

Effect of Lean Leadership Training Program on Head Nurses' Performance and Quality of Nurses' Work-Life

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Abstract

Background: The highly competitive climate in which healthcare organizations operate today necessitates flexibility, knowledge acquisition, technology adoption, and process improvement in order to introduce new services, reduce costs, and respond to market developments. Thus, healthcare organizations have needed to implement lean practices in order to improve leadership effectiveness and provide high quality and efficiency of services provided. **Aim:** The study aimed to determine the effect of lean leadership training program on head nurses' performance and quality of nurses' work-life at Hamdy El-Tabakh General Hospital. **Design:** Quasi-experimental, one group (pre/ post-test) research design was used. **Setting:** The study was carried out in all in-patient units (medical and surgical); ICU and emergency units at Hamdy El-Tabakh General Hospital. **Subjects:** Two groups of subjects were included; (a) All head nurses and their assistants (n=20), (b) All staff nurses (n=200). **Tools:** Three tools were used for data collection; head nurses' lean performance observation checklist, quality of nursing work-life questionnaire and lean leadership knowledge questionnaire. **Results:** There was a highly statistical significant difference between lean leadership training program and head nurses' performance. Also, there was a highly statistical significant difference between lean leadership training program and quality of nurses' work life. **Conclusion:** There were highly positive statistical significant correlations between lean leadership performance dimensions and quality of nursing work-life dimensions at before, immediately after and after three months from lean leadership training program implementation. **Recommendations:** Apply in-service training programs and workshops to implant a culture of lean leadership and lean management, among hospital administrators and unit manager.

Keywords: Lean, Lean leadership, Head nurses' performance, quality of nurses' work-life.

Introduction

Nowadays, addressing the quality of services provided to patients is a high priority issue for all health care organizations. To achieve this goal, most of health-care organization' managers and policymakers have pay attention to the application of lean tools and strategies in health care organizations (De Almeida et al., 2017). The main purpose of using lean tools is to improve the quality of services provided to patients, to shorten the length of hospital stay, and to minimize the frequency of medical errors. Also, it improves efficiency and productivity, reduce cost, and improve physical work environments for healthcare professionals (Aoun et al., 2018). According to D'Andre Matteo, et al., lean was defined as "an improvement approach applied in healthcare organizations to improve efficiency, clinical outcomes, satisfaction and safety for both staff and patients and ultimately to enhance financial performance and sustainability" (D'Andre Matteo, et al., 2015). Additionally, lean aims to improve safety and quality of services provided to patients by framing all activities through the value provided in order to eliminate waste and defects within healthcare organizations (Cohen, 2018). Waste in lean concept is defined as anything that not provides value to patients leading to increasing cost and time pertaining to their

demands. In health care setting, there are eight types of wastes, classified as: defect, over-production, transportation, waiting, inventory, motion, over-processing and human potential demands (Sutrisno et al., 2018). Lean leadership was defined as doing the right things to increase revenues, satisfying customers and reducing costs by eliminating all activities that do not add value to the product or service (Al-hadrawi R & Al-Abedi, 2020).

Lean leadership has five dimensions, namely: continuous improvement, self-development, qualification development, Gemba walk and Hoshin Kanri (Alefari et al., 2017). (a) Continuous improvement means strive for perfection but view failure as an opportunity for improvement. (b) Self-development refers to that, lean leaders must learn the philosophy, values, tools, and techniques of lean and serve as role models for others. (c) Qualification development defined as commitment to long-term development of employees and continuous learning. (d) Gemba walk is a Japanese word meaning "the real place". It is the place where value is added, sometimes referred to the "place of work". (e) While Hoshin kanri is a strategic planning method used to ensure that improvement activities are in alignment with long-term goals (Aij, & Rapsaniotis, 2017). There are a lot of lean strategies used in health care sector that can be used to remove waste in daily work processes

such as: Value Stream Map (VSM), Gemba walk, and 5 S (Lot et al., 2018; Kovacevic et al., 2016).

The **VSM** was defined as the visualization of complex work flows, quantification of the resources needed (e.g., staff, materials, time), and restructuring of the work flows into an improved version with focus on the patient's needs. Therefore, VSM aims to reduce unnecessary process steps and time (Nowak, et al., 2017). **Gemba Walks** refers to lean managers make an effort to physically "go and see" what is happening on the real place of work using their human senses to better understand actual work processes and problems occur (Romero, 2020). **5 S** is a lean strategy includes an abbreviations representing five Japanese words that can be translated as sort, set in order, shine, standardize, and sustain. It has been recognized recently as a potential solution for improving the quality of government healthcare services in low- and middle-income countries (Kanamori, 2015). Nowadays the key challenge for the modern organization is to recognize the effects of lean leadership on the nurses' performance, their quality of work life and the outcomes for health care organizations.

Nursing performance was defined as the formal exhibition of a skill, ability, or talent of a professional nurse. Performance-related behaviors are directly associated with job tasks that need to be accomplished to achieve job objectives (Ibrahim et al., 2016). Head nurses' performance plays an important role in the successful operation of hospitals (Moghaddam et al.,2019). They have a significant impact on staff nurses' performance when they create a positive work climate, provide support, allowing them to work with maximum effectiveness and achieve the best work results in a suitable quality of work life (Ibrahim et al., 2016).

