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Assessment of Hospital Personnel's Awareness Regarding Lean Management

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Abstract:
Background*: Healthcare systems are facing growing challenges as the aging society is increasing the demand for care. To meet these demands, many organizations have turned to improvement approaches. One proven approach is Lean. The current study aimed to assess hospital personnel's awareness regarding lean management.*
Materials and Methods*: The study was conducted at private hospital in Cairo. Descriptive research design was used. purposive sample of hospital personnel; physician/s, nurse/s, pharmacist/s and financial department employee/s and ward secretary was included (N= 50). Hospital personnel's awareness test was used to assess hospital personnel's awareness level regarding lean management.*
Results*: the study indicated all hospital personnel have low level of awareness about lean management.*
Conclusion: *there was low level of hospital personnel awareness regarding lean management. It was recommended that implementation of in- at fixed periods service training program for all health care personnel with regard to knowledge and practices of lean management with regular monitoring. Further studies to explore the effect implementation of lean management in patient discharge planning process.*
Key Word*: Lean management; Hospital personnel.*

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I. Introduction

Lean management is a set of operating philosophies and methods that help to create the maximum value for patients by reducing waste and waits. It aims to fundamentally change organization thinking and value, which ultimately leads to the transformation of organization behavior and culture over time [1,2]. Lean management promises enhanced quality, capacity, and safety, while containing costs. Lean management consists of a systematic approach that enables the identification and elimination of waste in production processes, focusing mainly on aggregate quality and delivering to the customer only what he considers to be valued [3,4].

The Lean methodology is also known as a Lean enterprise, or Lean manufacturing, or Lean production has its roots in the Toyota Production System (TPS). Lean management seeks to maximize value to the customers while removing wasteful activities. In this view, waste is considered as anything that does not directly add value in the eyes of customers. One underlying assumption in the Lean methodology is based on continuous efforts to challenge the existing methods of working to generate ideas for improvement [5].

Although lean concepts were proposed a long time ago, including these concepts in healthcare sectors have not yet appreciated and/or recognized lean and its numerous benefits. Moreover, lean awareness must be sustained in healthcare organization. This means that lean thinking must be embedded in the operations of healthcare organization. In the context of lean management principles, lean identifies wastes to be non-value-added activities that exist in a process. Lean also identifies a number of common wastes in production processes which are called "lean deadly wastes." These lean deadly wastes include overproduction, waiting, inventory, overprocessing, transportation, motion, and defects. A number of tools and techniques for implementing lean also exist and these include; total productive maintenance (TPM), just in time (JIT), 5 s, kanban, single minute exchange of dies (SMED), production smoothing, standard work, visual control, cellular manufacturing, plan-do-check-act cycle (PDCA), and value stream mapping[6,7,8.]

It is always necessary to assess lean awareness and lean perceptions as well as understand the lean thinking before any lean programs are set in motion. Depending on the current awareness level, lean awareness programs can then be developed and customized to be commensurate with the lean awareness status quo. Such

programs should focus on providing fundamental knowledge starting at an appropriate level. Such knowledge will be geared at understanding lean and lean roles as well as clarify how personnel at various levels in an organization will take part in lean transformation efforts[9]. The uniqueness of the present study lies in providing knowledge and information that can be used to define and understand the local context in determining lean awareness among hospital personnel. As such, the results of this study can be used to develop a training program for advancing lean management practices.

II. Material And Methods

The study was conducted at in-patient units at private hospital in Cairo. It was organized as day care have 10 rooms; 7th floor has 30 rooms (4 rooms double and 26 rooms single with total number of beds 34); 8th floor has 14 rooms; and 9th floor has 8 rooms double and 32 rooms single with total number of beds 48).

Study Design: Descriptive research design was used in this study.

Study Duration: December 2020

Sample size:50 hospital personnel.

Sampling: Purposive sample of hospital personnel; physician/s, nurse/s, pharmacist/s, financial department employee/s, and ward secretary were included.

