

# Adopting Lean Management in Quality of Services, Cost Containment, and Time Management

Omar Ayaad<sup>1\*</sup>, Ronza Al-Dewiri<sup>2</sup>, Lara Kasht<sup>3</sup>, Bayan Qaddumi<sup>4</sup>, Malik Ayyad<sup>5</sup>

## Abstract

**Objectives:** This study aims to identify the role of adopting lean management in the quality of service, cost containment, and time management and to identify factors affecting lean management adoption, quality of service, cost containment, and time management in oncology settings. **Methods:** A cross-sectional design was adopted in this study at the King Hussein Cancer Center (KHCC), a private institution in Amman, Jordan. A convenience sampling technique was used to select 360 participants. A self-administered questionnaire (58 items) was used to collect the data. **Results:** The mean value for the quality of services was  $3.84 \pm 0.56$ . These values for adoption of lean, time management, and cost containment were  $3.82 \pm 0.74$ ,  $3.73 \pm 0.75$ , and  $3.40 \pm 0.76$  respectively. The results showed that the impacts of lean management adoption on the quality of service, cost containment, and time management were significant ( $p$ -value $<0.001$ ). The results showed substantial effects of all factors (organizational, departmental, and individual factors) on lean adoption, quality of service, cost containment, and time management ( $p$  value $<.001$ ). **Conclusion:** Lean management adoption had a significant impact on quality of service, cost containment, and time management in oncology settings.

**Keywords:** Lean- cost containment- quality of service- oncology setting- adoption of lean

*Asian Pac J Cancer Prev*, 23 (8), 2835-2842

## Introduction

Health systems in many developed and developing countries struggle with the negative effects of waste, inefficiency, high cost, and inadequate quality of health care. These concerns extend from avoidable delays to risky practices in the provision of healthcare (Kruk et al., 2018; Kruk et al., 2018; Rowe et al., 2018). Health managers are challenged to overcome these problems and have recently started shifting to an engineering redesign approach known as “lean management” (Costa et al., 2017; Hihnala et al., 2017; Narayanamurthy and Gurumurthy, 2018; Sloan et al., 2014).

Lean management is one of the management systems that organizes the operational design. This system provides vital enhancements in health quality and safety, work effectiveness, and costs in the health sector (Hallam and Contreras, 2018).

Hospitals that adopt lean techniques focus on the organization and management units, beginning with the realization that one approach can be utilized to enhance the patient consequences, which is the waste reduction process and efficient delivery of health care (A et al., 2019).

Many health organizations, such as the National Health Service (NHS) and the Institute for Healthcare Improvement (IHI), have recommended utilizing lean concepts to eliminate waste in operational work in health

care, transform the culture of the organization toward adequate professional development of the staff, enhanced work effectiveness, and quality care. The NHS has utilized lean approaches to decrease cost and enhance quality in several settings (Costa et al., 2017; Hihnala et al., 2017; Narayanamurthy and Gurumurthy, 2018; and Sloan et al., 2014).

Many studies have shown that there are a lot of factors with a significant impact on the adoption of lean management (Reponen et al., 2021; Shortell et al., 2021), quality of services (Antony et al., 2019; Hallam and Contreras, 2018), cost containment (Borges et al., 2019), and time management. In a health setting, these factors can be categorized into individual, organizational, and departmental factors. Organizational factors include the organization’s mission, corporate culture, recognition and reward system, organization and collaboration system, training program, and reporting systems (Abuseif and Ayaad, 2018; Al-Ruzzieh et al., 2022; Ayaad et al., 2022; and Vashistha et al., 2019). Departmental factors include well-placed and accessible suppliers, teamwork, time management, manager support, work organizing, authority and empowerment, support by managers, and training (Al-Ruzzieh and Ayaad, 2021b). Individual factors include motivational use of good, systematic work, and knowledge levels (Abuseif et al., 2018 and Vashistha et al., 2019).