Nurses quality of work-life is defined as nurses satisfaction with a variety of needs through resources, activities and outcomes at work (Gawad et al.,2022). It has four dimensions, namely: work-life/home-life, work design, work context and work world. Work life/home life is the interaction between nurse's work and home life. Work design is the composition of nursing work and describes the actual work, such as work load, staffing, and autonomy. While, work context includes the practice settings in which nurses' work. Finally, work world is defined as the implications of wide society changes and effects on nursing practice (Kaddourah et al.,2018 & Fu et al., 2015).

Significance of the study

Many global healthcare challenges, such as infections, preventable errors, growing healthcare costs, and changing patient expectations, have a negative impact on health outcomes. Lean management provides a solution to these problems by

reducing costs and eliminating waste (Çavmak & Kaptanoğlu 2017). So implementation of lean practices improves staff performance, adapt to new competitors, and foster flexibility. They are beneficial for economic growth. Research shows that lean practices improve knowledge and skills of head nurses, improve environmental quality, and create a safer and more productive work environment (Fischman, 2018). Hence the present study aims to find out the effect of a lean leadership training program on head nurses' performance and quality of nurses' work-life. This study will provide more focus on the value of lean leadership as a new approach to be implemented in Egyptian hospitals to improve leader's competencies, capacity and skills in determining wastes in care processes by using lean tools and for continuous improvement. Also, it will help in improving performance of staff nurses and provide high quality of work life to provide safe and appropriate care for patient which result in improving health care system as a general.

Aims of the Study

Determine the effect of lean leadership training program on head nurses' performance and quality of nurses' work-life at Hamdy El-Tabakh General Hospital.

Research Hypotheses

- The lean leadership training program will have positive effect on head nurses' performance at Hamdy El-Tabakh General Hospital.
- The lean leadership training program will have positive effect on quality of nurses' work-life at Hamdy El-Tabakh General Hospital.

Materials and Methods

Design: Quasi-experimental, one group (pre/ post-test) research design was used to conduct this study.

Setting: This study was conducted in all in-patient units (medical and surgical); ICU and emergency units (n= 10), at Hamdy El-Tabakh General Hospital, which is affiliated to Ministry of Health and Population (MOHP); and equipped with 125 beds. It is classified as following: in-patient units (n=7): medical, surgical, urology, obstetric, rehydration, operation, and hemodialysis units; ICU (n=1): general ICU; and lastly, emergency units (n=2): emergency and emergency operation.

Subjects: Two groups of subjects were included in this study.

a) All head nurses and their assistants, who were working in the previously mentioned setting and who

were available at the time of data collection, were included. (n=20)

b) All nurses, who were working in the previously mentioned setting and who were available at the time of data collection, with at least six months of experience, were included. (n=200)

Tools: The study used three tools for data collection:

Tool (I): Head Nurses' Lean Leadership Performance Observation Checklist (HNLLPOC):

This tool was developed by (Boswihi, 2018). It was adapted by the researcher based on the review of related literature (Ilangakoon et al., 2022; D'Andreanmatteo et al., 2015; Trenkner 2016 & Alefari et al., 2017). The observation checklist was used to measure the head nurses' performance; before, immediately after and after three months from program implementation. It consists of 62 items divided into four main dimensions, namely: continuous improvement (21 items); self-development (12 items); qualification development (17 items); and finally, lean thinking (12 items). Responses were measured on a 4-point Likert scale ranging from (3) done, (2) partially done, (1) not done, and lastly (0) not applicable. Scores ranged from 62 to 248, where low scores ranged from 62 to 123 (< 50 %); moderate scores ranged from 124 to 185 (50 % - < 75 %); and high scores ranged from 186 to 248 (≥ 75 %).

Tool (II): Quality of Nursing Work-Life questionnaire (QNWL):

It was developed by (Brooks, 2001) to measure the quality of nursing work-life for head nurses and staff nurses. It includes 42 items divided into four subscales, namely: (1) home-life /work-life (7 items); (2) work design (10 items); (3) work conditions (20 items); and (4) work world (5 items). Responses were measured on a 6-point Likert scale ranging from (1) strongly disagree to (6) strongly agree. Scores ranged from 42 to 252, where low scores ranged from 42 to 84 (< 33 %); moderate scores ranged from 85 to 168 (33 % - < 66 %); and high scores ranged from 169 to 252 (≥ 66 %).

Tool (III): Lean Leadership Knowledge questionnaire:

This tool was developed by the researcher based on a thorough review of related literature (Usman, 2020; Lot, et al., 2018; Burgess, 2018; Marolla & Manfredi, 2020). This tool was used to assess the head nurses and their assistants' knowledge as pre/post-test. It consisted of ten items, covering: lean leadership concept, methods, principles, lean strategies and type of wastes in health care. The answers of all questions were scored then summed together; the total score was categorized into three levels, as following: (< 50 %) indicated poor knowledge, (50 % - <75%) moderate knowledge and (≥ 75 %) good Knowledge.