Procedure methodology

Hospital personnel's awareness test consisted of two parts; Part 1: Demographic data of hospital personnel. This part includes demographic data of hospital personnel as (age, sex, job title, department, level of education and years of experience). Part 2: Components of hospital personnel's awareness test was developed by the researcher based on review of the related literature[10,11,2]. This tool was used to assess hospital personnel's awareness about lean management. This tool is multiple choice questions. Every question has four choices. One choice is right. It composed from 20 questions. It was related to definition and objective of lean management, principles of lean management, lean tools, different types of wastes, lean organization, and lean leadership. Responses were measured on 2-point (0 = correct) and (1= correct). Scoring system: hospital personnel's awareness test scoring system was calculated according to three levels:

- Low < 60 %
- Moderate > 60% - < 75%
- High > 75

An agreement was obtained from hospital manager to carry out the study. Individual oral consent was also obtained from hospital personnel. The tool was tested by 5 experts in the field of the study for their content validity through an opinionaire sheet. Accordingly, the necessary modifications had been done. The pilot study was carried out after validity of the tools and before starting the actual data collection. The aim of the pilot study was to confirm understanding, clarity, and applicability of the tool, to determine required time to fulfill the tool. The pilot study was carried out on 10% of the total sample size, (5) from hospital personnel. Those participants were included in the study sample as there was no major modifications. Test of reliability for lean awareness tool yielded (0.79), indicating a very good level of internal consistency.

The researcher explains the aim of the study to participants. All participants were assured that anonymity and confidentiality guaranteed and the right to withdraw from the study at any time. The researcher collected data by himself through meeting the subjects and explaining the purpose of the study to them in the study settings. The researcher was present all the time during fulfilling the forms to answer any questions. The time needed by hospital personnel to complete the lean management awareness test was ranged between (30-40). The researcher checked the completeness of each filled sheet after the subjects. completed it to ensure the absence of any missing data.

Statistical analysis

Data entry and statistical analysis were performed using personal computer software, the statistical package for social sciences (SPSS), version 24. Reliability of the questionnaire was assessed using Cronbach's alpha reliability coefficient. Pearson correlation coefficient was used to determine significant correlations between the variables. The significance level was set at $P \leq 0.05$.

III. Result

Table no (1) depicts the demographic characteristics of hospital personnel, more than half of them (58%) were females; and only (42%) were males. Pertaining to age, approximately less than three quarters of them (72%) had from 25 to less than 30 years old, whereas (10%) had equal to or more than 35 years to 40 years old. According to their job title, (40%) were staff nurses while only (4%) of them were nursing supervisors, also (4%) of them were pharmacists and (4%) were financial employee.

As regards the number of hospital personnel in departments, more than one quarter (26%) worked in 7th floor and also (26%) worked in 8th floor; whereas only (4%) of them were from nursing office, also (4%) from pharmacy and (4%) from financial department. Regarding level of education, the majority of them (86%) had bachelor's degree whereas only (14%) had master's degree. Concerning years of working experience, half of them (50%) had from equal to or more than 5 to less than 10 years of experience, whereas only (4%) of them had more than or equal 10 to 15 years of experience.

Table no (1): Demographic characteristics of hospital personnel (N=50)

Demographic characteristics	No	%
➢ **Sex**		
▪ Male	21	42
▪ Female	29	58
➢ **Age (years)**		
▪ 25 - < 30	36	72
▪ ≥30- < 35	9	18
▪ ≥35- 40	5	10
➢ **Job title**		
▪ Staff nurse	20	40
▪ Charge nurse	10	20
▪ Head nurse	4	8
▪ Nursing supervisor	2	4
▪ Physician	6	12
▪ Pharmacist	2	4
▪ Financial employee	2	4
▪ Ward secretary	4	8
➢ **Department**		
▪ Day care	8	16
▪ 7th floor	13	26
▪ 8th floor	10	20
▪ 9th floor	13	26
▪ Nursing office	2	4
▪ Pharmacy	2	4
▪ Financial department	2	4
➢ **Level of education**		
▪ Bachelor's degree	43	86
▪ Master's degree	7	14
➢ **Years of experience**		
▪ 1- <5 years	23	46
▪ ≥5 - <10 years	25	50
▪ ≥10 - 15 years	2	4

Table no (2) presents percentage distribution hospital personnel awareness about lean management. Regarding items No (1,2,3,4,5,6,7,8,9,10); (34%, 20%, 26%, 26%, 34%, 32%, 36%, 34%, 32%, & 14%) were correct while (66%, 80%, 74%, 74%, 66%, 68%, 64%, 66%, 68%, & 86%) were incorrect, respectively. Additionally, this table clarifies that, there were significant differences between in lean management awareness in all items at ($P \leq 0.05$).

Table no (2). Percentage distribution hospital personnel awareness about lean management.

