Effect of Lean Management Training Program on Nurse Managers' Innovation and Crisis Management

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ABSTRACT

Background: Efficiency and effectiveness in healthcare are paramount, as any deviation can result in a dire crisis, so there is a need to improve healthcare quality by implementing lean management strategies innovatively to eliminate waste, reduce costs, and resolve work issues. **Aim:** Evaluate the effect of the lean management training program on nurse managers' innovation and crisis management. **Subjects and methods:** A quasi-experimental research design, one group (pre- and post-intervention). **Setting:** The study was conducted at Belkas Central Hospital in Dakahlia Governorate. **Subjects:** The study sample consisted of all nurse managers working in the study setting (63). **Tools:** A self-administered lean management knowledge questionnaire, a lean management strategies self-reported questionnaire, an innovative work behavior scale, and a crisis management questionnaire. **Results:** After program implementation, nurse managers' knowledge of lean management, lean management strategies, applied lean tools, innovative work behavior, and crisis management practice improved significantly across all three program phases. In addition, the multiple comparisons reveal that every two pairs of pre- and post-, pre- and follow-up, and post- and follow-up, has a statistically significant difference in the mean score at p =.000. **Conclusion:** The partial (η2) values for nurse managers' lean management knowledge, lean management strategies, applied lean tools, innovative work behavior, and crisis management practice indicate that the effect size of the lean management training program for nurse managers is substantial. **Recommendations**: Lean management training courses should be conducted and regularly updated for all healthcare providers. More research in this area is also recommended.

Keywords: Crisis management, innovation, lean management, nurse managers.

INTRODUCTION

Healthcare is a field where effectiveness and efficiency are crucial because any deviation could cause a crisis. Because of this, healthcare organizations use a variety of quality strategies to reduce costs and improve quality while increasing effectiveness to be competitive in the healthcare market (Veres, Cotoi, Moica, Marian & Pîslă, 2020). Lean management is one quality improvement method that focuses on the customer (Dizon, 2017).

Lean management is an ideology that enables one to obtain the correct quantity of items at the right location; it seeks to minimize waste and is adaptable to change. Lean reduces costs, adds value, and enhances supply chain outcomes (Rodrguez Cornejo, Cervera Paz, López Molina, & Pérez-Fernández, 2020). Also, the ideas and principles of lean management should be adopted within the healthcare sector, as it poses many solutions to many possible incidents occurring in the industry (Kumar, 2021).

Wastes are defined by Helmold (2020) as anything that must be reduced or eliminated in lean and will not be paid by the customer. Sharma and Khatri (2021) mentioned that eight types of waste focused on lean. The eight deadly wastes are overproduction, waiting, transportation, overprocessing, inventory, motion, defects, and underutilized people (Boswihi, 2018). Numerous tools aim to identify and eliminate waste and implement continuous improvements, such as Just in Time, Kanban, Value Stream Mapping, the 5S method, and Kaizen (Marandi, 2018; Veres et al., 2020).

Additionally, lean management provides a solid platform for utilizing innovation in all healthcare practices. In light of this, healthcare organizations that successfully integrate lean and innovation would be highly competitive and achieve long-term sustainability (Abuhejleh, Dulaimi & Ellahham, 2016). Applying innovative techniques in healthcare organizations decreases service time and improves the hall system's efficiency (Alharthi & Aziz, 2018).

Innovation transforms an idea into a novel product, process, practice, or improvement by applying relevant knowledge and resources (*Varadarajan, 2018).* Healthcare innovation is a new way of helping healthcare professionals deliver high-quality care that is more innovative, quicker, better, and more cost-effectively (Samuelsson, Witell, Gottfridsson & Elg, 2019). Also, innovative nursing behavior refers

to nurses' work-related behavior, enabling them to generate and apply new ideas, procedures, and methods in health care to increase the quality and effectiveness of care delivery (Yang, Zhou, Wang, Lin, & Luo, 2019).

Healthcare has recently paid greater attention to innovation, which could be crucial during severe economic and health crises because illness and other pandemics damage the nation's economic productivity (Akinwale, 2021). These innovations concern the introduction of novel methods for crisis forecasting, new techniques for creating preventive measures, and innovations for crisis recovery (Gajda & Zaplatynskyi, 2017).

The crisis is an unanticipated, unplanned event that is anticipated to result in a risky condition and endanger the viability of administrative work (Khanna, 2020). Also, crisis phenomena are a necessary component of the growth of any system worldwide (Zvarych & Tysh 2020). Remarkably, the healthcare system is viewed as a high-stakes sector prone to crises (Lei & Palm, 2019). Moreover, Khanna (2020) defines crisis management as an organization's process of dealing with an unfavourable situation that negatively impacts the organization and its stakeholders. Proper crisis management practices can improve patient safety, prevent or mitigate the risks associated with a possible crisis, keep the work operations running in a survivable manner during the unfavorable phase, and overcome it with minimal losses (Gangaram, Alinier & Menacho, 2017; Zvarych & Tysh, 2020).

Therefore, hospitals need strong leaders who can effectively manage and lead the hospital’s response to any crisis surrounding them. They can quickly gain a competitive advantage and improve the performance of their subordinates (Aljamal, 2018). Also, leaders must develop and review formal pre-tested and crisis action plans periodically (McClelland, 2016).

Significance of the study:

Several healthcare problems worldwide, such as infections, preventable errors, increasing healthcare costs, and changing customer expectations, affect health outcomes adversely. Lean management solves those problems by eliminating waste and reducing costs (Çavmak & Kaptanoglu 2017). With the implementation of lean management, approximately 60%–65% of healthcare waste can be removed (Singh & Lillrank, 2018). Furthermore, organizations should focus on sending individual managers to external

courses for lean transformation training to build their capacity for continuous development and holistic leadership development, including personal and interpersonal skills as well as improving organizational structures and practices to be aligned with lean thinking (Holmemo, Ingvaldsen, & Powell, 2022). Therefore, this study aims to evaluate the effect of a lean management training program on nurse managers' innovation and crisis management.

THE AIM OF THE STUDY:

This study aimed to evaluate the effect of a lean management training program on nurse managers' innovation and crisis management.

Objectives:

1. Assess nurse managers' knowledge regarding lean management through program phases.
2. Determine the lean management strategies that nurse managers use through program phases.
3. Measure the nurse managers' innovation through program phases.
4. Identify nurse managers' crisis management skills from their perspective through program phases.
5. Develop a training program about lean management for nurse managers.
6. Find out the effect of a lean management training program on nurse managers' innovation and crisis management.

Research hypotheses:

H1: An applied lean management training program improves nurse managers' knowledge and strategies toward lean management.

H2: An applied lean management training program improves nurse managers' innovation.

H3: An applied lean management training program improves nurse managers' crisis management skills.

SUBJECTS AND METHODS

A. Technical Design:

Research design:

A quasi-experimental research design (a pre-and post-intervention study) on a single group.

Study setting:

The research was conducted at Belkas Central Hospital, affiliated to the Ministry of Health and Population in Dakahlia Governorate. It has nine buildings and 187 beds for medical care for patients with various diseases. All 18 hospital departments were included in the study.

