Original Article

Lean management in hospitals: key factors for successful implementation: (an investigation of factors affecting lean management in public hospitals in Kohgiluyeh and Boyerahmad and Bushehr provinces)

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ABSTRACT

Lean is a set of operating philosophies and methods that help create a maximum value for patients by reducing waste and waits. It emphasizes the consideration of the customer's needs, employee involvement and continuous improvement. The aim of this study was of Factors Affecting Lean management in public hospitals in Kohgiluyeh and Boyerahmad and Bushehr provinces. Methods: This research was and applied and comparative-descriptive study. with using 60 questions questionnaire, the validity of the content of the method developed by the researchers and expert judgment and Cronbach's alpha and test-retest reliability of the method was discussed, the opinions of 500 primary health care practitioners were collected. then a two-stage exploratory and confirmatory factor analysis and structural equation modeling with use of statistical software SPSS21 and AMOS20 carried out to review and modify the conceptual model. Results: Exploratory factor analysis identified six factors of human, technology, management, processes, and relational that explain 58/5 percent of the total variance. Confirmatory factor analysis also showed that among identified factors, technology factor with 0/953 coefficient have greatest impact and management factor with 0/615 coefficient have lowest impact on the pattern of lean management in public hospitals to improve the quality of services. Conclusions: The factors affecting the deployment of lean management in public hospitals and appropriate strategy for using the lean management to improve the delivery of primary health care and reduce waste. The results, represent guidelines for using effective implementation of lean management to increase efficiency and ability to compete in the global market offers.

Keywords: Lean management, quality improvement, public hospitals

Introduction

The implementation of lean management in healthcare could guide health care rganizations to improvement of performances and outcomes, lower costs, and increased patients and employees' satisfaction [1]. Improvements and velopments 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 [2] . 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. This methodology Lean is a methodology that tries to reduce or eliminate cost, defects, faults, inventory, space, lead times, waste and also attempts to improve and increase productivity, customer satisfaction (downstream customer, employees, suppliers), profit, on time delivery, capacity, quality, customer responsiveness and cash flow. Many unknown problems and defects exist in an organization, Lean methodology helps showing those problems and creating a way for improvement. The base line of Lean philosophy is changing the culture from traditional thinking to lean thinking. Comprehensive literature review on critical factors affecting the success of implementing lean concepts was conducted, an excellence leadership and management is one of the crucial factors that drive the success of lean implementation

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[3]. Implementing lean requires the effective topdown communication in order to provide employee with clear objectives and consistent mission statements [4]. Rather than working individually, successful lean implementation required cross-functional teamwork of all employees in the organization. Brainstorming and frequent communication are typically considered important ingredients of successful implementation of various improvement initiatives [5, 6] Hence, it is important that organization pay attention to communication both in terms of vertical and horizontal communication. Financial capacity is a critical success factor in the determination of any successful projects. Implementing the lean initiative needs some significant investment of company in developing resources, training materials, statistical software licensing purchase, seeking consultation advice, rewards and recognition systems and others in order to cultivate and sustain the culture [3]. The importance of financial capability towards the success of lean implementation can be considered in terms of reward and compensation [7] and infrastructure [6] Considering the high degree of customer contact in services, employees play important roles in delivering valued service to customers. The highly skilled labors of the organization are important to ensure company growth and success [6]. Hence, it is necessary that service company pays more attention on skills and training for employee in order to achieve the goal of lean implementation. With this regards, three dimensions, pertaining to the skills and training, include employee sufficiency, employee training, and employee learning. Organizations have little chance in successfully implementing lean unless paying attention to culture. [8] stated that the creation of supportive organizational culture is an essential platform for the implementation of lean concept. Antony and Banuelas [9] agreed that successful implementation required adjustments of organizational culture and changes in employee attitude. [7] mentioned that collaboration is required in order to achieve and sustain the success of lean implementation [8, 10] considered critical success factors for lean adoption, towards the cultural implications. Overall, it is imperative that organization
considers important aspects of cultural factor, including openness, collaboration, receptivity, and data sharing.

In this study, in order to develop an initial and conceptual model of research, the related literature and research at home and abroad were reviewed and the success key factors of lean management and its challenges, lean management techniques and tools that can be used in the field of services, especially hospitals were identified.

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. IOC is the process where content experts rate individual items on the degree to which they do or not do measure specific objectives listed by the test developer. The context experts will evaluate each item by giving the rating of 1 (mean clearly measure); -1(mean clearly not measuring); or 0 (mean degree to which it measure the content area is unclear). The IOC form of this study was presented to three experts to evaluate. The items which IOC rate greater than 0.75 is considered valid, the items which IOC rate below 0.75 are required to be revised.IOC forms were sent out for experts to evaluate the validity. The IOC index of all constructs, which include leadership and management, communication, financial capability, Skills and expertise, organizational culture, and lean implementation success, are higher than 0.75, represented the high validity of survey instrument. 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 1were 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), 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.

