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ASSESSMENT OF NURSES' KNOWLEDGE REGARDING LEAN MANAGEMENT IN HEALTHCARE ORGANIZATIONS

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Abstract

Lean management is a method of managing and organizing work with the aim of improving a company's performance, particularly the quality and profitability of its production processes. This method relies heavily on a management strategy that allows employees to work in the best possible conditions. ***Aim:*** *This study aimed to assess nurses' knowledge regarding lean management principles, techniques, and concepts at King Khalid Hospital, Najran, Saudi Arabia. Design descriptive design was utilized in this study.* ***Setting:*** *The study was conducted in at King Khalid Hospital, Najran, Saudi Arabia. Sample: a convenient sample of nurses who work at the previously selected intensive care units. The total number of participants were (50) nurses.* ***Tools:*** *1) Personal and work-related characteristics, 2) lean management knowledge questionnaire used to measure participants' lean management knowledge.* ***Results:*** *all participants had low mean scores in total lean management knowledge dimensions.* ***Conclusion:*** *The findings revealed that nurses had inadequate knowledge regarding lean management principles, techniques, and concepts, indicating the need for structured educational interventions to improve lean implementation in healthcare settings.* ***Recommendations:*** *hospital administrators should conduct educational program about lean management to raise nurses' awareness regarding importance of applying lean methods in different healthcare settings to maximize their benefits for patients, organization and health care providers.*

Keywords: *Lean Management; Nursing Knowledge; Waste Reduction; Healthcare Organizations; Intensive Care Units; Quality Improvement; Saudi Arabia.*

1. INTRODUCTION

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. 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 lean management provides a foundation to foster healthcare innovation (Mohamed, Mohammed Abu Elenin, & Ibrahim, 2023).

Lean management describe as an ongoing effort to convert waste into value as perceived by customers. Beyond being a set of operational tools, Lean represents a comprehensive management philosophy focused on continuous improvement, quality enhancement, and waste reduction. Effective Lean implementation necessitates a systems-based perspective, whereby managers view the

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Vol: 63 | Issue: 06 | 2026

organization as an interconnected system of processes working collectively to deliver value and improve organizational performance (Muharam & Firman, 2022).

Lean management is a method of managing and organizing work with the aim of improving a company's performance, particularly the quality and profitability of its production processes. It helps optimize processes by reducing non-value-added activities (unnecessary operations or transport, waiting, overproduction etc.), poor-quality costs and complications. This method relies heavily on a management strategy that allows employees to work in the best possible conditions. Ultimately, the approach has two main objectives: complete customer satisfaction and employee success (Akmal, Foote, Podgorodnichenko, Greatbanks, & Gauld, 2022)

Lean management is based on four fundamental principles designed to improve organizational performance and reduce waste. First, organizations must identify the value stream by recognizing all activities that add value and eliminating those that do not. Second, value should flow continuously by addressing factors that create delays and inefficiencies, including quality-related issues. Third, a pull-based approach should be implemented, whereby work and resources are provided according to actual customer needs rather than being transferred unnecessarily between departments. Finally, organizations should strive for perfection through ongoing process improvement initiatives that promote efficiency, quality, and customer satisfaction (Dey, Malesios, De, Chowdhury & Abdelaziz, 2020).

There are three aspects of Lean activities: Assessment activities which include reviewing the performance of existing organizational processes in terms of their waste, flow or capacity to add value, such as “waste walks” or more formal process/value stream mapping exercises (Gładysz, Buczacki, & Haskins 2020). Improvement activities to support and improve processes, e.g. Rapid Improvement Events (RIEs, also referred to as “kaizen blitz” or “kaikaku” events) which are held over three to five days and involve staff evaluating, developing and redesigning processes through forms of problem solving or housekeeping tools, such as “5S” (which comprises of Sorting, Setting in Order, Sweeping, Standardizing and Sustaining (Jye, Lokman, Haque, Senathirajah, & bin Omar Din 2022)

Significance of the study

Many studies reported successful lean applications in health care which the most common areas of improvement included time-savings, timeliness of service, cost reductions or productivity enhancements, and several quality aspects including reduction in errors or mistakes, improved staff and patient satisfaction, and reduced mortality. Application the lean management can achieved positive results (such as high practitioner satisfaction and improved quality indicators) with a value of with practices such as team training, process management, continuous improvement and delegation of responsibilities (Birgün, & Kulaklı, 2020).From the investigator point of view, as lean system is crucial in achieving quality, safety, delivery improvement and cost reduction in all departments of at King Khalid Hospital, and the investigator observed that there is no similar study conducted in this point. so, investigator interested to conduct such type of study to assess nurses’ knowledge regarding lean management.