Lean awareness	Before lean sessions (N=50)				χ^2	P
	correct		In correct			
	no	%	no	%		
1-What is a Lean approach?	17	34	33	66	5.12	.024*
2-What is the objective of the lean management?	10	20	40	80	18	.000**
3-In order for lean management to work, what must you eliminate?	13	26	37	74	11.5	.001**
4- What are the five lean principles?	13	26	37	74	11.5	.001**
5-A delaying in discharging patients is likely to cause recurrent bottlenecks in...	17	34	33	66	5.12	.024*
6- Lean thinking's fifth principle	16	32	34	68	6.48	.011**
7-What does PDCA stands for?	18	36	32	64	3.9	.048*

8-A method of mapping that includes data.	17	34	33	66	5.12	.024*
9- The amount of time taken to complete an operation	16	32	34	68	6.48	.011**
10- What are the main eight types of waste?	7	14	43	86	25.9	.000**

(*): statistically significant at P ≤ 0.05 (**): highly statistically significant at p≤ 0.001

Table (3) clarifies percentage distribution hospital personnel awareness about lean management. Regarding items No (11,12,13,14,15,16,17,18,19,20); (38%, 46%, 18%, 24%, 32%, 28%, 36%, 32%, 24%, & 46%) were correct while (62%, 54%, 82%, 76%, 68%, 72%, 64%, 68%, 76%, & 54%) were incorrect, respectively. Furthermore, this table shows that, there were significant differences between in lean management awareness in all items at (P ≤ 0.05) except item No (11, 12, 20) there was no significant differences.

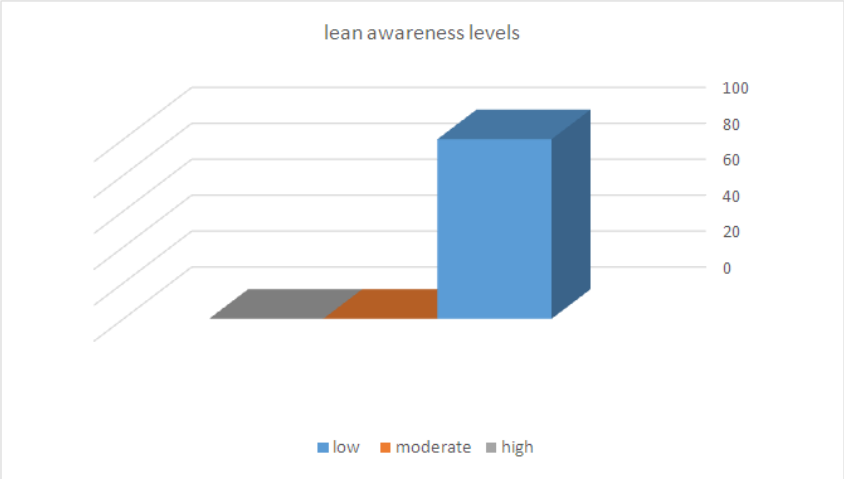
Table no (3). Percentage distribution hospital personnel awareness about lean management.

Lean awareness	**Before lean sessions (N=50)**				χ^2	**P**
	correct		**In correct**			
	no	**%**	**no**	**%**		
11- "wrong medicine or wrong dose administered to patient "is what type of waste?	19	38	31	62	2.88	.090
12- "catheter lab being located a long distance from the emergency department "?	23	46	27	54	.320	.572
13- " employees get burned out giving suggestions for improvement "	9	18	41	82	20.4	.000**
14-"expired supplies that must be disposed of, such as out of date medications?"	12	24	38	76	13.5	.000**
15-production in leaned organizations is driven by	16	32	34	68	6.48	.011**
16- How is lean manufacturing achieved by an organization?	14	28	36	72	9.68	.002**
17- What should be the basis for organization change over?	18	36	32	64	3.92	.048*
18- What is Japanese word for "real place",?	16	32	34	68	6.48	.011**
19- what constitute lean leader's main responsibility in healthcare?	12	24	38	76	13.5	.000**
20- in any lean initiative, teamwork is an important, what factor limits team's effectiveness?	23	46	27	54	.320	.572

(*): statistically significant at P ≤ 0.05 (**): highly statistically significant at p≤ 0.001

Figure no (1) traces levels of total lean management awareness between hospital personnel. All hospital personnel have low level of awareness.

Figure no (1): lean management awareness levels among hospital personnel



Low (≤ 60 %); Moderate (> 60 %- ≤ 75%); and High (> 75 %)

Table (4) refers to correlation between lean awareness and demographic characteristics of hospital personnel. There was significant correlation between lean awareness and age with p= .003 and high significant correlation with years of experience with p=.000, respectively.