Study subjects:

All levels of nurse managers with a total number of 63: nurse service director, assistant nurse service director, supervisor, head nurses, team leader, and charge nurses (alternative head nurses on afternoon and night shifts).

Inclusion criteria:

The study included nurse managers working at Belkas Central Hospital at the time of data collection and who volunteered.

Data collection tools:

The data was gathered using four tools: a self-administered lean management knowledge questionnaire, lean management strategies self-reported questionnaire, an innovative work behavior scale (IWB), and a crisis management questionnaire.

Tool I: a self-administered lean management knowledge questionnaire

Researchers developed this questionnaire to assess nurse managers' lean management knowledge. It was split up into two distinct parts:

Part I: included the demographic and job characteristics of nurse managers, including their age, gender, level of education, position title, marital status, years of expertise, and prior participation in an educational program in the study area.

Part 2: a developed tool of the Lean Management Knowledge Questionnaire based on relevant literature (International Labour Organization, 2017; Boswihi, 2018; Gaafer, 2018). To assess nurse managers' knowledge level regarding the lean management approach before and after the program implementation. This part consisted of 50 questions of two types (25 questions true or false and 25 questions multiple-choice) grouped under five main categories: 1) lean management (10 questions), 2) lean leadership (9 questions), 3) value (7 questions), 4) waste (11 questions), and 5) lean management tools (13 questions).

Scoring system:

Each true or false and multiple-choice question received "one" for correct and "zero" if incorrect. The total knowledge was measured according to the cut-off point, which means that the nurse managers were considered to have sufficient lean management knowledge if the percentage score was 60% or higher and insufficient lean management knowledge if the percentage score was less than 60%.

Tool II: Lean Management Strategies Self-Reported Questionnaire:

A tool developed by the researcher based on a review of related literature (Roszell, 2013; Machado, Scavardac, Vaccaroa, Kipperd & Khan, 2015; Gaafer, 2018; Bannay, 2019). To assess nurse managers' lean management strategies for overcoming the eight deadly wastes. This tool comprised 80 items (79 items were grouped under eight main categories according to types of waste, and one item was about the most commonly used lean management tools). The eight domains of the instrument were: 1) defects (13 items), 2) waiting (10 items), 3) overproduction (9 items), 4) non-utilized talent (13 items), 5) transportation (8 items), 6) inventory (8 items), 7) motion (11 items), and 8) excess processing (7 items).

Scoring system:

The participant's response was scored on a four-point Likert scale, with three indicating yes, two indicating sometimes, one showing no, and zero indicating not applicable for each activity. The subscale item scores were totaled and divided by the number of items to produce a mean score for each component. The total score of nurse managers' lean management strategies was considered low if their score was less than 40%, moderate if their score ranged between 40% and less than 75%, and high if their score was 75% or more (Gaafer, 2018).

Tool III: Innovative Work Behavior Scale (IWB):

This scale was used to assess the innovativeness of nurse managers. The scale was created in English by Lambriex-Schemitz et al. (2020). It was translated to Arabic with some minimal modifications by the researcher. It was composed of 44 items subcategorized into five dimensions. 1) opportunity exploration (4 items), 2) idea generation (7 items), 3) idea promotion (7 items), 4) idea realization including criterion-based implementation and learning-based communication (9 items), and 5) idea sustainability including internal embedding and external dissemination (17 items).

Scoring system:

According to Lambriex-Schmitz et al. (2020), responses for each item were rated on a 6-point Likert scale (1 = strongly disagree, 2 = disagree, 3=neither agree nor disagree, 4=agree, 5=mostly agree, and 6 = strongly agree). The total score of nurse managers' innovative work behavior was considered low if less than 65%, moderate from 65 % to less than 75%, and high if equal to 75% or more.

Tool IV: Crisis Management Questionnaire:

The researcher devised this tool based on a review of the relevant literature (Al-Gedely, 2006; Corbaley, 2010; Aljamal, 2018). Aimed to identify nurse managers' crisis management roles from their perspective. This tool consisted of 68 statements grouped under five main categories, as follows: 1) early detection of warning signals stage (18 statements), 2) preparation and prevention stage (21 statements), 3) damage containment

stage (16 statements), 4) recovery stage (7 statements), and 5) learning stage (6 statements).

Scoring system:

On a five-point Likert scale, answers ranged from (1) strongly disagree to (5) strongly agree. The overall crisis management role score for nurse managers was 340, ranging from 68 to 340. The subscale item scores were totaled and divided by the number of items to produce a mean score for each component. Using the cut-off points, a high score of 60% or more indicates that nurse managers have a high level of crisis management skills, whereas a low score of less than 60% reveals a low level of crisis management skills (Al-Gedely, 2006).

B. Operational Design:

Tools' validity:

All tools of a self-administered lean management knowledge questionnaire, a lean management strategies self-reported questionnaire, and an innovative work behavior scale (IWB) were translated into Arabic and retranslated into English by the researcher and a language expert. Then all four tools were submitted and revised by a jury committee composed of seven experts (Five experts in the field of nursing administration and two experts in medical surgical nursing at the faculty of nursing in Port Said and Mansoura University for testing the validation of the tools. Minor changes were made in response to their feedback. From the standpoint of experts, the tools were deemed valid.

Tools' reliability:

Using Cronbach's alpha coefficient reliability test, the internal consistency of the instruments was determined. A high Cronbach's alpha coefficient indicated that the tool was reliable (0.93 for a self-administered lean management knowledge questionnaire, 0.95 for a self-reported lean management strategies questionnaire, 0.96 for an IWB scale, and 0.95 for a crisis management questionnaire).

Pilot study:

10% of the study sample (7) participated in a pilot study to evaluate the instruments' clarity, feasibility, applicability, and completion time. The pilot study participants were omitted from the primary study sample to guarantee uniformity of responses. As a result, the data from the pilot research were analyzed, and changes were made as needed. Due to the pilot study, six items were removed from the lean management self-reported questionnaire, constituting the only essential change.

Fieldwork:

The assessment, planning, implementation, and evaluation phases of this study's fieldwork spanned eight months, from the beginning of May 2022 to the end of December 2022.

Phase 1: Assessment or exploratory phase:

After obtaining official consent from the hospital directors examined, data were collected. Individual meetings were also held with the directors of nursing services to explain the study's objectives and solicit their participation. The researcher started data collection from nurse managers by introducing herself to the subjects and explaining the study's purpose. Then pre-test data were collected from nurse managers using a self-administered lean management knowledge questionnaire, a lean management strategies self-reported questionnaire, an innovative work behavior scale (IWB), and a crisis management questionnaire before developing the training program. Also, the collected data was analyzed to determine the nurse manager's learning needs. Each head nurse spent approximately 35–40 minutes responding to the study tools.

Phase 2: Planning of the Training Program

Planning and developing the lean management training program for the studied nurse managers based on the assessment phase result, reviewing related literature, and developing the training sessions, strategies, case scenarios, training aids, time schedules, and handouts

Phase 3: Implementation of the Training Program

The training program was implemented for nurse managers after developing the training material for lean management and designing the program. The program sessions were implemented three times, after dividing the participants into three groups and repeating the agenda for every group because meeting all of them was challenging. Every group takes eight sessions over five days. The duration of each session was sixty minutes. Introduce only one session on the first and last day while introducing two sessions each day from the second to fourth days.