2. METHOD

Aim of the study

The current study aimed to assess nurses’ knowledge regarding lean management principles, techniques, and waste reduction concepts at King Khalid Hospital, Najran, Saudi Arabia.

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Vol: 63 | Issue: 06 | 2026

Research question

What is the level of nurses' knowledge regarding lean management principles, techniques, and waste reduction concepts?

Research design

Descriptive design is a non-experimental approach that describes things "the way they are." and describe meaningful characteristics of a distinct group or to develop normative information. The aim is to identify and describe variables as they exist in a specific environment (Deckert, & wilson, 2022).

Setting

This study will be conducted at King Khalid Hospital, Najran Saudi Arabia. The hospital consisted of three buildings that included 330 beds to provide free care services. It has 48 adult ICU. The study was conducted at different settings at the selected hospital.

Sample

A convenient sample of nurses who are working in the previously mentioned setting and their number were (50) at the present study.

Data Collection Tools:

The data of current study was collected by using three tools as follows:

First tool: Personal Characteristics Sheet:

Which contains the personal data of the participants, such as (age, level of education, gender, years of experience in nursing)

Second tool: Lean Management Knowledge Questionnaire

This tool was developed by (Abd Al Fadeel, 2023) and was modified by a researcher. It was used to assess the nurse's knowledge about lean management concept. The questionnaire consisted of four dimensions with (24) questions divided into (19) multiple choice MCQ about "techniques of lean management, (6 questions)," principles of lean management (6 questions) and types of wastes in health care" (7 questions). And other (5) true and false questions for lean management and waste management concepts.

Scoring system:

The value of each question was granted one point for the correct answer, and zero for the incorrect answer. The total scores for all questions were 24, if the final score were (<60%) indicated (low knowledge about lean management concept), if the final score were (60%-75%) indicated (moderate knowledge about lean management concept), and if the final score were more (>75%) indicated high knowledge about lean management concept).

Validity and Reliability

The tools were checked for validity and reliability, high agreement of jury group upon the face validity of evaluation tool, in which all jury group agreed that it look like a tool for assessing nurses' knowledge regarding lean management. In addition, all items of the tool had high value alpha as the Cronbach's Alpha for nurses' lean management knowledge test was (0. 0.90).

Statistical analysis

The collected data was tabulated, computed and analyzed statistically using Statistical Package for the Social Sciences (SPSS) program version 24. Descriptive statistics in the form of frequency distribution,

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Vol: 63 | Issue: 06 | 2026

percentages, mean and standards deviations were utilized.

3. RESULT

Findings of the current study were presented in the following parts as follows:

Part 1: Distribution of the personal characteristics data of nurses (Table 1).

Part 2: Nurses' Knowledge Regarding lean management (Tables 2)

Part 3: Distribution of Total Lean Management Knowledge Levels (Tables 3)

Part 4: Relationship between nurses' personal characteristics data and study variables (Tables 4-7)

Table (1): Distribution of Nurses According to Their Personal Characteristics (n=50)

Demographic data	No.	%
Gender		
Male	3	6.0
Female	47	94.0
Age		
20-<30	14	28.0
30-<40	24	48.0
40+	12	24.0
Education		
Nursing diploma	2	4.0
Bachelor's degree	45	90.0
Master's degree	3	6.0
Experience		
<5 years	10	20.0
5–<10 years	21	42.0
10–<15 years	13	26.0
≥15 years	6	12.0
Training		
Yes	0	0
No	50	100.0

Table (1) showed that the highest percentage (94%) of the study sample was female while (6%) of them were male. The highest percentage (48%) of the study sample were in age group ranged between (30-<40) years while (28%) of them were in age group (20-<30). The above table illustrated that (90%) of the study samples had bachelor's degree in nursing while (6 %) had master's degree in nursing. It's clear from the above table that the highest percentage (42%) of the study sample had years of experience ranged from (5-<10) while the lower percentage (12%) of them had years of experience (15-<20) years. The same table illustrated that all the study samples (100%) didn't attend previous lean management training programs.

Table (2): Mean Scores of Nurses' Lean Management Knowledge Dimensions (n=50)

Lean Management Knowledge Dimensions	Mean ± SD
Techniques of Lean Management	1.22 ± 2.41
Principles of Lean Management	1.86 ± 2.78
Types of Waste in Healthcare	1.68 ± 2.96
Lean and Waste Reduction Concepts	1.68 ± 2.35
Total Score	6.44 ± 2.29

DOI: 10.5281/zenodo.20605714
Vol: 63 | Issue: 06 | 2026

Table (2) reveals that nurses demonstrated low mean scores across all lean management knowledge dimensions.