Table no (4). Correlation between lean awareness and demographic characteristics

		Age	sex	Job title	department	Level of Education	years of experience
Total lean awareness	r	.409*	.078	.188	.063	.139	.497**
	p	.003	.589	.192	.665	.334	.000

(*): statistically significant at P ≤ 0.05 (**): highly statistically significant at p≤ 0.001

IV. Discussion

Lean Management is an approach which makes it possible to improve quality of the implemented processes[12]. This paper was used to assess hospital personnel awareness regarding lean management. The study results presented a statistically significant difference in lean awareness of hospital personnel in questions about lean management concept, objectives, and principles. This is due to lean management is a new concept for many medical and non-medical personnel in healthcare. These findings were in agreement with Brajer-marczak[12], who explain the employee resistance to introduction of lean concept due to insufficient knowledge regarding Lean concept as well as its objectives, and principles. Also, Adegbembo et al[13] found the results of the questionnaire highlight that despite the lack of awareness of lean terminology and lean principles. On the other hand, Machado et al[14] noted that Brazilian hospitals have an alignment knowledge of lean principles.

Lean tools are very important in planning, design, production, and delivery phase of any healthcare sector. These tools are significantly effective to add value to the process and service and simultaneously eliminate non-value adding activities[15]. The current study stated that a statistically significant difference in awareness of hospital personnel in questions about PDCA, value stream mapping and cycle time This is due to these questions is mostly related to lean management which is a new concept for many hospital personnel. These findings were consistent with Khaba & Bhar [16] who identified the awareness of lean tools. The findings showed that the respondents have general knowledge about lean tools although 20 percent of all respondents were not familiar with any of the lean tools. Ahmed et al[15] stated that more than 50 percent respondents are not familiar with lean tools. He clarified that large number of professionals are unaware of these tools. This huge portion of professionals will be the awareness status changer if they have the opportunity to know about the lean principles, lean tools and their objectives. On the other hand, Salem et al [9] found out how much the respondents are aware of the lean tools. Also, Yahya et al[17] showed that respondents more aware by lean tools especially PDCA.

Knowledge and awareness of lean wastes among medical, paramedical, and nonmedical staff of any hospital is an important pre-requisite for effective management. The study results depicted a statistically significant difference in awareness of hospital personnel in questions regarding types of wastes. These results is matched by Bopaiah et al[18] Nema [19] Rao et al[20] who concluded that majority of hospital staff were found to have average awareness about waste management. In a study conducted by Mohammed et al[21], they found that less than half of nurses knew definition of medical wastes. Less than three-quarter of them had correct knowledge about definition of waste management and less than one-quarter of them had correct knowledge about medical waste classification and types. On the other hand, Reda et al [22] Uddin et al[23] found that, more than half of respondents did not know any information on the general waste and waste management background.

The consideration of lean leadership, leaned organizations and lean thinking is an important move that can position healthcare towards leading value indicators of operational excellency[9]. The current study revealed low awareness of hospital personnel regarding questions of lean organization and lean leadership. In this regard Machado et al [14] showed that hospitals do not have a concept well defined in the construct of lean leadership. Also, Albliwi et al[24] concluded the awareness of respondents regarding leaned organizations, less than half were described as somewhat aware about lean management. A further 11 percent stated that organizations had limited awareness in comparison to one third found organizations were well aware of lean management or the 11 percent who expressed that organizations were fully aware of lean management. Only 1 percent of the participants described organizations as not aware about lean management.

Introducing Lean management in practice involves a slow, continuous, and comprehensive approach to introducing changes in the structure[12]. The current study dedicated that majority of hospital personnel have low awareness about lean management. In this issue, Albliwi et al[24] clarified Participants' awareness. Half of the respondents were found to be fully aware about Lean management, approximately one quarter were well aware, 17 percent were somewhat aware, and 9 percent had limited awareness about lean management. In this regard,

Madhavan & Gurumurthy[25] identified that respondents have limited awareness towards lean management. They recommended that a training module is needed to improve the awareness level leading to successful implementation of the program. Overall, Williamsson & Dellve[26] defined perceptions of participants about lean management and stated the proportion of high, medium, and low responses were roughly equal. The current study was in harmony with Ahmed et al[15] Salem et al[9] who conducted a study on lean awareness and found that lean awareness is low. They stated that, the main causes they identified are lack of knowledge on Lean awareness and resistance toward change.

Furthermore, the current study noticed some correlations between lean awareness and years of experience, and age. This may be explained as the level of awareness increased by increasing in experience and age, because experienced hospital personnel more oriented by types of wastes and they have background about quality management. In this respect, the current study was in harmony with Salim et al[27] who concluded that there are no correlations between employees' views on the lean management in terms of gender, qualifications, and years of service.

V. Conclusion

There was low level of hospital personnel awareness regarding lean management. It was recommended that implementation of in- at fixed periods service training program for all health care personnel with regard to knowledge and practices of lean management with regular monitoring. Further studies to explore the effect implementation of lean management in patient discharge planning process.

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