<sup>1</sup>Sultan Qaboos Comprehensive Cancer Care and Research Center, Oman. <sup>2</sup>King Hussein Cancer Center, Jordan. <sup>3</sup>Traning Office/GME Office, Jordan. <sup>4</sup>KHCC, Jordan. <sup>5</sup>Mutah University, Jordan. \*For Correspondence: omarayad86@yahoo.com

Although many studies have examined the factors in the adoption of lean management, quality of services, cost containment, and time management, and the impact of the adoption of lean management on the quality of services, cost containment, and time management, there is no study on the role of lean management adoption in the quality of service, cost containment, and time management and the factors (organizational, departmental, and individual factors) in health settings including oncology settings.

Moreover, many reports have shown that healthcare organizations worldwide suffer from poor quality, high cost, and ineffective practices due to inadequate time management, especially in oncology settings (Ramireddy et al., 2017; Vashistha et al., 2019; Zaker et al., 2019; Zaroushani et al., 2020; Zoure et al., 2020). This calls for further studies to discuss the factors that can significantly affect the adoption of lean management and improve the outcome in the healthcare setting. Therefore, this study aims to:

- Identify the roles of lean management adoption in the quality of service, cost containment, and time management in oncology settings.
- Identify factors affecting lean management adoption, quality of service, cost containment, and time management in the oncology setting.

The findings will provide health managers with valuable information regarding lean management, the factors, and impacts on the quality of services, cost containment, and time management in health settings. This information would guide the health managers in adopting lean management and redesigning the organization to enhance the quality of services, reduce costs, and manage the time for improvement, which leads to a significant improvement of patient's outcomes and satisfaction.

#### *Research Framework*

Based on previous studies, a research model was developed to examine the role of lean management adoption in the quality of service, cost containment, and time management in health settings (Costa et al., 2017 and Reponen et al., 2021). The factors (organizational, departmental, and individual Factors) in lean adoption, quality of service, cost containment, and time management in health settings were also examined (Al-Ruzzieh et al., 2020; Antony et al., 2019; Borges et al., 2019; Reponen et al., 2021; and Shortell et al., 2021). Figure 1 presents the study model.

## **Materials and Methods**

### *Design*

A cross-sectional design was adopted in this study. This design is used to understand the existing situation and determine the impacts of a certain technique.

### *Setting*

The study was conducted at the King Hussein Cancer Center (KHCC), a non-governmental, non-profit, specialized center for cancer located in Amman, Jordan.

### *Sample*

The sample size for the study was determined based on power analysis using a medium effect size of 0.5, a significance alpha of 0.05, and a power of 0.8, which showed a minimum sample size of 375. Moreover, a convenience sampling technique was used to select the participants.

The inclusion criteria were all employers from the different departments who worked at least for six months in the current department to ensure proper awareness of their department and organization. The exclusion criteria included employees who refused to participate in the study and those who worked less than six months in their current department.

### *Data collection*

A self-administered questionnaire (58 items) was developed by the researchers after conducting an extensive literature review (Al-Ruzzieh et al., 2020; Antony et al., 2019; Borges et al., 2019; Reponen et al., 2021; and Shortell et al., 2021).

The questionnaire consists of three sections of demographics, independent variables (24 items), and dependent variables (44 items). The independent variables section discusses the employees' perceptions regarding the affecting variables factors (6 items), departmental (10 items), and individual factors (8 items). The dependent variables section (22 items) discusses the employees' perceptions regarding the adoption of lean management (22 items), the quality of service (9 items), cost containment (6 items), and time management (7 items). The items were designed based on Likert's five-point scale. The questionnaire was developed based on similar studies.

A pilot study was conducted to evaluate the questionnaire in terms of clarity and understandability and accordingly the required modifications were made. Face validity was done by distributing the questionnaire to three experts. The reliability coefficient using Cronbach's alpha test was more than 0.70 for each domain.

### *Procedure*

The prospective participants were approached by their managers. The research aims and the process were explained and discussed by the researchers to the prospective participants in private sessions. Accordingly, the researchers asked the prospective participants if they would like to participate in the study. The participants were asked to sign a letter of consent before filling out the questionnaire. In addition, the author offered his contact details for any inquiries.