In addition, a demographic characteristics data sheet for study subjects were developed by the researcher, it included data; a) for head nurses: age, working unit, gender, educational qualification, years of experience (nursing and unit) and years of managerial experience and marital status; and b) for nurses: age, working unit, gender, educational qualification, years of experience (nursing and unit) and marital status.

Methods

1. An approval to carry out the study was obtained from the Dean of Faculty of Nursing Damanhour University, the responsible authorities from Ministry of Health and Population and hospital administrators, to collect the necessary data and implementation of the training program, after explanation of the purpose of the study.

2. Tool I was tested for its face and content validity by five experts in the field of the study. Accordingly, the necessary modifications were done. Also, it was tested for its reliability; using Cronbach's Alpha coefficient reliability test to assess internal consistency of the items ($\alpha = 0.890$), indicating good reliability.

3. Tool II was translated into Arabic language and tested for its face and content validity and translation by five experts in the field of the study. Accordingly, the necessary modifications were done. Also, it was tested for its reliability; using Cronbach's Alpha coefficient reliability test to assess internal consistency of the items ($\alpha = 0.928$), indicating excellent reliability.

4. A pilot study was carried out on (10%) of total sample size for head nurses (n=2) and nurses (n=20), rather than the study sample at Dimesna Children's Specialty Hospital; in order to check and to ensure the clarity and feasibility of the developed tools and to identify obstacles and problems that may be encountered during data collection. Based on the findings of the pilot study, no modifications were done.

5. The lean leadership training program was developed, implemented, and the evaluation of its effect on head nurses' performance and quality of nurses' work-life was conducted, based on the following phases:

Phase 1. Assessment phase:

- The process of data collection was started from 1 November 2021 to 30 November 2021. Assessment was carried out before developing the training program where data was collected by the researcher. The tools used in the following sequence:

Tool (I): Head Nurses' Lean Leadership Performance Observation Checklist (HNLLPOC) was used to

measure head nurses and their assistants' performance as lean leaders in their work environment before lean leadership program implementation, who were available in the morning shift of the selected settings at the time of data collection. It focused on the following dimensions: continuous improvement; self-development; qualification development; and finally, lean thinking.

Tool (II): Quality of Nursing Work-Life questionnaire (QNWL) was used to assess quality of nursing work-life, based on the following dimensions: home-life/work-life; work design; work conditions; lastly, work world. It was collected before program implementation from both head nurses, their assistants and nurses from the previously mentioned settings.

Tool (III): Lean Leadership Knowledge questionnaire was used to assess the head nurses and their assistants' knowledge, as pre/ post-test, regarding lean leadership concept, methods, principles, lean strategies and type of wastes in health care before conducting the training program.

Phase 2. Development of the lean leadership training program to improve head nurses' performance and quality of nursing work-life:

Planning and development of the lean leadership training program for head nurses and their assistants, based on the result of phase 1 and review of related literature. This was taken one month from 1-30 December 2021. The program included: general and specific objectives, relevant content, teaching strategies as (discussion, group work and brainstorming) and evaluation techniques.

Phase 3. Implementation phase:

Training program was provided to head nurses and their assistants and implemented at Hamdy El-Tabakh General Hospital's training unit. The implementation phase was initiated in January, 2022 to February 2022. The training program took eight working days, and was implemented twice, one for head nurses and the other for their assistants. It was divided into 5 days for theoretical contents and 3 days for practice. The theory included objectives, content, teaching strategies and evaluation techniques (pre and post-test). Each day of the training program was divided into 2 sessions, the duration of each session was 75 minutes, and a break for 15 minutes was arranged between each session.

Phase 4. Evaluation phase:

Evaluation was done three times in relation to the training program. Firstly, before implementation of the program (tool I, II, III). Secondly, immediately after the program implementation (tool I, II, III) and finally, three months after the program implementation (tool I, II); in order to validate the

effect of implementation of the lean leadership by the study subjects on head nurses' performance and quality of nursing work-life.

Data obtained was analyzed using the appropriate statistical techniques

Ethical Considerations

- The research approval was obtained from the ethical committee at the Faculty of Nursing-Damanhour University, prior to the start of the study.
- An informed written consent was obtained from the study subjects after explanation of the aim of the study.
- Privacy and right to refuse to participate or withdraw from the study was assured during the study.
- Confidentiality and anonymity regarding data collected was maintained.

Statistical Analysis:

Data collected from the studied sample was revised, coded and entered using Personal Computer (PC). Computerized data entry and statistical analysis were fulfilled using the Statistical Package for Social Sciences (SPSS) version 22. Data were presented using descriptive statistics in the form of frequencies, percentages and Mean \pm SD. Chi-square to assess the relations between variables and their characteristics. The one-way analysis of variance (ANOVA) is used to determine whether there are any statistically significant differences between the means of three or more independent (unrelated) groups. A t-test is a statistical test that is used to compare the means of two groups. A correlation coefficient "Pearson correlation" is a numerical measure of some type of correlation, meaning a statistical relationship between two variables. Linear regression is a statistical method used to analyze the relationship between a dependent variable and one or more independent variables.

