After performing structural analyzes, it was found that lean management components including communicative, processes, management, technology, structural, and human components have impact on improving the quality of services. They also lead to reduced loss in service provided by public hospitals. Thus, to improve their service quality, public hospitals could use lean management to increases patents' satisfaction and reduce loss.

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