### *Data Analysis*

Statistical Package for Social Sciences (SPSS) version 21 was used to analyze the collected data. Descriptive statistics, frequencies, percentages, means, and standard deviations were calculated to describe demographic data. Moreover, the impacts between variables were measured using multiple regressions.

### *Ethical Approval*

The Institutional Review Board at King Hussein

Cancer Center reviewed the study proposal and approved the study. This approval required taking the consent form before conducting the research, the voluntary participation in the study and the right to withdraw from the study, and confidentiality of anonymity of patients' data.

## Results

Table 1 presents demographic characteristics for a total sample size of 360. Around 52.6% of them were female. Most of them had a university degree (n=284, 68.9%). Most of them were aged less than 49 years. Around 43.4% (n=191) were nurses and the majority had less than five years of experience (n=164, 45.6%).

Table 2 presents the mean values of the study variables and the factors. The results showed that the study variables had high mean values. The mean value of quality of services was 3.84 (SD = 0.56), adoption of lean was 3.82 (SD = 0.74), time management was 3.73/5 (SD = 0.75), and cost containment was 3.40 (SD = 0.76). Moreover, the individual factors had a high mean value (mean = 4.04, SD = 0.58), while the departmental factors had the least mean value (mean = 3.94, SD = 0.68).

Table 3 presents the correlations between study variables (the adoption of lean management, quality of service, cost containment, and time management) and the factors (organizational, departmental, and individual factors). The results showed that all the correlations were positive and significant (p value<.001).

Table 4 presents the impacts of lean management adoption on the quality of service, cost containment, and time management. The results showed that the effects of lean management adoption on the quality of service, cost containment, and time management were significant at 0.01 level. Moreover, the results showed that the adoption of lean had a higher impact on time management (B=0.729, t=17.943).

Table 5 presents the impact of factors (organizational, departmental, and individual) on lean adoption, quality of service, cost containment, and time management. The results showed that all the factors had a significant impact on lean adoption, quality of service, cost containment, and time management (p-value<0.01). Moreover, the

Table 1. Participants Demographics

Demographic Characteristic	Number (Percentage)
Gender	
Male	171 (47.4)
Female	189 (52.6)
Educational level	
Secondary school	3 (0.8)
Diploma	46 (12.8)
University Degree	284 (68.9)
Postgraduate	63 (17.5)
Age	28.28 (5.89)
Less than 30 years	151 (41.9)
31-39 Years	151 (41.9)
40-49 Years	39 (10.8)
More than 50	19 (5.3)
Profession	3.95 (5.41)
Physician	75 (20.8%)
Nurse	191 (43.4)
Pharmacist	16 (4.4)
Lab technician	21 (5.8)
Others	56 (15.6)
Years of Experience	
Less than 5 years	164 (45.6)
5-15 years	153 (45.3)
More than 15 years	33 (9.2)
Total	360 (100)

Table 2. Study Variables' Mean Values

Variables	Mean (SD)
Factors	
Organizational factors	4.02 (0.77)
Departmental factors	3.94 (0.68)
Individual factors	4.04 (0.58)
Variables	
Adoption of lean	3.82 (0.74)
Quality of Services	3.84 (0.56)
Cost Containment	3.40 (0.76)
Time Management	3.73 (0.75)

Table 3. Correlation between Study Variables r (p-value)

Factors and variables	1	2	3	4	5	6	7
1. Organizational factors	1						
2. Departmental factors	0.822**	1					
3. Individual factors	0.637**	0.733**	1				
4. Adoption of lean	0.681**	0.731**	0.593**	1			
5. Quality of Services	0.555**	0.628**	0.606**	0.512**	1		
6. Cost Containment	0.503**	0.565**	0.450**	0.499**	0.537**	1	
7. Time Management	0.749**	0.810**	0.669**	0.718**	0.598**	0.634**	1

\*\* , Correlation is significant at the 0.01 level (2-tailed).