Results

Table 1 represents that the Mean \pm SD of head nurses' age was 36.45 \pm 4.85; compared to 31.18 \pm 6.23 for nurses. Less than two thirds of head nurses (65%) and less than half of nurses (48%), had from 30 to less than 40 years old and from 20 to less than 30 years old, respectively. In relation to working unit, the highest percentage of head nurses and nurses (40%, 42.5%) were working in surgical units and ICU, consecutively. Regarding gender, all head nurses and the majority of nurses were female (100%, 86%), respectively. Concerning educational qualification, all head nurses got Bachelor degree of Sciences in Nursing (100%); whereas, less than two thirds of

nurses (64.5%) got Diploma of Technical Institute of Nursing. Pertaining to years of nursing experience, Mean±SD of head nurses was 12.65±4.33; compared to 10.67±6.53 for nurses. Above half of head nurses and less than half of nurses (55%, 41.5%) had more than 10 years of the same experience, respectively. According to years of unit experience, Mean±SD of head nurses was 10.75±3.32; compared to 9.44±5.50 for nurses. More than half of head nurses; and less than half of nurses (60%, 40%), had from 5 to less than 10 years of unit experience. As regard to years of managerial experience, Mean±SD of head nurses was 6.34±2.15, where above half of them (60%) had from 5 to less than 10 years of this experience. Concerning marital status, the majority of head nurses and nurses were married (90%, 84.5%), consecutively.

Table 2 illustrates that there are highly statistically significant differences between total lean leadership performance, continuous improvement, self-development and qualifications development dimensions and the three times of program implementation (before, immediately after and after three months), where ($P \leq 0.01$). Moreover, a statistically significant difference is found between lean thinking dimension and the three times of data collection (before, immediately after and after three months); where ($P=0.011$). The highest Mean±SD was for "continuous improvement" dimension at before, immediately after and after three months from program implementation (43.85±12.09, 46.95±11.86, 45.25±11.78), respectively. However, the lowest Mean±SD was for "self-development" dimension at before, immediately after and after three months from program implementation (21.7±6.51, 29.1±6.67, 24.55±6.73), consecutively.

Table 3 reveals that there were highly statistically significant differences between total quality of nursing work-life, work design and work context dimensions of nurses at before, immediately after and after three months from lean leadership training program implementation, where ($P \leq 0.01$). On the other hand, statistically significant differences were found between work-life /home life and work world dimensions and the three times of data collection, where ($P=0.024, 0.036$) respectively. The highest Mean±SD was for "work context" dimension at before, immediately after and after three months from program implementation (72.46±23.33, 76.99±23.8, 74.93±23.11), respectively. However, the lowest Mean±SD was for "work world" dimension at before, immediately after and after three months from program implementation (16.09±5.53, 19.24±5.42, 18.09±5.53), consecutively.

Table 4a shows that there were high positive statistically significant correlations between lean leadership performance dimensions and quality of nursing work-life dimensions, where ($P \leq 0.01$); except, positive statistically significant correlations between continuous improvement and work design dimensions;

self-development and work-life /home life and work context dimensions; qualifications development and lean thinking, work-life /home life, work design and work context dimensions; lean thinking and work context and total quality of nursing work-life dimensions; total lean leadership performance and work-life /home life and work context dimensions; work-life /home life and work world dimensions; work design and work context dimensions; and finally, work context and work world dimensions, where ($P < 0.05$) before lean leadership training program implementation.

Table 4b shows that there were high positive statistically significant correlations between lean leadership performance dimensions and quality of nursing work-life dimensions, where ($P \leq 0.01$); except a positive statistically significant correlation between total lean leadership performance, work-life /home life, work design and total quality of nursing work-life, where ($P < 0.05$) immediately after lean leadership training program implementation.

Table 4c shows that there were high positive statistically significant correlations between lean leadership performance dimensions and quality of nursing work-life dimensions, where ($P \leq 0.01$); except a positive statistically significant correlation between total lean leadership performance, work-life /home life, work design and total quality of nursing work-life, where ($P < 0.05$) after three months from lean leadership training program implementation.

Table 5 shows that there were high positive statistically significant correlations between quality of nursing work-life dimensions where ($P \leq 0.01$) at before, immediately after and after three months from lean leadership training program implementation.

Table 6 indicates that there is a highly statistically significant difference between head nurses' lean leadership Knowledge, at before and immediately after lean leadership training program, where ($P = 0.000$).