Results:

500 participants participated in this study of which 50.2% were female and the rest were male. 49.2% were between 41-50 years old. 25.2% of the participants had graduate studies and organizational position and 37.8% of them had undergraduate studies. After the factor analysis and varimax rotation 6 factors were identified. (Table 1) shows the total amount of explained variances by these six factors. The (Table 1) shows the Eigen Values and the variance associated with the factors. Eigen Values for each factor are a proportion of the variance of total variables which is explained by that factor. Based on the (Table 2) results, research items are divided into 6 factors that the first factor explains 19.539% of variance, the sixth factor explains just 6.467% of variance and in total these 6 factors explains 58.574% of variance. As can be seen in the (Table 2), the management factor had the highest response with an average of 32.534 and standard deviation of 7.011 and the process factor

had the lowest response with an average of 13.340 and standard deviation of 5.130.

The relationship between critical success factors and lean implementation success were analyzed by using multiple regression analysis. The multiple regression model was statistically significant (significant level = 0.05). The F value was 32.517 and p value was .000 indicated that the critical success factors have positive influence on the success of lean implementation. Table 3 shows the result of the multiple regression of all six critical factors regressed on the dependent variable lean implementation success.

Table 4 displays the multiple regression of all six critical success factors regressed on the success of lean implementation. Factors contributed to success of lean implementation are presented. Results demonstrated that human criterion, technology criterion, management criterion, process criterion, communicative criterion and tructural criterion have significant relationship with the success of lean implementation.

Table 1: The variance explained by the six factors of lean management model

	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						
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						
…									

Table 2: Average Of Lean Management Factors After Exploratory Factor Analysis

Factors	At Least	At Most	Average	Standard Deviation
Human	9	25	18.418	3.977
Technology	13	39	28.290	4.567
Managment	15	50	32.534	7.011
Process	5	20	13.340	5.130
Communication	11	40	27.108	5.130
Structural	8	32	21.162	3.761

Table 3: Correlation matrix between variables for the whole sample (n = 500)

Components	Human	Technology	Managment	Process	Contact	Structural
Human	1	-0.58**	0.54**	-0.58**	-0.48**	0.41**
Technology	0.58**	1	0.63**	0.61**	0.66**	0.57**
Managment	0.58**	0.86**	1	0.53**	0.72**	0.57**
Process	0.61**	0.72**	0.58**	1	0.61**	0.72**
Communication	0.58**	0.60**	0.49**	0.60**	1	0.60**
Structural	0.66**	-0.57**	0.58**	0.54**	0.57**	1

Table 4: Multiple regression analysis on lean implementation success

variables	Lean Impementation Success			
	Standardized Coefficients	Standardized Coefficients(beta)	t	sig
Constant	8.250	0.162	5.740	0.000
Human	0.305	0.230	3.240	0.001
Technology	0.020	0.127	0.406	0.654
Managment	0.123	0.130	2.323	0.012
Process	-0.005	-0.400	-0.097	0.934
Contact	0.243	0.237	7.540	0.000
Structural	0.204	0.213	4.650	0.000
R = .551, R-Sq = .304, Adjusted R-Sq= .295, F = 32.517, Sig. = .000				

Discussion

The paper reviewed and identified critical factors enabling to the success of lean implementation in service operations six critical success factors were identified including human, technology, management, process dimension, communicative, and structural dimension.

The aim of this paper was to examine these critical success factors and the success of lean implementation in kohgelioye and buyerahmad and Bushehr provinces. Dataset collected during 2016 was analyzed by using. multiple linear regression. The key statistical finding suggested that there is a significant relationship between some factors to the success of lean implementation.

These critical success factors included leadership and management, human, technology, process dimension, communicative, and structural. In summary, this studyhelped in broadening the literature related to critical success factors in a particular context of general Hospitals.

In this study, after exploratory analysis to review the fitness of conceptual model with the collected data, the confirmatory factor analysis was used. proposed model of research has been fitted in all aspects of fitness. This means that the data and experimental model are consistent with each other and data supports the experimental model. Finally, the results show that of the seven factors identified in lean management model, the technology factor with a coefficient of 0.953 has the highest impact and the management factor with a coefficient of 0.615 has the lowest impact Lean Management Model. Therefore, it can be said that findings of this study are in line with [11-16]. All these researchers found that lean management improves service quality and in their review, they more study human and contact dimensions of lean management. About the impact of technology factor in lean management model, we can refer to Ker, Wang, Hajli, sang & Ker study [17]. The result of their research highlighted the impact of lean technology factor in improvement of hospitals service quality and waste reduction and by selection of digital scanning technology showed a

significant reduction in time processes. About the impact of management factor on the improvement of the quality of public hospital services, [18-20] emphasized the importance of management factor and its impact on improving the quality. These researchers concluded that increase of relationship among employees, and the relationship between employees and management will be the benefits of lean implementation. Clear and effective relationship as one of the success factors in the application of lean management in service sector is helpful for providing staff feedback for the manager to improve the quality.