Table 4. The Impacts of Lean Adoption on the Quality of Service, Cost Containment, and Time Management (Liner Regression)

Variable*	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
Quality of Services	0.386	0.037	0.512	10.347	0.000**
Cost Containment	0.510	0.051	0.499	10.013	0.000**
Time Management	0.729	0.041	0.718	17.943	0.000**

\*Independent variable=adoption of lean \*\* Significant at the 0.01 level (2-tailed).

results showed that the organizational, departmental, and individual factors had the highest impacts on time management and the lowest impacts on cost containment.

### Discussion

The purpose of this study was to determine the role of lean management adoption in terms of service quality, cost containment, and time management and the factors in an oncology setting.

Lean management is an all-purpose management tool for providing value and streamlining operations (Antony et al., 2019; Costa et al., 2017). The Lean approach is based on three very basic ideas of continuous improvement, waste elimination, and delivering value from the viewpoint of the customer’s needs (Antony et al., 2019; Hallam and Contreras, 2018). Currently, lean management is a concept that is extensively used across a broad range of sectors, including manufacturing and health care (Antony et al., 2019; Hallam and Contreras, 2018; and Shortell et al., 2021).

Lean healthcare uses “lean” concepts in healthcare facilities to reduce waste in every process, operation, and activity via an ongoing system of improvement and continuous improvement (Al-Haijaa et al., 2018; Hallam and Contreras, 2018). Everyone in the business, from

physicians to operations and administrative employees strives to find areas of waste and remove everything that does not add value to the patient’s experience (Henrique and Godinho Filho, 2018). The increasing popularity of lean management may be attributed to the fact that they truly concentrate on improving every part of a work process and engage all levels of a company’s hierarchy in its implementation (Hallam and Contreras, 2018; Shortell et al., 2021).

Lean management is the process of reducing waste and improving efficiency by focusing on tasks that provide value to the organization. Managers can benefit from lean management in a variety of ways, including improved decision making and increased focus on key areas of the business (Ayaad et al., 2019; de Sousa et al., 2021). It is easier for workers to be productive and efficient if they focus on creating value rather than being distracted by ambiguous assignments (Antony et al., 2019; Ayaad et al., 2019; de Sousa et al., 2021).

An organization will be able to supply work only when there is a genuine need for it. When production is based on real demand, it will employ only as many resources as are necessary in order to meet that need (Ayaad et al., 2019). Because of this, the organization (team) will be a lot more flexible and able to adapt faster to the needs of the clients and customers (Ayaad et al., 2019; de Sousa

Table 5. The Impacts of Affecting Variables on the Lean Adoption, Quality of Service, Cost Containment, and Time Management (Liner Regression)

Variable*	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
Independent: organizational factors					
Adoption of lean	0.653	0.04	0.681	16.167	0.000**
Quality of Services	0.402	0.035	0.555	11.600	0.000**
Cost Containment	0.493	0.049	0.503	10.118	0.000**
Time Management	0.728	0.037	0.749	19.620	0.000**
Independent: departmental factors					
Adoption of lean	0.801	0.043	0.731	18.642	0.000**
Quality of Services	0.519	0.037	0.628	14.017	0.000**
Cost Containment	0.632	0.053	0.565	11.889	0.000**
Time Management	0.9	0.037	0.81	24.025	0.000**
Independent: individual factors					
Adoption of lean	0.754	0.059	0.593	12.813	0.000**
Quality of Services	0.581	0.044	0.606	13.247	0.000**
Cost Containment	0.584	0.067	0.45	8.768	0.000**
Time Management	0.861	0.055	0.669	15.627	0.000**

\*, Significant at the 0.01 level (2-tailed).