Table (1): Demographic characteristics of study subjects, working at Hamdy El-Tabakh Central Hospital. (N=220)

Demographic characteristics	Head nurses (n=20)		Nurses (n=200)		Total (n=220)	
	No	%	No	%	No	%
Age						
20 -	1	5.0	96	48.0	97	44.1
30 -	13	65.0	79	39.5	92	41.8
40 – 50	6	30.0	25	12.5	31	14.1
Mean±SD	36.45±4.85		31.18±6.23			
Working unit						
Medical	6	30.0	55	27.5	61	27.7
Surgical	8	40.0	60	30.0	68	30.9
ICU	6	30.0	85	42.5	91	41.4
Gender						
Male	0	0.0	28	14.0	28	12.7
Female	20	100	172	86.0	192	87.3
Educational qualification						
Bachelor of Sciences in Nursing	20	100	27	13.5	47	21.4
Diploma of Technical Institute of Nursing	0	0.0	129	64.5	129	58.6
Diploma of Secondary School of Nursing	0	0.0	44	22.0	44	20.0
Years of nursing experience						
1 -	1	5.0	49	24.5	50	22.7
5 –	8	40.0	68	34.0	76	34.5
>10	11	55.0	83	41.5	94	42.8
Mean±SD	12.65±4.33		10.67±6.53			
Years of unit experience						
1 -	1	5.0	52	26.0	53	24.1
5 –	12	60.0	80	40.0	92	41.8
>10	7	35.0	68	34.0	75	34.1
Mean±SD	10.75±3.32		9.44±5.50			
Years of managerial experience						
1 -	7	35.0	NA	NA	7	35.0
5 –	8	40.0	NA	NA	8	40.0
>10	5	25.0	NA	NA	5	25.0
Mean±SD	6.34±2.15					
Marital status						
Single	2	10.0	31	15.5	33	15.0
Married	18	90.0	169	84.5	187	85.0

Table (2): Mean scores of head nurses' lean leadership performance before, immediately after and after three months from lean leadership training program implementation, at Hamdy El-Tabakh Central Hospital. (N=20)

Lean Leadership Performance dimensions	Before program (n=20)			Immediately after program (n=20)			After three months from program (n=20)			F P
	Min	Max	Mean±SD	Min	Max	Mean±SD	Min	Max	Mean±SD	
Continuous Improvement	28	49	43.85±12.09	33	59	46.95±11.86	31	57	45.25±11.78	7.102 .002**
Self-Development	13	31	21.7±6.51	16	33	29.1±6.67	14	30	24.55±6.73	8.221 .000**
Qualifications Development	19	42	37.2±8.75	23	48	39.62±8.99	22	47	38.83±8.96	6.830 .004**
Lean Thinking	14	30	25.47±6.04	15	32	26.78±6.13	12	33	26.47±6.17	4.561 .011*
Total Lean Leadership Performance	74	152	128.22±33.39	87	172	142.45±33.65	79	167	135.1±33.64	8.900 .000**

**Highly significant at $P \leq 0.01$. *Significant at $P \leq 0.05$. Not significant at $P > 0.05$

F= Anova test

Table (3): Mean scores of nurses' quality of nursing work-life before, immediately after and after three months from lean leadership training program implementation, at Hamdy El-Tabakh Central Hospital. (N=200)

Quality of Nursing Work-Life dimensions (QNWL)	Before program (n=200)			Immediately after program (n=200)			After three months from program (n=200)			F P
	Min	Max	Mean±SD	Min	Max	Mean±SD	Min	Max	Mean±SD	
Work-life /Home Life	10	25	22.19±7.64	12	28	26.7±6.92	11	27	25.51±7.01	3.998 0.024*
Work Design	14	39	34.32±10.12	17	43	36.89±9.65	15	42	35.42±9.72	4.021 0.007**
Work Context	24	76	72.46±23.33	26	80	76.99±23.8	25	78	74.93±23.11	5.062 0.005**
Work world	5	17	16.09±5.53	6	20	19.24±5.42	5	18	18.09±5.53	2.976 0.036*
Total QNWL	53	158	145.06±46.62	61	171	159.82±45.79	56	165	153.95±45.37	7.082 0.000**

**Highly significant at $P \leq 0.01$. *Significant at $P \leq 0.05$. Not significant at $P > 0.05$

F= Anova test

Table (4a): Correlation matrix between head nurses' lean leadership performance and quality of nursing work-life before lean leadership training program implementation, at Hamdy El-Tabakh Central Hospital. (N=20)

lean leadership performance dimensions		Before program									
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
(1) Continuous Improvement	r	1	0.490	0.457	0.563	0.607	0.499	0.331	0.513	0.487	0.699
	P		0.003**	0.003**	0.001**	0.001**	0.003**	0.036*	0.002**	0.005**	0.000**
(2) Self-Development	r		1	0.650	0.468	0.700	0.199	0.670	0.242	0.515	0.543
	P			0.000**	0.003**	0.000**	0.016*	0.000**	0.015*	0.001**	0.002**
(3) Qualifications Development	r			1	0.278	0.513	0.256	0.240	0.309	0.531	0.417
	P				0.014*	0.003**	0.016*	0.017*	0.010*	0.001**	0.004**
(4) Lean Thinking	r				1	0.622	0.480	0.576	0.301	0.398	0.315
	P					0.000**	0.003**	0.001**	0.010*	<0.01**	0.010*
(5) Total lean leadership performance	r					1	0.216	0.356	0.714	0.615	0.820
	P						.014*	.010*	0.000**	0.002**	0.000**
(6) Work-life /Home Life	r						1	0.455	0.448	0.281	0.750
	P							0.004**	0.004**	0.017*	0.000**
(7) Work Design	r							1	0.223	0.537	0.600
	P								0.019*	0.002**	0.002**
(8) Work Context	r								1	0.209	0.567
	P									0.014*	0.003**
(9) Work world	r									1	0.780
	P										0.000**
(10) Total quality of nursing work-life	r										1
	P										