Conclusions

Finally, the findings showed that there is a positive and significant relationship between lean process and structural factors with improvement of quality and two factors of process and structure have a direct impact on improvement of quality. In this regard [20] also emphasized the changes in the processes and structures for easier understanding of them which will motivate employees and improve the quality. Sarkar [21] stated that identifying the processes in the service sector is very hard because they are not as obvious as processes in the manufacturing sector. Moreover, because of size and complexity, it is difficult for organizations to deal with processes to minimize waste. Therefore, processes must be registered consistently in order to keep track of performance. According to what was said above, lean management is a very important concept because it requires broad understanding, high commitment and depth analysis of the problem. In the long term many organizations used lean to improve quality, reduce costs, and provide faster service. To be successful in the application of lean management in public hospitals existence of a committed manager to support the organization and participation and commitment of all staff is necessary. Lean management focuses on identifying the root of the problems to prevent their recurrence. Its successful is the result of participation of all levels of managers and staff, organizational structures and procedures and the use of new technologies. Understanding these factors before implementing lean will help to realize its benefits and also to create a lean culture.

References

1. Black J, Miller D. The Toyota Way to Healthcare Excellence: Increase Efficiency and Improve Quality with Lean. Chicago, IL: Health Administration Press; 2008.
2. De Souza L. B. Trends and approaches in lean healthcare. Leadership in Health Services. (2009); 22(2): 121-139.
3. Achanga, P., Shehab, E., Roy, R. and Nelder, G. 2006. Critical Success Factors for Lean Implementation within SMEs. Journal of Manufacturing Technology Management, 17(4): 460-471.
4. Lluı_s Cuatrecasas Arbós 2002, Design of a rapid response and high efficiency service by lean production principles: Methodology and evaluation of variability of performance, International Journal of Production Economics, 80:169-183.
5. Staats B. R., Brunner D. J. and Upton D. M. 2011, Lean principles, learning, and knowledge work: Evidence from a software services provider, Journal of Operations Management, 29: 376-390
6. Jeyaraman K. and Teo L. K. 2011, A conceptual framework for critical success factors of lean Six Sigma Implementation on the performance of electronic manufacturing service industry, International Journal of Lean Six Sigma, 1(3): 191-215.
7. Bhasin S. 2011, Measuring the Leanness of an organization, International Journal of Lean Six Sigma, 2 (1): 55-74.
8. Bhasin S. and Burcher P., 2006 Lean viewed as a philosophy, Journal of Manufacturing Technology Management, 17 (1):56 – 72
9. Antony, J. and Banuelas, R. 2001, A strategy for survival, Manufacturing Engineer, 80 (3): 119-121.
10. Dahlgaard J.J. and Dahlgaard-Park S.M. 2006, Lean production, six sigma quality, TQM and company culture, The TQM Magazine, 18(3): 263-281
11. Sheikhi S. Designing a model of lean hospital and comparing it with the selected processes of Kashani hospital in Shahre-Kord. Research project, Centre of studies and standards codification. (2013).
12. Bani Asadi M., Vatan Khah S, Agha Hosseini F. Measurement and analysis of the quality of hospital services using the importance-performance analysis tools of patients' view in selected public hospitals of Tehran. Faculty of health and medical research institute. (2013); Issue 1 (11): 35-46.
13. DGioia N M, Greenhouse P.K, Chermak T, Hayden M.A.A case for integrating the patient and family centered care methodology and practice in lean healthcare organizations. Healthcare. In press, corrected prof, Avialable online. (2015).
14. Andreamatteo A, Lanni L, Lega F, Sargiacomo M. Lean in healthcare: A comprehensive review. Healthy policy in press, corrected proof. Available on line. (2015).
15. Farjam A, Farjam S. Checking the quality of provided health care services in university hospitals in Isfahan based on Servqual model. Approved projects in Isfahan University of medical sciences. (2010).
16. Globenko A, Sianova Z. Service quality in healthcare quality improvement initiatives through the prism of patient and providers perspectives, Master thesis, Umea University. (2012).
17. Ker J.I, Wang Y, Hajli M.N, Song J, Ker C.W. Depioying lean in healthcare: Evaluating information technology effectiveness in U.S. hospital pharmacies. International journal of information management. (2014); 34(4): 556-560.
18. Abdullah M M, Uli J & Tari J J. The influence of soft factors on quality improvement and performance:

Perceptions from managers. The TQM Journal. (2008); 20(5): 436-452.

19. Atkinson P. Creating and Implementing Lean Strategies. Management Services, (2004); 48(2):18.
20. Cotte P, Farber A, Merchant A, Paranikas P & Sirkin H L. Getting more from Lean.BCG Publication. <http://www.bcg.co.jp/documents/file15326.pdf > [Retrieved 2010-10-15].
21. Sarkar D. Challenges of Service Lean Implementation. Six Sigma IQ (2009)., http://www.sixsigmaiq.com/columnarticle.cfm?externalid=681&columnid=15 [Retrieved 2010-10-05].