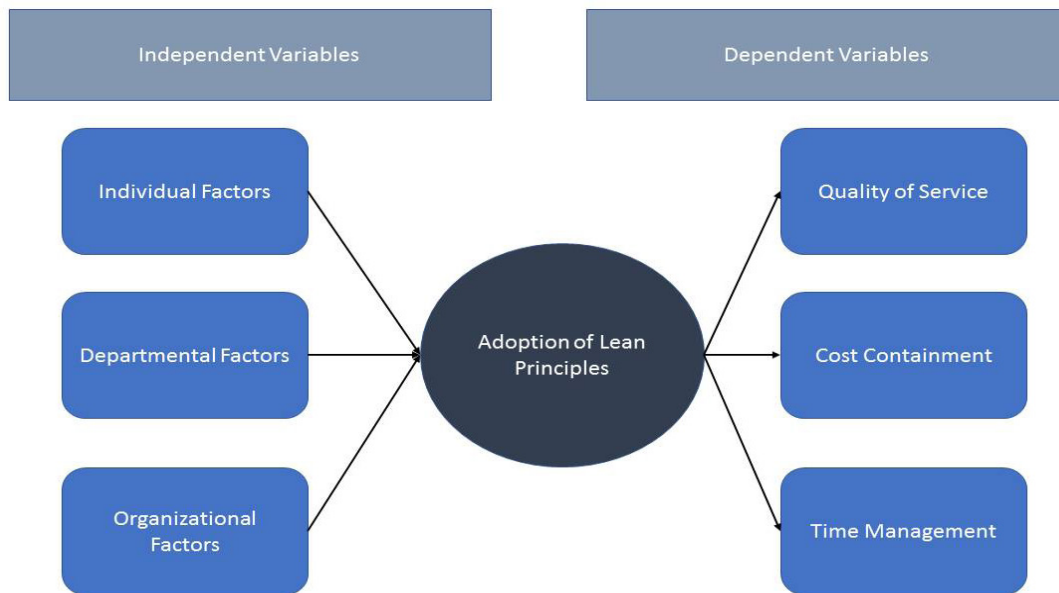


Figure 1. Research Framework

et al., 2021; Zepeda-Lugo et al., 2020).

In short, lean management concepts allow the organization to establish a robust production system (Lean system), which increases the chances of boosting overall productivity (Costa et al., 2017). Activists in the healthcare industry have been implementing Lean Manufacturing Management to help rein in costs while adding value for patients. They try to find innovative solutions to the unsustainable 5.5% annual increase in national health expenditures. One area of emphasis is on boosting “customer” happiness (patients and payers) while raising profits in the process (Zepeda-Lugo et al., 2020).

Lean management is fundamental in that it eliminates waste at every level of an organization. Because “lean thinking,” to be successful, requires buy-in from every member of an organization’s team, it becomes deeply ingrained in the culture of the organization, resulting in innovation at every level (de Sousa et al., 2021; Hallam and Contreras, 2018). With the implementation of lean healthcare, enterprises also enhance patients’ satisfaction by making choices and procedures that are more centered on the patient (Ayaad et al., 2019; Tlapa et al., 2020).

In a medical context, it may seem counter-intuitive to use what has been successful in manufacturing; however, by applying lean in healthcare and analyzing processes and systems through the prism of the eight wastes, businesses have the opportunity to reduce waiting and idle time (Borges et al., 2019; Hallam and Contreras, 2018). The management of lean manufacturing believes that waste occurs each time patients or workers are compelled to stand by (de Sousa et al., 2021; Hallam and Contreras, 2018).

Patients in waiting; meetings that are halted due to late arrivals; appointment waiting lists; and high-tech equipment that is not in use are all examples of situations in which healthcare organizations can harness the creativity and imagination of their teams to reduce waste and improve patients’ care (Tlapa et al., 2020).

Using lean methods, businesses might possibly reduce

their inventory levels. Inventory represents unutilized capital and storage costs for a business. Inventory waste may be caused by a variety of factors, including excess supplies and drugs, surplus equipment, unnecessary data, and stockpiles of pre-printed forms. Furthermore, having a large inventory increases the risk of losing money due to theft or expiration of equipment (Borges et al., 2019). Employees across the business may be educated to spot excess inventory and devise creative solutions to reduce them as needed (Henrique and Godinho Filho, 2018).