At the beginning of the first session, an acquaintance was made between the researcher and the studied nurse managers; ask the participants about their expectations of the program and give them an orientation to the training program, its importance, and its timing. At the beginning of each session, the researcher identifies the session's goals and reviews the objectives touched on during the previous session. The researcher used different teaching methods during each session: discussion, brainstorming, and lectures. At the end of each session, feedback was given, and any questions on the content or critical points about the current session were reviewed.

Phase 4: Evaluation phase:

In this stage, the impact of the lean management training program for nurse managers was examined immediately and after three months of program implementation using the same tools that were used prior to program implementation to estimate the effect of the program on nurse managers' knowledge level regarding lean management, lean management strategies used to overcome eight deadly wastes, innovation level, and crisis management role. The subsequent period ended in December 2022.

C. Administrative Design:

An official letter from the vice president for graduate studies and researcher and the dean of the faculty of nursing was sent to the selected area of the study. The hospital director was contacted and informed to obtain permission to include all levels of nurse managers in the present research.

Ethical considerations:

Approval was taken from the Faculty of Nursing's Research Ethics Committee (Ref. No. NUR 8/8/2021(5)) Port-Said University. Administrators at the targeted hospital granted permission to conduct the study. In addition, informed written consent was obtained from all nursing managers following an explanation of the study's purpose and nature. Participants in the study were informed that their participation was voluntary and that they could disengage at any time. The anonymity of the participants was guaranteed and maintained. No coercion or pressure was applied to the participants, and they were not subjected to any risk or burden to participate in the study. The collected information was strictly discreet and will only be used for research purposes.

D. Statistical Design:

The SPSS version 22 statistical software was used for data analysis. A one-sample Kolmogorov-Smirnov test was performed to determine the normality of the data. To identify qualitative data, utilized numbers and percentages. The means and standard deviations of continuous variables are displayed. The statistical analysis employed in this study was a one-way repeated-measures analysis of variance (ANOVA) test, along with applying a multiple comparison adjustment method known as the Bonferroni test. These methods were specifically chosen to analyze parametric data. The effect magnitude of the lean management training program was calculated using partial eta squared ($\eta 2$). The significance level was set at 0.05.

RESULTS:

Table (1): displays that the most studied nurse managers were female, married, and not trained in lean management before (93.7%, 82.5%, and 98.4%, respectively); about three-quarters of nurse managers had baccalaureate degrees and were aged 30 to less than 40 years (76.2% and 77.8 %, respectively). Meanwhile, more than one-third of nurse managers studied have 10 to less than 15 years of experience and an appointment as head nurses (36.5% and 38.1%).

Table (2): reflects the nurse managers' knowledge regarding the lean management approach through the program phases. This table clarifies significant differences between nurse managers' knowledge of the lean management approach for all domains through the

three program phases (P value =.000). Furthermore, the mean per cent scores of the five lean management approach knowledge domains differ by a large margin. That demonstrated that the post-intervention phase had the highest mean scores compared to the pre-intervention and follow-up phases (94.92%, 91.886%, 90.475%, 94.373%, and 93.407%, respectively), with large partial η2 values for all knowledge domains, indicating that the program had a major effect on nurse managers' knowledge regarding lean management.

Table (3): shows the nurse managers' lean management strategies for overcoming the eight deadly wastes through the program phases. It demonstrates significant differences between the nurse managers' lean management strategies for overcoming the eight deadly wastes through the program phases. Also, the mean percent scores of the eight lean management strategies differ by a large margin, demonstrating that the post- and follow-up intervention phases had the highest mean scores compared to the pre-intervention stage. Furthermore, the η2 values for defects, waiting, overproduction, non-utilized talent, transportation, inventory, motion, and excess processing domains are 0.580, 0.440, 0.552, 0.531, 0.485, 0.481, 0.570, and 0.455, respectively, indicating a magnitude effect of the lean management training program on nurse managers' lean management strategies for overcoming the eight deadly wastes.

Figure (1): illustrates the frequency of applying lean management tools among nurse managers through the program phases. This figure illustrates that all nurse managers used the 5S tool through all program phases. Conversely, KAIZEN, Poka Yoke, Gemba, Kanban, and Value Stream Mapping tools were not applied in the pre-intervention phase. All lean management tools were frequently used post-intervention and in follow-up phases, except the two tools of Kanban and Value Stream Mapping, which had low application (1.6% and 6.3%, respectively) by nurse managers.

Table (4): emphasizes the innovative work behavior of nurse managers throughout the program phases. The post-intervention and follow-up intervention phases had the highest mean scores in all innovative work behavior domains compared to the pre-intervention phases, with a statistically significant difference between program phases. In addition, the partial η2 values for opportunity exploration, idea generation, idea promotion, idea realization, and idea sustainability were (0.603, 0.643, 0.677, 0.76, and

0.708, respectively), indicating that the deployment of the lean management training program had a significant impact on the innovation of nurse managers.

Table (5): reflects the nurse managers' crisis management role through the program phases. In all crisis management practice domains, the post-intervention and follow-up intervention phases had the highest mean scores compared to the pre-intervention phases, demonstrating statistically significant differences among the three program stages. Furthermore, the magnitude effect size of the lean management training program on nurse managers' crisis management practices was confirmed by the values of partial η2 (0.651, 0.682, 0.670, 0.560, and 0.572, respectively) for the early detection of warning signals stage, preparation and prevention stage, damage containment stage, recovery stage, and learning stage.

Table (6): articulates the effect of the training program on nurse managers' lean management knowledge, lean management strategies, applied lean tools, innovative work behavior, and crisis management role. The post-intervention and follow-up intervention phases had the greatest mean compared to the pre-intervention phase, with a statistically significant difference between the three program phases. In addition, the Bonferroni test for multiple comparisons reveals that each pair of pre- and post-, pre- and follow-up, and post- and follow-up data had a statistically significant mean difference at p =.000. Additionally, (η2) values for lean management knowledge, lean management strategies, applied lean tools, innovative work behavior, and crisis management practice of nurse managers (0.938,.727,.937,.814, and 0.753) prove the enormous effect size of the lean management training program on nurse managers.