**Highly significant at $P \leq 0.01$. *Significant at $P \leq 0.05$. Not significant at $P > 0.05$

Interpretation of r: Weak (0.1-0.24) Intermediate (0.25-0.74) Strong (0.75-0.99) Perfect (1)

Table (4b): Correlation matrix between head nurses' lean leadership performance and quality of nursing work-life immediately after lean leadership training program implementation, at Hamdy El-Tabakh Central Hospital. (N=20)

lean leadership performance dimensions		Immediately after program									
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Quality of nursing work-life	r										
	P										
(1) Continuous Improvement	r	1	0.560	0.548	0.608	0.614	0.573	0.660	0.511	0.489	0.605
	P		0.001**	0.001**	0.000**	0.001**	0.001**	0.000**	0.001**	0.003**	0.001**
(2) Self-Development	r		1	0.518	0.499	0.810	0.560	0.613	0.604	0.581	0.590
	P			0.001**	0.003**	0.000**	0.001**	0.000**	0.000**	0.001**	0.002**
(3) Qualifications Development	r			1	0.508	0.490	0.613	0.587	0.600	0.599	0.482
	P				0.001**	0.003**	0.000**	0.001**	0.000**	0.001**	0.003**
(4) Lean Thinking	r				1	0.602	0.562	0.670	0.488	0.561	0.342
	P					0.001**	0.001**	0.000**	0.003**	0.001**	0.010*
(5) Total lean leadership performance	r					1	0.257	0.301	0.790	0.603	0.819
	P						.012*	.010*	0.000**	0.003**	0.000**
(6) Work-life /Home Life	r						1	0.612	0.502	0.487	0.712
	P							0.000**	0.001**	0.003**	0.000**
(7) Work Design	r							1	0.560	0.519	0.543
	P								0.001**	0.001**	0.003**
(8) Work Context	r								1	0.601	0.600
	P									0.000**	0.002**
(9) Work world	r									1	0.706
	P										0.000**
(10) Total quality of nursing work-life	r										1
	P										

**Highly significant at $P \leq 0.01$. *Significant at $P \leq 0.05$. Not significant at $P > 0.05$

Interpretation of r: Weak (0.1-0.24) Intermediate (0.25-0.74) Strong (0.75-0.99) Perfect (1)

Table (4c): Correlation matrix between head nurses' lean leadership performance and quality of nursing work-life after three months from lean leadership training program implementation, at Hamdy El-Tabakh Central Hospital. (N=20)

lean leadership performance dimensions		After three months from program									
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Quality of nursing work-life											
(1) Continuous Improvement	r	1	0.572	0.489	0.476	0.701	0.530	0.498	0.611	0.582	0.800
	P		0.001**	0.003**	0.004**	0.000**	0.001**	0.003**	0.000**	0.001**	0.000**
(2) Self-Development	r		1	0.543	0.617	0.658	0.716	0.606	0.543	0.590	0.603
	P			0.001**	0.000**	0.001**	0.000**	0.000**	0.001**	0.001**	0.001**
(3) Qualifications Development	r			1	0.713	0.666	0.620	0.517	0.480	0.542	0.499
	P				0.000**	0.001**	0.000**	0.001**	0.003**	0.002**	0.003**
(4) Lean Thinking	r				1	0.471	0.570	0.614	0.628	0.599	0.267
	P					0.005**	0.001**	0.000**	0.000**	0.001**	0.019*
(5) Total lean leadership performance	r					1	0.277	0.287	0.643	0.771	0.798
	P						.013*	.011*	0.001**	0.000**	0.000**
(6) Work-life /Home Life	r						1	0.538	0.602	0.666	0.693
	P							0.001**	0.000**	0.000**	0.001**
(7) Work Design	r							1	0.570	0.538	0.599
	P								0.001**	0.001**	0.003**
(8) Work Context	r								1	0.681	0.771
	P									0.000**	0.002**
(9) Work world	r									1	0.650
	P										0.001**
(10) Total quality of nursing work-life	r										1
	P										

**Highly significant at $P \leq 0.01$. *Significant at $P \leq 0.05$. Not significant at $P > 0.05$

Interpretation of r: Weak (0.1-0.24) Intermediate (0.25-0.74) Strong (0.75-0.99) Perfect (1)

Table (5): Correlation Matrix between nurses' quality of nursing work-life at before, immediately after and after three months from lean leadership training program implementation, at Hamdy El-Tabakh Central Hospital. (N=200)

Phases of program implementation		Before program (N=200)					Immediately after program (N=200)					After three months from program (N=200)				
		(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)
(1) Work-life /Home Life	r		0.726	0.560	0.499	0.700		0.650	0.593	0.476	0.801		0.700	0.482	0.506	0.655
	P	1	0.000**	0.002**	0.003**	0.000**	1	0.000**	0.001**	0.003**	0.000**	1	0.000**	0.003**	0.002**	0.002**
(2) Work Design	r			0.601	0.578	0.812			0.702	0.614	0.790			0.529	0.702	0.701
	P		1	0.000**	0.001**	0.000**		1	0.000**	0.000**	0.000**		1	0.001**	0.000**	0.001**
(3) Work Context	r				0.405	0.776				0.529	0.691				0.533	0.733
	P			1	0.003**	0.000**			1	0.001**	0.001**			1	0.001**	0.000**
(4) Work world	r					0.780					0.713					0.681
	P				1	0.000**			1	0.000**				1	0.001**	0.001**
(5) Total QNWL	r										1					1
	P					1										1