By using lean management, enterprises have the opportunity to eliminate defects, improve the quality of care provided, and increase reimbursement. The breakdown of processes or systems, medical errors, and misdiagnosis are all instances of defect waste in the healthcare industry (Henrique and Godinho Filho, 2018). Defective waste in healthcare is exemplified by problems such as needless readmissions; drug or surgical mistakes; blood clots and infections; and inadequate or erroneous medical records, all of which are caused by healthcare-associated defects (Haroun et al., 2021; Henrique and Godinho Filho, 2018; Moraros et al., 2016; Tlapa et al., 2020).

Companies may use lean concepts to motivate all personnel to reduce defective waste and enhance quality in order to favorably influence the bottom line and, most crucially, to minimize errors as payers move toward pay-for-performance models that reward and punish outcomes (Henrique and Godinho Filho, 2018; Tlapa et al., 2020). By using lean management, a company may reduce the movement of patients, supplies, and equipment, resulting in an improvement in patients’ flow. The unnecessary movement of goods, personnel, and medical equipment is a source of transportation waste in the healthcare industry. Transporting patients to and from other departments, as well as rushing about to obtain supplies, increases the risk of harm to patients or caregivers and causes delays in patient treatment (waiting waste) (Haroun et al., 2021; Henrique and Godinho Filho,

2018; Tlapa et al., 2020).

Patients and caregivers' mobility within a medical facility may be analyzed using lean thinking techniques in order to prevent harm, save time, and optimize the flow of patients (Ayaad et al., 2019; Haroun et al., 2021; Tlapa et al., 2020). Because of the use of lean management, a business may reduce injuries while saving time through reducing motion. Waste in motion occurs when hospital employees move around in their workstations in ways that do not benefit patients. Instances of motion waste include reaching or stooping for commonly used items; increased walking owing to inefficient building design, supplies, and equipment; and non-ergonomic patient transfers between beds, wheelchairs, or operating tables (Tlapa et al., 2020; Zepeda-Lugo et al., 2020).

By using lean management, a company may optimize resources while reducing healthcare costs. Overproduction waste includes redundancy, the production of too much of something, or the manufacturing of something at an inconvenient time of year (Antony et al., 2019). A few instances of overproduction include the preparation of prescriptions for a discharged patient, the duplication of tests, and prolonged hospital stays beyond the bare minimum medically necessary.

The company may eliminate waste from over-processing by using lean management. Over-processing happens when patients are subjected to needless effort throughout their treatment. Exacerbating the situation are unnecessary exams; filling out many forms with the same information; and entering data into multiple systems. It may be possible to alter or remove a process when time, effort, and resources are not contributing to the improvement of patients' outcomes. This may be accomplished via lean analysis (Zepeda-Lugo et al., 2020).

By looking at all processes through a lean healthcare lens, employees may identify repetitive, duplicated, or less-than-valuable activities that can be eliminated to save time and money for the organization. The adoption of lean leads to recognition of how healthcare waste contributes to untapped human potential—the pinnacle of waste in the healthcare industry (Hallam and Contreras, 2018).

Whenever any of the activities mentioned above take up too much of a worker's time, they are unable to apply their creativity and abilities to tasks to increase patient care and operational efficiency. Waste in healthcare takes away the time professionals should spend on developing connections with patients, pursuing educational opportunities, or making system-based changes, to name a few activities. Implementing a lean culture not only results in enhanced care quality and lower costs, but it also results in increased staff morale and dedication (Haroun et al., 2021; Henrique and Godinho Filho, 2018; Moraros et al., 2016; Tlapa et al., 2020).