Table 1: Frequency distribution of nurse managers' demographic characteristics (n = 63):

Demographic Characteristics	N	%
		Age groups
< 30 years	8	12.7
30 : < 40 years	49	77.8
40 : < 50 years	5	7.9
≥ 50 years	1	1.6
Mean age ± SD	34.37±4.591	
Range	25-50	
Gender		
Female	59	93.7
Male	4	6.3
Educational levels		
Bachelor	48	76.2
Master	2	3.2
Diploma	13	20.6
Years of experience		
< 5 years	1	1.6
5 : < 10 years	20	31.7
10: < 15 years	23	36.5
≥ 15 years	19	30.2
Mean age ± SD	11.95±4.664	
Marital status		
Single	5	7.9
Married	52	82.5
Widow	1	1.6
Divorced	5	7.9
Job position		
Nurse service director	1	1,6
Assistant nurse service director	2	3.2
Supervisor	3	4.8
Team leader	13	20.6
Head nurse	24	38.1
Senior (charge nurse)	20	31.7
Training in the area of study		
No	62	98.4
Yes	1	1.6

Table 2: Nurse managers' knowledge regarding the lean management approach throughout the various stages of the program (n = 63):

Lean management domains	Pre Intervention	Post Intervention	Follow-up Intervention	F	Sig.	Partial η2	Effect Size
	Mean ±D	Mean ± SD	Mean ± SD				
Lean management definition	5.365 ±1.568	9.492±.644	8.920±.809	283.070	.000	0.820	Large
Mean %	67.0621	94.92	89.2				
lean leadership	5.476±1.377	8.269±.676	7.698±.873	164.336	.000	0.726	Large
Mean %	68.4525	91.886	85.533				
Value	2.381±1.113	6.333±1.047	5.301±1.1163	262.371	.000	0.809	Large
Mean %	47.62	90.475	75.737				
Wastes	5.809±1.490	10.381±.727	9.619±1.141	329.559	.000	0.842	Large
Mean %	64.55	94.373	87.445				
Lean management strategies	6.285±1.736	12.142±1.0450	10.428±1.422	309.664	.000	0.833	Large
Mean %	52.381	93.407	80.215				

F = Repeated Measure ANOVA Partial η2 = Partial Eta Squared *Significant (P<0.05).

Table 3: Nurse managers' lean management strategies for overcoming the eight deadly wastes throughout the various stages of the program (n = 63):

Lean management strategies for overcoming the eight deadly wastes	Pre Intervention	Post Intervention	Follow-up Intervention	F	Sig.	Partial η2	Effect size
	Mean ±D	Mean ± SD	Mean ± SD				
1. Defects	32.365±3.870	36.873±1.727	37.555±1.542	85.630	.000	0.580	Large
Mean %	35.171	94.546	96.294				
2. Waiting	24.301±2.921	27.841± 1.859	25.555±1.376	48.688	.000	0.440	Large
Mean %	83.796	92.803	94.648				
3. Overproduction	21.349±2.553	24.492±1.803	25.047±1.580	76.497	.000	0.552	Large
Mean %	82.111	90.711	92.766				
4. Non-utilized talent	32.822±3.394	36.629±1.985	36.989±2.012	68.998	.000	0.531	Large
Mean %	84.158	93.920	94.828				
5. Transportation	20.412±2.366	22.714±1.590	23.111±1.206	58.415	.000	0.485	Large
Mean %	85.05	94.641	96.295				
6. Inventory	20.047±2.158	22.571±1.710	22.539±1.966	57.449	.000	0.481	Large
Mean %	83.529	94.045	93.912				
7. Motion	27.587±2.921	31.142±1.839	31.523±1.624	82.311	.000	0.570	Large
Mean %	83.596	94.369	95.524				
8. Excess processing	17.349±1.850	19.238±1.643	19.873±1.396	51.747	.000	0.455	Large
Mean %	82.614	91.609	94.633				

F = Repeated Measure ANOVA Partial η2 = Partial Eta Squared *Significant (P<0.05).

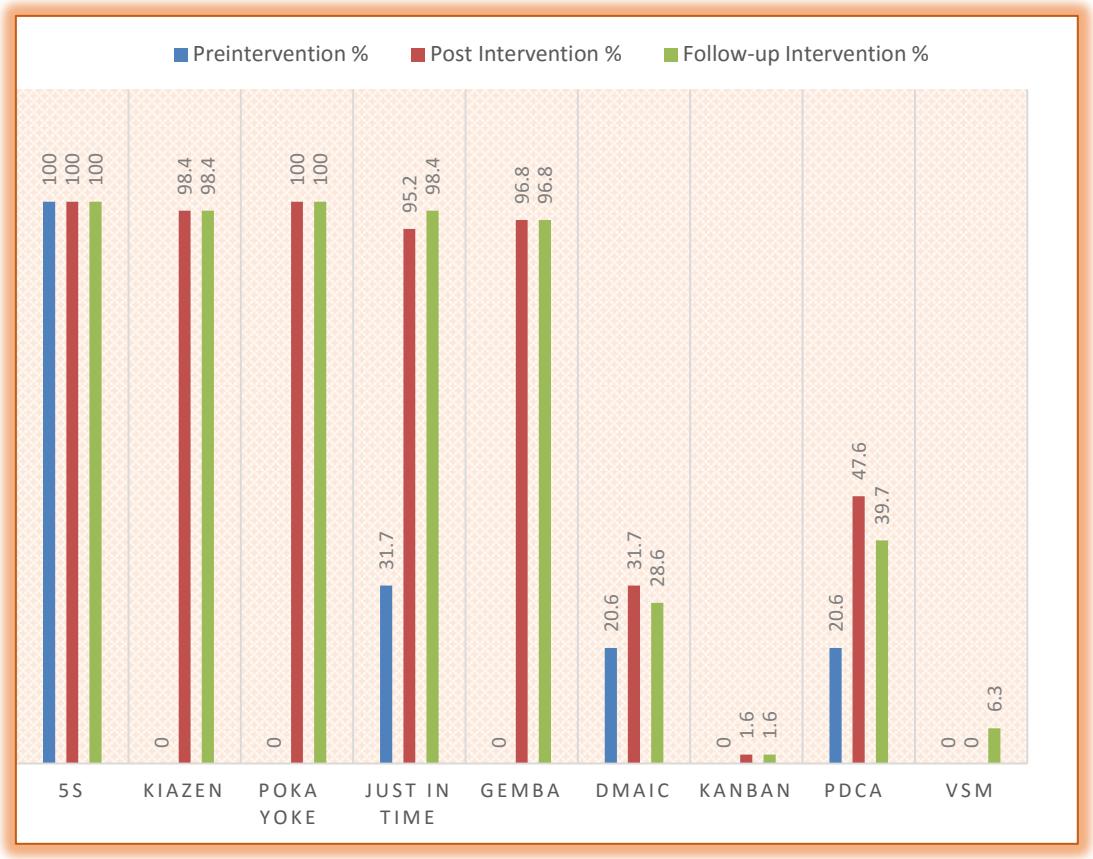

Figure 1: Frequency distribution of applied lean management tools by nurse managers through the program phases (n = 63)

Table 4: Nurse managers' innovative work behavior throughout the various stages of the program (n = 63)**:**

Nurse managers' innovative work behavior domains	Pre Intervention	Post Intervention	Follow-up Intervention	F	Sig.	Partial η2	Effect Size
	Mean ±D	Mean ± SD	Mean ± SD				
Opportunity exploration	18.698 ±1.837	22.127±1.570	21.952±1.962	94.331	.000	0.603	Large
Mean %	81.295	92.195	91.466				
Idea generation	31.555±2.588	36.904±3.261	37.619±3.376	111.563	.000	0.643	Large
Mean %	83.039	87.866	89.569				
Idea promotion	30.841±3.827	37.349±3.413	38.158±3.233	129.819	.000	0.677	Large
Mean %	81.160	88.926	90.852				
Idea realization	39.587±3.757	47.507±4.226	48.920±3.432	201.881	.000	0.765	Large
Mean %	84.297	87.975	90.592				
Idea sustainability	73.206±8.708	84.206±7.410	91.238±6.367	150.201	.000	0.708	Large
Mean %	82.253	87.714	91.238				

F = Repeated Measure ANOVA Partial η2 = Partial Eta Squared *Significant (P<0.05).