* Highly significant at $P \leq 0.01$. *Significant at $P \leq 0.05$. Not significant at $P > 0.05$

Interpretation of r: Weak (0.1-0.24) Intermediate (0.25-0.74) Strong (0.75-0.99) Perfect (1)

Table (6): Head nurses' Lean leadership knowledge, before and immediately after lean leadership training program (n=20)

lean leadership 'Head nurses knowledge	Mean±SD	X² p
Before program	4.02±1.33	8.193
Immediately after program	8.92±2.07	0.000**

**Highly significant at $P \leq 0.01$. *Significant at $P \leq 0.05$. Not significant at $P > 0.05$

Discussion

Implementing lean in healthcare through reviewing processes, systems, removing wastes and hazards, help the organization to reduce patient waiting time, eradicate defects to improve quality of care, save time by reducing motion, remove waste from over-processing and over-production. Obtaining head nurses' support and their involvement in the lean initiative is a vital factor for successful lean implementation in healthcare (**Boswihi, 2018**). In healthcare, lean strategies training program, as in-service program, creates a condition that improve healthcare services with value-add activities, through applying lean thinking which help in reducing medication errors, wastes and hazards to move toward quality of work life and improve performance that required to support and improve health care provided to patients and enhance hospital outcomes (**Elzohairy et al.,2020**).

The results of the current study revealed that, there were highly statistical significant differences between head nurses' total lean leadership performance and the three phases of program implementation (before, immediately after and after three months). Also, the highest mean scores for all dimensions were at immediately after program implementation phase. This result may be due to the majority of head nurses hadn't attended previous training courses about lean strategies, and it is new concept for them, so they need to acquire more information and apply it to improve performance. Also, it may be due to the improvement of head nurses' awareness after training program about importance of close observation and monitoring of the staff to check any defects in daily work duties, and to identify the origin of the problems as a result, head nurses determined different types of wastes such as: cost, time, efforts and try to overcome it which improve quality of patient care provided.

This finding is supported by a study performed by (**Ahmed et al. 2019**) reported that lean management have a significant impact on quality performance of the Malaysian hospitals. In the same context, (**Gao et al. 2020**) argued that, lean management emphasizes the patient as the center to achieve improvement, improve the efficiency and reduce costs. In this regard, (**Elzohairy et al.,2020**) stated that there was a marked increase in quality of care and performance after the lean training program implementation. Likewise, (**Ong et al., 2023**) whose study revealed that a lean leader who undertakes lean leadership training influence the overall performance of lean healthcare providers. Finally, (**Elsayed et al., 2023**) concluded that, there was highly statistically significant correlation between pre, post and follow up program implementation regarding head nurses' knowledge, performance regarding lean strategies and leadership effectiveness.

The current study indicated that there was highly statistically significant difference in the nurses' total quality of nursing work-life at three phases of training program implementation. Also, the highest mean scores for all dimensions were at immediately after program implementation phase. This may be due to head nurses try to involve their staff nurses in decision making process and have autonomy to deal with any problem in work place. Also, good communication and relationship between nurses and top level which increase staff satisfaction and retention and accordingly enhance nurses' work environment.

This was similar to a study performed by (**Honda et al., 2018**) demonstrates that lean leadership can provide effective solutions to improving the quality of nurses' work life and processes in a healthcare service environment while simultaneously creating a cultural change within the organization by involving everyone associated with the process being evaluated. (**Ayaad et al., 2019**) stated that use of lean management plays important role in improving work effectiveness and increase patient and nurse satisfaction, and how the work life among nurses can be improved by utilizing lean principle. Also, this result was congruent with a study carried out by (**Gemmel et al., 2019**) and reported that, extensive lean implementation where management clearly shows its belief in lean is a more favorable environment for changing the problem-solving behavior of nurses. Similarly, (**Zdeba-Mozola et al., 2022**) who mentioned that the use of lean management tools in the hospital allowed for a significant improvement in the efficiency of the work of medical personnel and for significant savings in working time that could be spent on patient care. In contrast, a study conducted by (**Zibrowski et al. 2018**) found that there wasn't significant difference as regard nurses' quality of work life after implementing lean management.

The current study revealed that there was a highly positive statistically significant correlation between total lean leadership performance and total quality of work life at three phases of training program implementation. This can be explained as, head nurses start to apply many lean strategies which emphasized on maintain clean and tidy work environment, encourage continuous self-learning, provide frequent observation and guiding staff in a real work area, be a role model for their staff, prioritize work duties, maintain good relationship with all health team and develop staff abilities. Applying these strategies help head nurses to save time, efforts, minimize work errors, enhance their ability to be proactive and innovative in dealing with problems to provide good work environment that help to provide safe and high quality patient care.