Table (3): Frequency Distribution of Total Lean Management Knowledge Levels Among Nurses (n=50)

Knowledge Levels	Frequency	%
Low (<60%)	50	100.0
Moderate (60-<75%)	0	0.0
High (≥75%)	0	0.0

Table (3) indicates that all nurses had low levels of lean management knowledge.

Part 3: Relation between Nurses Personal Characteristics and Study Variables (Table 4- 7)

Table (4): Statistical relationship between nurses' lean management knowledge and their age (n=50)

	Lean management Knowledge			
	mean	Sd	F	p
Age			0.02	0.97
20-<30	14.60	6.21		
30-<40	14.36	6.33		
40+	14.58	6.18		

Table (4) showed that there was no statistically significant difference between nursing staff lean management knowledge and their age (F=0.02, P=0.97)

Table (5): Statistical relationship between nurses' lean management knowledge and their gender (n=50)

	Lean management knowledge			
	Mean	sd	F	P
Gender			0.01	0.98
Male	14.44	6.37		
Female	14.48	6.23		

Table (5) showed that there was no statistically significant difference between nursing staff lean management knowledge and their gender (F=0.01, P=0.98)

Table (6): Statistical relationship between nurses' lean management knowledge and their experience (n=50)

	Lean Management_Knowledge			
	Mean	sd	F	p
Experience			0.12	0.94
<5	14.43	6.08		
5-<10	14.83	6.47		
10-<15	14.15	6.00		
15-<20	14.06	6.48		
20+	14.43	6.08		

Table (6) showed that there was no statistically significant difference between nursing staff lean management knowledge and their experience (F=0.12, P=0.94).

DOI: 10.5281/zenodo.20605714
Vol: 63 | Issue: 06 | 2026

Table (7): Statistical relationship between nurses' lean management knowledge and their education (n=50)

	Lean management Knowledge			
	mean	**sd**	**F**	**p**
Education			0.02	0.96
Nursing diploma	14.17	7.14		
Bachelor's degree in	14.47	6.22		
Master's degree in nursing	14.89	6.39		

Table (7) showed that there was no statistically significant difference between nursing staff lean management knowledge and their education (T=0.02, P=0.96).

4. DISCUSSION

Nurses as frontline caregivers have a crucial and diverse role. They are essential in spotting inefficiencies, promoting process enhancements, and they also have unique insights into the day to-day operations of patient care (Tan et al., 2023). The present study aimed to assess nurses' knowledge regarding lean management principles, techniques, and waste reduction concepts at King Khalid Hospital, Najran, Saudi Arabia. The findings revealed that all participating nurses demonstrated low levels of lean management knowledge, indicating a substantial gap in understanding lean principles and their practical application within healthcare settings.

Regarding nurses' demographic characteristics, the findings revealed that the majority of participants were female nurses holding bachelor's degrees in nursing, with most having between five and ten years of professional experience and belonging to the age group of 30 to less than 40 years. These findings reflect the current nursing workforce profile in many Saudi healthcare organizations, where bachelor-prepared nurses constitute the largest proportion of clinical staff. Similar findings were reported by Mohamed et al. (2023), who found that most nurses participating in lean management studies were female and held bachelor's degrees. However, the current findings contradicted those reported by Miranda and Silva (2022), who found that the highest proportion of participants held technical nursing diplomas, while bachelor-prepared nurses represented the smallest proportion. Such differences may be attributed to variations in recruitment policies, educational requirements, and workforce development strategies across healthcare organizations. Furthermore, the present study revealed that nearly half of the nurses had between five and ten years of professional experience. This finding is consistent with Elzohairy, Elhanafy, and Mostafa (2020), who reported that a substantial proportion of nurses had between five and fifteen years of experience. Regarding age distribution, most participants in the current study were between 30 and less than 40 years old, whereas Dyudina (2022) reported that almost half of the study participants were between 20 and 30 years old. Such variations may reflect differences in workforce demographics, healthcare settings, and national staffing structures.

Concerning lean management knowledge, the findings demonstrated that all participating nurses had low levels of knowledge regarding lean management principles, techniques, and waste reduction concepts. This result indicates a considerable knowledge gap that may hinder nurses' ability to effectively participate in quality improvement initiatives, waste reduction programs, and continuous process improvement activities. These findings are further supported by Wang et al. (2025), who demonstrated that healthcare workers' knowledge levels significantly influence their ability to apply waste management practices effectively. Similarly, Winner et al. (2022) emphasized that insufficient staff knowledge remains one of the most frequently reported barriers to successful lean implementation in healthcare organizations.