Table 5: Nurse managers' crises management role throughout the various stages of the program (n = 63)**:**

Nurse managers' crises management role	Pre Intervention	Post Intervention	Follow-up Intervention	F	Sig.	Partial η2	Effect Size
	Mean ±D	Mean ± SD	Mean ± SD				
Early detection of warning signals stage	71.809 ±7.204	82.952±4.978	85.238±5.005	115.676	.000	0.651	Large
Mean %	81.601	92.168	94.708				
Preparation and prevention stage	84.761±7.1723	95.650± 6.667	97.825±5.813	133.028	.000	0.682	Large
Mean %	83.921	91.095	93.166				
Damage containment stage	65.365±4.735	73.269±4.776	74.777±4.991	125.832	.000	0.670	Large
Mean %	87.153	91.526	93.471				
Recovery stage	29.064±2.540	32.241±2.474	32.548±2.427	77.490	.000	0.560	Large
Mean %	83.04	92.117	92.994				
Learning stage	24.634±1.877	27.841±2.156	28.142±2.085	82.834	.000	0.572	Large
Mean %	86.677	91.764	93.697				

F = Repeated Measure ANOVA Partial η2 = Partial Eta Squared *Significant (P<0.05).

Table 6: The effect of the training program on nurse managers' lean management knowledge, lean management strategies, applied lean tools, innovative work behavior, and crisis management throughout the various stages of the program**:**

Variables	Pairwise comparisons			Pre	Post	Follow-up	F	Sig.	η2	Effect Size
	Pre and Post	Pre and follow-up	Post and follow-up							
	Mean Difference	Mean Difference	Mean Difference	Mean ±D	Mean ±D	Mean ±D				
	Sig. a (P)	Sig. a (P)	Sig. a (P)	Mean %	Mean %	Mean %				
Total knowledge	21.302*	16.651*	4.651*	25.317±4.015	46.619±2.289	41.961±2.776	932.114	.000	.938	Large
	.000	.000	.000	70.325	93.238	87.433				
Total strategies	24.286*	24.952*	-.667	197.22±12.892	221.507±9.882	222.17±8.09	165.092	.000	.727	Large
	.000	.000	.000	88.838	93.462	94.946				
Total applied lean methods	3.984*	3.968*	.016	1.7302±.987	5.714±.749	5.698±.664	922.371	.000	.937	Large
	.000	.000	1.000	43.255	81.632	81.40				
Total innovative work behavior	39.413*	44.000*	-4.587	193.88±16.092	233.30±16.91	237.889±1.92	270.614	.000	.814	Large
	.000	.000	.059	69.996	88.371	90.797				
Total crises management	36.365*	42.937*	-6.571*	275.635±18.117	312.000±17.50	318.571±16.57	188.888	.000	.753	Large
	.000	.000	.004	86.677	91.764	93.697				

a. Adjustment for multiple comparisons: Bonferroni.
(P): p-value for comparing the groups studied*: At the.05 level, the mean difference is significant.
F = Repeated Measure ANOVA Partial η2 = Partial Eta Squared

DISCUSSION

The healthcare system has common issues such as errors, infections, rising health expenditures, and shifting consumer expectations that harm health outcomes and raise health costs (Çavmak & Kaptanoglu, 2017). Lean management gives managers, nurses, and other staff members the confidence and resources they need to address problems that can only be solved by making ongoing adjustments to the workplace (Dizon, 2017). Also, lean training is utilized by organizational leaders as a process improvement strategy to eliminate waste and inefficiencies in processes, improve the quality of care for patients, and combat escalating costs (Bailey, 2016). Moreover, lean management provides a foundation to foster healthcare innovation (Abuhejleh et al., 2016).

In this regard, the present study was undertaken to evaluate the effect of a lean management training program on nurse managers' innovation and crisis management by assessing nurse managers' knowledge of lean management, identifying lean management strategies and tools used by nurse managers, measuring nurse managers' innovation, and identifying nurse managers' roles in crisis management from their perspective.

Concerning nurse managers' knowledge of lean management across program phases, the study revealed that the mean percent of the five lean management approach knowledge domains differ by a wide margin. This indicated that the post-intervention phase had the highest mean scores compared to the pre-intervention and follow-up phases, with large partial $\eta 2$ values for all knowledge domains, indicating that the program substantially impacted the knowledge among nurse managers.

Inadequate knowledge before program implementation could be explained by the fact that most nurse managers had not previously attended lean management training classes. Meanwhile, nurse managers' knowledge improvement immediately after program implementation might be due to the simple, clear, concise presentation and teaching methods that motivate nurse managers to understand the program content. The slight decline in their knowledge level three months after program implementation might be because nurse managers did not use the handouts they received during program implementation to refresh their knowledge, making them forget some of the knowledge they gained.

These findings are consistent with those of Gaafer (2018), who studied "the effect of the implementation of lean strategies utilization training program for first-line nurse managers on quality of environmental and occupational safety" and stated that there were highly significant differences in knowledge of first-line nurse managers regarding lean management pre- and post-program implementation. Also, Boswihi (2018) studied the effect of a lean leadership training program on head nurses and found that the knowledge of head nurses regarding lean management was improved after the program's implementation, with a statistically significant difference in the head nurses' knowledge between pre-and post-implementation of the lean leadership training program. Similarly, Elzohairy, Elhanafy, and Mostafa (2020), who implemented a lean strategy utilization training program for head nurses and staff nurses working in specific units at all El-Mansoura University Hospital, concluded that there was a statistically significant difference between pre-and post-workshop knowledge regarding lean strategies among study subjects.

The current study's findings reported that the nurse managers' eight lean management strategies for overcoming the eight deadly wastes were improved during the post-intervention and follow-up phases compared to the pre-intervention phase, with a statistically significant difference between the program phases. This could be because nurse managers used the training program's information after the program was implemented, which helped them detect waste and employ lean management practices to easily overcome this waste.

A similar finding was reported by Abd Al Fadeel, Abd El Megeed, and Etway (2023), who studied the effect of lean management training programs on waste management knowledge and practices among the nursing staff and reported that a statistically significant distinction existed between program phases. With marked improvement in all dimensions of waste management practices during different assessment periods immediately post-program and three months later compared to pre-program implementation.

Also, Elzohairy et al. (2020) found a statistically significant difference between program phases and the improvement of value-add activities and the reduction of non-value-add activities such as defects, over-processing, waiting, and motion waste after the lean strategy training program implementation. In this respect, Boswihi (2018) stated that

head nurses' skills, performance, attitudes, and care processes improved after the lean leadership training program's implementation.