(**Ali et al., 2020**) argued that, applying lean leadership approaches reduce hospitalization of patients, increase patients' satisfaction, reduce patient waiting time, reduce inventory level, increase visit number of patients to their doctor, eliminating waste,

reduce costs, increase quality of services and patient safety, reduce overtime of employees, mistakes and accidents, reduce patient care period, patient recovery, reduce workload, increase staff satisfaction, and create of a calmer and more orderly working environment. In this concern, (Kalogeropoulos et al., 2022) discussed that the implementation of lean principles and tools in healthcare has gradually led to a significant improvement in quality and efficiency of work life. Consistently, a study conducted by (Tan et al., 2023) and reported that the studied participants' quality of work had significantly improved after the intervention of lean leadership program. The training induced managers to role-model innovative work behaviors while co-creating, with their employees, a renewal of their agency's core processes and contributed to an innovative work culture.

Concerning correlation between nurses' quality of work life dimensions, there was a highly positive statistically significant correlation between quality of work life at three phases of training program implementation. This may be due to the application of lean strategies in work place save nurses' time and efforts which decrease their work-load, improve nurses' satisfaction and retention which maintain good work environment, improve patient outcomes and increase organization productivity.

In this concern, (Dhamija et al., 2019) reported that there was a positive correlation between quality of work life dimensions and argued that management style, work environment, worker satisfaction, organizational productivity, working conditions, work and social life interaction are said to be the components of quality of work life. In the same context, (Aruldoss et al., 2021) found that there was significant positive correlation between quality of work life dimensions and stated that quality of work life is a multidimensional construct and includes job security, training and career advancement, empowerment, reward systems and the overall work environment.

Pertaining to lean leadership knowledge of head nurses, the current study reflected there was a highly statistically significant difference between head nurses' mean score of lean leadership knowledge before and immediately after lean leadership training program. From the researcher point of view this improvement in lean management knowledge was due to the lean management concept is new and the head nurses want to know all information about it, so it was interesting for them know a lot of information about it. Also, this improvement could be due to the lean management could help the head nurses to decrease their waste and improve the nursing process in cost efficient way so they wanted to learn more about the concept and how to apply it in their units.

In the same line, the result of the current study was in agreement with (Demirli et al., 2021) found that that there was highly significant improvement in lean management knowledge of studies of nurses

throughout post and follow up phase. In this concern, (Udod et al., 2020) argued that nurse managers without the requisite knowledge of the lean management system and adequate resources to build and support a continuous improvement process may not realize positive outcomes.

Besides, the result of the current study indicated that almost two thirds of head nurses had good knowledge about lean leadership at immediately after training program implementation; compared to one quarter of them at before program implementation. This result was supported by (Abd Al Fadeel et al., 2023) indicated that the majority of nurses had improved in the level of knowledge at immediately post program and three months' post program phases, and there was a highly statistically significant difference in total knowledge during different periods of assessment at immediately and three months' post program.

Conclusion

Based on the results of this study, it has been concluded that there was a highly statistically significant differences between lean leadership training program and head nurses' performance program at Hamdy El-Tabakh Central Hospital. Also, there was high statistically significant correlation between lean leadership training program and quality of nurses' work-life. Moreover, there was high statistically significant correlations between head nurses' performance and quality of nurses' work-life at before, immediately after and after three months from lean leadership training program implementation. Additionally, there is a highly statistically significant difference between head nurses' lean leadership knowledge, at before and immediately after lean leadership training program.

Recommendations

Based on the findings of the current study, the following recommendations are suggested:

A. Recommendation for hospital administrators and managers should:

- ❖ Initiate a strong orientation programs toward lean approach and its strategies, from the highest administrative levels to the lower levels.
- ❖ Introduce lean approach in the healthcare strategic plans, policy as well as vision, this will ensure that

the healthcare providers understand the importance of lean approach to the organization.

❖ Transform the traditional administrative processes into lean management strategies through applying in-service training programs and workshops to implant a culture of lean leadership and lean management, among hospital administrators and unit managers.

B. Hospital head nurses should:

- ❖ Explain lean leadership approach for their staff nurses as a tool for quality improvement methods in the hospital units.
- ❖ Ensure that staff nurses apply lean strategies in daily work processes.
- ❖ Evaluate benefits of lean strategies implementation in saving time, effort; decrease resources consumption and enhance patient outcomes.
- ❖ Perform conferences about lean and its strategies should be conducted to teach the health care providers what is lean and how to implement it.

C. Administrators of faculty of nursing should:

- ❖ Add lean approach in nursing administration theoretical and practical curriculum to provide students with knowledge and skills about lean concept and strategies.
- ❖ Coordinate with administrators of health care settings to facilitate application of lean strategies in the hospitals.

Further studies:

- ❖ Impact of head nurses lean leadership training program on the nurses' performance.
- ❖ Identify the factors that affect lean strategies application at health care settings.
- ❖ Impact of lean strategies utilization training program on quality of occupational safety.
- ❖ Impact of lean strategies training program on patient outcomes.

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