DOI: 10.5281/zenodo.20605714
Vol: 63 | Issue: 06 | 2026

From a practical perspective, successful lean implementation depends largely on employees' understanding of lean principles and their ability to identify and eliminate non-value-added activities. Therefore, inadequate knowledge among nurses may represent a significant barrier to lean transformation within healthcare organizations. This observation is consistent with Thakur et al. (2023), who concluded that Lean and Six Sigma frameworks contribute significantly to quality improvement and operational efficiency when healthcare professionals possess sufficient knowledge and skills to participate in continuous improvement activities. The current findings are consistent with Udod et al. (2020), who reported that healthcare professionals experienced difficulties in understanding and integrating lean concepts into daily clinical practice and that resistance to change limited effective implementation of lean management systems. Tan et al. (2023) emphasized that successful lean implementation among nursing staff depends heavily on organizational support, staff engagement, and continuous professional development. The authors attributed this deficiency to the lack of structured educational programs and practical training opportunities focused on lean techniques. Likewise, Tan et al. (2023) highlighted that nursing engagement in lean transformation is strongly influenced by access to education, training opportunities, and organizational support. Without adequate preparation, nurses may encounter difficulties in understanding and applying lean principles in daily clinical practice.

In contrast, several intervention-based studies have demonstrated substantial improvements in lean management knowledge following educational interventions. Elzohairy, Elhanafy, and Mostafa (2020) reported significant improvements in participants' knowledge regarding lean strategies after implementation of a structured training program. Likewise, Osman (2023) found that first-line nurse managers' lean knowledge improved markedly, shifting from low to high levels following an educational intervention. Similar findings were reported by Zdęba-Mozoła et al. (2022), who observed increased staff awareness and understanding of lean management practices after implementation initiatives. Furthermore, Khashaba, El-Gilany, and Denewar (2023) demonstrated significant improvements in knowledge scores across all measured domains among healthcare workers after a waste management educational intervention. Akanmu, Nordin, and Gunasilan (2022) also reported significant improvements in healthcare staff knowledge following lean-related educational activities.

Regarding the relationship between nurses' personal characteristics and lean management knowledge, the findings revealed no statistically significant differences according to age, gender, years of experience, or educational level. These findings suggest that the observed knowledge deficit is widespread across all demographic groups and is likely related to organizational factors such as limited training opportunities and insufficient exposure to lean methodologies rather than individual characteristics. This finding is consistent with Abd Al Fadeel et al. (2023), who reported no statistically significant associations between nurses' demographic characteristics and lean management knowledge levels.

Although Koc and Alpar (2025) suggested that higher educational attainment may positively influence nurses' ability to apply lean management practices, the current findings did not demonstrate a statistically significant relationship between education and lean management knowledge. This discrepancy may be explained by the fact that academic qualifications alone do not necessarily provide formal training in lean management principles. The current findings are supported by Musthak, Dias, and Dilhari (2025), who also reported no statistically significant association between educational level and knowledge of lean practices among healthcare professionals.

5. CONCLUSION

The findings revealed that lean management knowledge deficits were evident across all demographic categories, including age, gender, educational level, and years of experience, suggesting that the lack

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Vol: 63 | Issue: 06 | 2026

of knowledge was primarily related to insufficient exposure to lean methodologies rather than individual characteristics. The study highlights the critical role of lean management knowledge in supporting healthcare quality improvement and waste reduction initiatives. Given the frontline role of nurses in patient care delivery, inadequate understanding of lean concepts may limit their ability to identify operational inefficiencies, participate in continuous improvement activities, and contribute effectively to waste elimination efforts.

Furthermore, the findings emphasize the importance of integrating lean management education into nursing professional development programs. Enhancing nurses' knowledge and awareness of lean principles is essential for fostering a culture of continuous improvement, optimizing resource utilization, improving workflow efficiency, and promoting high-quality patient-centered care. Therefore, healthcare organizations should prioritize structured lean management training and ongoing educational initiatives to strengthen nurses' competencies and support successful lean transformation within healthcare settings.

Ethical consideration

An official permission was obtained from the research ethical committee of the faculty of nursing-Cairo University, after that the letter from the Faculty of Nursing was sent to the director of (King Khalid Hospital, Najran Saudi Arabia) .To conduct the study the researcher explained the aim of the study ,nature and significance of the study for each participants to obtain their acceptance to participate in the study then the researcher obtain their acceptance in written form then, the investigator obtained their acceptance in a written form.

Conflicts of Interest

The author declares that there is no conflict of interests regarding the publication of this manuscript. In addition, the ethical issues, including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, and redundancies have been completely observed by the authors.

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Vol: 63 | Issue: 06 | 2026

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