On the other hand, Udod et al. (2020), who studied the perceptions and experiences of nurse managers involved in implementing the lean management system in a Western Canadian province within a publicly funded healthcare system in the region of Saskatchewan, reported that there were tensions in the implementation of a lean model adapted to the context of health care organizations and the lean management system was not effectively implemented; participants were unable to overcome their resistance to the change.

Concerning the frequency of applying lean management tools among nurse managers through the program phases. All lean management tools were frequently used in post-intervention and follow-up phases compared to pre-intervention, with statistically significant differences between program phases. This might be because nurse managers, after program implementation, become aware of the benefits of lean management tools and how to apply them to their work environment. This result was confirmed by Zdęba-Mozoła, Rybarczyk-Szwajkowska, Czapla, Marczak and Kozłowski (2022), who investigated "Implementation of Lean Management in a Multi-Specialty Hospital in Poland and the Analysis of Waste" discovered that the use of lean management tools in the hospital led to the recognition of waste in the process of admitting and treating a patient, an important enhancement in the efficiency of medical personnel, and a significant reduction in working time that could have been spent on patient care.

In addition, Elzohairy et al. (2020) reported that implementing the lean strategy utilization training program led to a statistically significant reduction in the frequency of exposure to occupational hazards during medication administration. Green and Valentini (2015) discovered a decrease in the work process after applying a value stream map to the current process, identifying delay causes, and developing changes to improve process flow, such as creating an appropriate dispensing schedule and implementing evaluations to reduce interruptions.

Regarding the nurse managers' creative approaches to their work throughout the program. A statistically significant disparity was seen among the various stages of the

program, wherein the mean scores of the post-intervention and follow-up intervention phases were greater than those of the pre-intervention phases in all areas of innovative work behavior. This might be due to implementing a lean management training program that supports their ability to think innovatively to apply lean management tools to eliminate eight deadly wastes, which increases their innovation level after implementing a lean management training program. When studying "using lean management to leverage innovation in healthcare projects: a case study of a public hospital in the UAE", Abuhejleh et al. (2016) reported a similar finding. They reported that lean management is the basis for incorporating innovation into healthcare initiatives. Additionally, a company that effectively implements lean management and innovation will achieve a greater competitive advantage and long-term sustainability.

Addressing the nurse managers' obligations in crisis management throughout the program phases. The study results show that the post-intervention and follow-up intervention phases had higher mean scores in all crisis management practice domains than the pre-intervention phases, with a statistically significant difference among the program's three phases. This could be related to the program's implementation time after the COVID-19 pandemic, which required them to obtain additional training on how to deal with such a crisis and support their role in crisis management. Furthermore, lean management solutions for overcoming eight fatal wastes in nurse managers may impact their capacity and practice in dealing with crises in the post-program stages.

This result is supported by Jackson and Nowell (2021), who studied the experiences of nurse managers during the COVID-19 pandemic and found that nurse managers continue to support high-quality care despite working in a difficult context and have a variety of experiences during COVID-19, which were influenced by changes to their roles and the support they received. Also, Jankelová, Joniaková, Blštáková, Skorková and Procházková (2021) stated that crisis management in healthcare facilities had a strong correlation with reliable knowledge and the fast sharing of information through education focused on the development of managerial competencies which supporting the performance of healthcare teams. From another point of view, Ozmen and Havva (2022) studied “Nurse managers' challenges and opportunities in the COVID- 19 pandemic crisis”. They stated that the nurse managers had difficulties in their managerial roles during the pandemic crisis.

Also, as proven by the study result, the lean management training program provides nurse managers with an opportunity to think innovatively to understand the concept of lean management, wastes, value, principles and the lean management tools to get rid of healthcare wastes and be able to face any crisis regardless of their residual level of knowledge. This result is supported by Teo, Lee, and Lim (2017), who assert that innovative solutions are not a panacea for overcoming and managing crises effectively. Nonetheless, executives must introduce and implement new procedures, practices, equipment, and safety tools, a crucial resource for resilience-related success. In addition, Lyng, Ree, Wibe, and Wiig (2021) stated that novel and creative ideas (idea realization) are required to solve and manage crises innovatively.

Finally, the study result articulates the effect of the training program on nurse managers' lean management knowledge, lean management strategies, applied lean tools, innovative work behavior and crisis management role. Compared to the pre-intervention phase, the post-intervention phase and follow-up intervention phases had the highest mean scores with a statistically significant difference between the three program phases. Also, the Bonferroni test for multiple comparisons shows that every two pairs of pre and post, pre and follow-up, and post and follow-up had a statistically significant mean difference at ($p=.000$). Additionally, ($\eta 2$) values for lean management knowledge, lean management strategies, applied lean tools, innovative work behavior and crisis management practice of nurse managers proofing the large effect size of the lean management training program on nurse managers.

In this respect, Barrett (2014) stated that adopting any operational best practice without adequate individual preparation would not automatically result in attaining the benefits typically associated with that best practice. This result was supported by Abd Al Fadeel et al. (2023), who studied the effect of lean management training programs on waste management knowledge and practices among the nursing staff and showed that there was a statistically significant positive correlation between nursing staff lean management knowledge and their waste management practices immediately post-program and three months post-program implementation. Singh and Lillrank (2018) mentioned that lean management could improve work processes and integrate innovative ideas to significantly reduce costs.

Tiso, Crema, and Verbano (2021) conducted research titled "A framework to guide the implementation of lean management in the emergency department" and came to the conclusion that lean management application in healthcare is progressively demonstrating its capability in dealing with emergency department crowding and patient dissatisfaction by developing a care delivery system with a focus on the individual. Jankelová et al. (2021) corroborated this finding by arguing that lean management practices are more effective during times of crisis and that these favorable outcomes are linked to factors like staff morale, job satisfaction, and pride in work. Moreover, Demir and Turan (2021) found that lean management implementation for waste reduction significantly affects the crisis management process.

From another perspective, Abuhejleh et al. (2016) stated that there was a strong relationship between lean management and innovation, so healthcare organizations that successfully accommodate both lean and innovation will gain a higher competitive advantage and reach long-term sustainability without training program implementation. Also, Pring, Malietzis, Kendall, Jenkins and Athanasiou (2021), who study “Crisis Management for surgical teams and their leaders, lessons from the COVID-19 Pandemic”, stated that crisis breeds innovation and advancement and provides impetus without training program implementation.

CONCLUSION

Based on the study's primary findings, it was determined that, relative to the pre-intervention phase, the post-intervention and follow-up intervention phases had the highest mean, with a statistically significant difference between the three program phases. Also, the Bonferroni test for multiple comparisons shows that every two pairs of Pre and Post, Pre and follow-up, and post and follow-up had a statistically significant mean difference at ($p=.000$). Additionally, ($\eta 2$) values for lean management knowledge, lean management strategies, applied lean tools, innovative work behavior and crisis management practice of nurse managers demonstrating the significant impact of the lean management training program on nurse managers. Additionally, all study hypotheses were proved.

RECOMMENDATION

- Lean management strategies should be introduced as a tool for quality improvement methods in hospital quality departments.
- Lean management training courses should be conducted and regularly updated for all healthcare providers.
- Encourage nursing staff to report any sources of waste in their unit work process and suggest strategies to overcome them.
- Meet nursing staff to hear their problems and opinions and include them in continuous improvement decisions.
- Encourage nursing staff to report errors or defects without fear to investigate the root of the problem by changing the blame culture to support culture.
- Educational institutions should introduce the lean management approach and its branches in the nursing curriculum to acquaint students with up-to-date knowledge and skills in lean management and leadership strategies.
- It is recommended that additional research be conducted to disseminate the developed lean management strategies and examine their impact on nurse managers in various settings.

references

Abd Al Fadeel, E. R., Abd El Megeed, M. I., & Etway, E. A. E. (2023). Effect Of Lean Management Training Program On Waste Management Knowledge And Practices Among Nursing Staff. *Journal of Clinical Otorhinolaryngology, Head and Neck Surgery, 27*(1); 1050-1062.

Abuhejleh, A., Dulaimi, M., & Ellahham, S. (2016). Using lean management to leverage innovation in healthcare projects: Case study of a public hospital in the UAE. *BMJ Innovations, 2(1),* 22-32.

Akinwale, Y. O. (2021). Health Expenditure, Economic Growth and Life Expectancy at Birth in Resource-Rich Developing Countries: A Case of Saudi Arabia and Nigeria. *Journal of Economic Cooperation & Development, 42*(2), 13-36.

Al-Gedely, R. (2006). The reality of the use of crisis management methods major government hospitals in the Gaza Strip, published Master thesis. Commerce College, Department of Business Administration at Islamic University of Gaza.

Alharthi, A., & Aziz, T. (2018, September). Lean six sigma, crises management and innovation: A theoretical Framework. International Conference on 3rd North American IEOM Conference in Washington DC during September 27-29, 2018. Retrieved from: http://ieomsociety.org/

Aljamal, A. B. (2018): Leadership styles in health crisis management: Study of governmental hospitals in Gaza Strip, unpublished Master thesis. Crisis and disaster management in the Islamic University of Gaza. Retrieved from: https://library.iugaza.edu.ps/thesis/125310.

Bailey, R. (2016). Exploring the process of lean training in the healthcare industry, published Doctorate dissertation. College of Management and Technology, Walden University. Retrieved from: www.ekb.eg

Bannay, F. D. (2019). The impact of lean management in Organizational Ambidexterity, Conference paper. 11th International Scientific Conference - Karbala University - Faculty of Management and Economics. Retrieved from: https://www.researchgate.net/publication/333036797

Barrett, D. (2014). *An empirical investigation of the influence of preparation and implementation capabilities on lean management competence* (Published doctorate dissertation). Graduate Program in Business Administration; The School of Graduate and Postdoctoral Studies; The University of Western Ontario; Canada. Retrieved from https://www.proquest.com/dissertations-theses/empirical-investigation-influence-preparation/docview/2701128472/se-2

Boswihi, M. S. S. H. (2018): Effect of lean leadership training program on head nurses' performance and patient satisfaction (unpublished doctorate dissertation). Faculty of Nursing, University of Alexandria.

Çavmak, D. & Kaptanoglu, A. (2017, April). Lean Management Implementations for Healthcare. Paper presented at the Conference: 3. International Journal of Health Administration and Education Congress (Sanitas Magisterium) paper_Retrieved from: https://www.researchgate.net/publication/333681879

Corbaley, S. R. (2010). A descriptive study to determine the level of crisis preparedness frontline leaders are trained to perform during an exploding crisis in Los Angeles County healthcare facilities, providing emergency services (published Doctorate dissertation). College of education and organizational leadership, University of La Verne, California.

Demir, E., & Turan, H. (2021). An integrated spherical fuzzy AHP multi-criteria method for Covid-19 crisis management in regarding lean six sigma. *International Journal of Lean Six Sigma, 12*(4), 859-885.

Dizon, D. M. (2017). Lean management system in healthcare, (published Master thesis). Business Administration, University of Stanislaus, California State.

Elzohairy, M. H., Elhanafy, E. Y., & Mostafa, W. H., (2020). Impact of Lean Strategy Utilization Training program on Quality of Environmental and occupational safety. *Egyptian Journal of Health Care, EJHC 11* (1), 1236- 1252.

Gaafer, F. (2018). The Effect of implementation of training program on lean strategies utilization for first-line nurse managers on quality of environmental and occupational safety (unpublished doctorate dissertation). Faculty of Nursing, University of Alexandria.

Gajda, W. & Zaplatynskyi, V. (2017). Innovations in crisis management. *MEST Journal 5(1),* 32-39, DOI 10.12709/mest.05.05.01.04.

Gangaram, P., Alinier, G., & Menacho, A. M. (2017). Crisis resource management in emergency medical settings in Qatar. *International Paramedic Practice*, 7(2), 18-23.

Helmold, M. (2020). *Lean Management and Kaizen; Fundamentals from Cases and Examples in Operations and Supply Chain Management*. *Management for Professionals* (1st ed.). Berlin,Germany: Springer international publishing. DOI: 10.1007/978-3-030-46981-8

Holmemo, M. D. Q., Ingvaldsen, J. A., & Powell, D. (2022). Beyond the lean manager: Insights on how to develop corporate lean leadership. *Total Quality Management & Business Excellence,* 1-13. Retrieved from: https://doi.org/10.1080/14783363.2021.2022468

International Labour Organization. (2017): *Lean Manufacturing Techniques for Ready Made Garments Industry* (1st ed.). Decent Work Team for North Africa/ Cairo. Published book retrieved from: https://www.ilo.org

Jackson, J., & Nowell, L. (2021). 'The office of disaster management nurse managers' experiences during COVID- 19: A qualitative interview study using thematic analysis. *Journal of Nursing Management*, *29*(8), 2392-2400.

Jankelová, N., Joniaková, Z., Blštáková, J., Skorková, Z., & Procházková, K. (2021). Leading employees through the crises: Key competencies of crises management in healthcare facilities in coronavirus pandemic. *Risk management and healthcare policy*, 561-573.

Khanna, S. (2020). ICT Enabled Learning: A tool in Crisis Management. Aptisi Transactions on Technopreneurship (ATT), 2(2), 127-132.

Kumar, J. (2021). Lean and Kaizen Application in the Healthcare during the COVID-19 Pandemic. In *11th Annual International Conference on Industrial Engineering and Operations Management, IEOM 2021* (pp. 5748-5753).

Lambriex-Schmitz, P., Van der Klink, M. R., Beausaert, S., Bijker, M., & Segers, M. (2020). Towards successful innovations in education: Development and validation of a multi-dimensional Innovative Work Behavior Instrument. *Vocations and Learning*, 1-28.

Lei, C., & Palm, K. (2019). Crisis resource management training in medical simulation. Book from: StatPearls Publishing, Treasure Island (FL), 24 Dec 2019 PMID: 31869172

Lyng, H. B., Ree, E., Wibe, T., & Wiig, S. (2021). Healthcare leaders' use of innovative solutions to ensure resilience in healthcare during the Covid-19 pandemic: a qualitative study in Norwegian nursing homes and home care services. *BMC health services research*, *21*(1), 1-11.

Machado, C. M., Scavardac, A., Vaccaro, G., Kipperd, L. M., & Khan, M. S. (2015, August). Knowledge about lean management: A study in hospitals. In Proceedings of the 23rd International Conference on Production Research.

Marandi, S. G. (2018). Adoption of lean manufacturing system with aim of efficiency improvement within a late lean adopter company (a case study), published Master thesis. University of Québec, Montreal.

McClelland, T. B. (2016). Experts' recommendations to create effective teams for successful crisis management: A Delphi study, unpublished Doctoral dissertation. Doctorate in management. University of Phoenix. Retrieved from: www.ekb.eg

Ozmen, S., & Havva, A. Y. (2022). Nurse managers' challenges and opportunities in the COVID- 19 pandemic crisis: A qualitative descriptive study. *Journal of Nursing Management, 30*(7), 2609-2619. doi: https://doi.org/10.1111/jonm.13817

Pring, E. T., Malietzis, G., Kendall, S. W., Jenkins, J. T., & Athanasiou, T. (2021). Crisis management for surgical teams and their leaders, lessons from the COVID-19 pandemic; A structured approach to developing resilience or natural organizational responses. *International Journal of Surgery*, *91*, 105987.

Rodríguez Cornejo, V., Cervera Paz, Á., López Molina, L., & Pérez-Fernández, V. (2020). Lean Thinking to Foster the Transition from Traditional Logistics to the Physical Internet. *Sustainability*, *12*(15), 6053.

Roszell, S. (2013). Measuring Lean Management Penetration on the Hospital Nursing Frontline: Instrument Development, unpublished Doctoral dissertation. Doctorate of Philosophy, University of North Carolina at Chapel Hill. Retrieved from: https://core.ac.uk/download/pdf/210602635.

Samuelsson, P., Witell, L., Gottfridsson, P., & Elg, M. (2019). Incremental and radical service innovation in Healthcare. *In Handbook of Service Science,* Volume II. Springer, Cham.

Sharma, S. S., & Khatri, R. (2021). Introduction to Lean Waste and Lean Tools. In (Ed.), Lean Manufacturing. Retrieved from: https://doi.org/10.5772/intechopen.97573

Singh, V.K. & Lillrank, P. (2018). *Planning and Designing Healthcare Facilities: A Lean, Innovative, and Evidence-Based Approach* (1st ed.). CRC Press, Taylor & Francis Group. Retrieved from: https://www.pdfdrive.com

Teo, W. L., Lee, M., & Lim, W. S. (2017). The relational activation of resilience model: How leadership activates resilience in an organizational crisis. *Journal of Contingencies and Crisis Management*, *25*(3), 136-147.

Tiso, A., Crema, M., & Verbano, C. (2021). A framework to guide the implementation of lean management in emergency department. [Lean management in emergency department] *Journal of Health Organization and Management*, *35*(9), 315-337. doi:https://doi.org/10.1108/JHOM-01-2021-0035

Udod, S. A., Duchscher, J. B., Goodridge, D., Rotter, T., McGrath, P., & Hewitt, A. D. (2020). Nurse managers implementing the lean management system: A qualitative study in Western Canada. *Journal of nursing management*, *28*(2), 221-228.

Varadarajan, R. (2018). Innovation, innovation strategy, and strategic innovation. In *Innovation and Strategy*. Emerald Publishing Limited.

Veres, C., Cotoi, O., Moica, S., Marian, L., & Pîslă, A. (2020). Case study regarding the implementation of lean management methods in healthcare. International Conference on Trends & Innovations in Management, Engineering, Sciences and Humanities, Dubai. Retrieved from: https://www.researchgate.net/publication/344362466

Yang, K., Zhou, L., Wang, Z., Lin, C., & Luo, Z. (2019). Humble leadership and innovative behavior among Chinese nurses: The mediating role of work engagement. *Journal of Nursing Management*, *27(8),* 1801-1808.

Zdęba-Mozoła, A., Rybarczyk-Szwajkowska, A., Czapla, T., Marczak, M., & Kozłowski, R. (2022). Implementation of Lean Management in a Multi-Specialist Hospital in Poland and the Analysis of Waste. *International journal of environmental research and public health*, *19*(2), 800.

Zvarych, R., & Tysh, T. (2020). Crisis management and leadership in a coronary crisis. Herald of Economics, 2 (96), 135-147.

أثر برنامج تدريبي للإدارة الرشيقه علي الإبتكار وإدارة الأزمات لمديري التمريض

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الخلاصة

تعتبر الكفاءة والفعالية في مجال الرعاية الصحية أمرا بالغ الأهمية ، حيث يمكن أن يؤدي أي انحراف إلى أزمة حادة ، لذلك هناك حاجة لتحسين جودة الرعاية الصحية من خلال تنفيذ استراتيجيات الإدارة الرشيقة بشكل مبتكر للقضاء على الهدر وخفض التكاليف وحل مشكلات العمل. **الهدف:** هدفت هذه الدراسة الى تقييم تأثير برنامج تدريبي للإدارة الرشيقه علي الإبتكار وإدارة الأزمات لمديري التمريض. **طرق البحث:** تم استخدام تصميم شبه تجريبي (اختبار قبلى وبعدى لعينة واحدة)لاجراء هذه الدراسة. **المكان:**تم إجراء البحث بمستشفي بلقاس المركزي بمحافظة الدقهلية. **العينة**: قد أجريت الدراسة علي جميع مديري التمريض وعددهم 63. **أدوات جمع البيانات:** تم إستخدام ثلاثة أدوات لجمع البيانات: استبيان تقييم المعرفة بالإدارة الرشيقة، واستبيان لتقييم استراتجيات الإدارة الرشيقة لدى مديرى التمريض، ومقياس سلوك العمل المبتكر، وإستبيان إدارة الأزمات. **النتائج**: أظهرت نتائج الدراسة أنه بعد تنفيذ البرنامج ، تحسنت معرفة مديري التمريض بالإدارة الرشيقة، واستراتيجيات الإدارة الرشيقة، ، وسلوك العمل المبتكر ، وممارسة إدارة الأزمات بشكل ملحوظ في جميع مراحل البرنامج الثلاث. بالإضافة إلى ذلك ، تكشف المقارنات المتعددة وجود فروق ذو دلالة إحصائية بين مراحل البرنامج الثلاث . **الخلاصة** : تم إستنتاج أن قيمة ايتا الجزئية (η2) لمعرفة مديري التمريض بالإدارة الرشيقة، واستراتيجيات الإدارة الرشيقة، وأدوات الإدارة الرشيقة، وسلوك العمل المبتكر، وممارسة إدارة الأزمات تشير الي وجود اثر كبير للبرنامج التدريبي للإدارة الرشيقة. **التوصيات:** أوصت نتائج الدراسة الحالية بضرورة إجراء دورات تدريبية عن الإدارة الرشيقة وتحديثها بانتظام لجميع مقدمي الرعاية الصحية .إضافة الى ذلك فأنه يوصى بمزيد من البحوث في هذا المجال.

الكلمات المرشدة: إدارة الأزمات، الإبتكار ، الإدارة الرشيقة ، مديري التمريض.