Many factors affect lean management adoption, quality of service, cost containment, and time management. These factors included organizational, departmental, and individual factors of profession (Al-Ruzzieh and Ayaad, 2020; Sharikh et al., 2020). Customer-oriented and goal-oriented cultures are critical components in preparing for the lean transformation. Based on the current consumer demand and the organization's aim to

change, the execution method and training are tailored to individuals. Management must place more emphasis on the readiness elements that are used to create the lean execution process for the purpose of continuous improvement in the healthcare company. The readiness level aids the management in identifying the target area for lean execution and identifying the appropriate resources (Vaishnavi and Suresh, 2020). These aspects include corporate culture, organizational purpose, training program, recognition and reward system, and reporting system, to name a few examples. Teamwork, time management, well-located and accessible suppliers, organized work, manager's support, authority and empowerment, usage of appropriate methods, and internal training are all examples of departmental variables. Individual aspects include the amount of motivation, the organization of work, and the level of expertise (Al-Ruzzieh and Ayaad, 2021a; Borges et al., 2019; Qaddumi et al., 2021).

Many limitations were faced in the implementation of the study. The study was conducted in oncology settings. The generalization of the results is limited to oncology settings. The study was conducted in the settings where the lean was adopted. However, the responses were taken from all employees, not only the participants. These may affect the responses since the level of knowledge may affect the participants' responses.

In conclusion, the results showed that the study variables (adoption of lean, quality of services, time management, and cost containment) had high mean values. Moreover, the individual factors had a high mean value, while the departmental factors had the most negligible mean value. The results showed significant correlations between the study variables (the adoption of lean management, quality of service, cost containment, and time management) and the factors (organizational, departmental, and individual factors).

The results showed that the impacts of lean management adoption on the quality of service, cost containment, and time management were significant. Moreover, the results showed that the adoption of lean had a higher impact on time management. The results showed substantial impacts of all factors (organizational, departmental, and individual factors) on lean adoption, quality of service, cost containment, and time management.

The results provide baseline information regarding work stress, coping strategies, and health-related quality of life among oncology nurses. Therefore, many interventions could be adopted to enhance these variables since the main stressors and coping strategies were identified. Moreover, the magnet culture could play an important role in improving these variables.

However, comparative studies between the magnet and non-magnet hospitals and/or longitudinal studies before and after magnet designation may be required to measure the impact of the magnet culture on the variables.

## Author Contribution Statement

The authors confirm that all authors actively participated as a team in study conception and design, data collection,

analysis, interpretation of results, and draft manuscript preparation processes. All authors reviewed the results and approved the final version of the manuscript.

## Acknowledgments

The authors express their appreciation to all workers and the research office in King Hussien Cancer Center for their support during this study.

### Scientific Approval

The study proposal was reviewed and approved by the Office of Scientific Affairs and Research at King Hussein Cancer Center, Amman, Jordan.

### Ethical Approval

The Institutional Review Board (IRB) approval to conduct the study was taken from the research department in KHCC, Amman, Jordan. This approval has confirmed the voluntary participation, the right of refusal or withdrawal from the study, and the confidentiality of participant information.

### Funding

The authors confirmed that the study did not receive any funding.

### Conflict of Interest

The authors have no conflicts of interest to disclose.

## References

- Abuseif S, Ayaad O, Abu-Al-Haijaa E (2018). Measuring factors affecting the autonomy of nurses work. *Int J Acad Res Bus Soc Sci*, **8**, 1785–96
- Abuseif, S, Ayaad O (2018). The relationship between organizational commitment and nurses' turnover intention behavior at tertiary private hospitals in Najran, KSA. *Int J Acad Res Bus Soc Sci*, **8**, 764-72]
- Abu-Al-Haijaa E, Ayaad O, Al-Refaay M, et al (2018). Malpractice an Updated Concept Analysis and Nursing Implications in Developing Countries. *J Nurs. Healthc Res*, **7**, 81–5.
- Al-Ruzziieh MA, Ayaad O (2020). Nursing professional practice model: Development, Implementation, and Evaluation at an International Specialized Cancer Center. *J Nurs Adm*, **50**, 562-4.
- Al-Ruzziieh MA, Ayaad O (2021a). Work Stress, Coping Strategies, and Health-Related Quality of Life among Nurses at an International Specialized Cancer Center. *Asian Pac J Cancer Prev*, **22**, 2995–3004.
- Al-Ruzziieh MA, Ayaad O (2021b). Impact of nurses' emotional intelligence on the implementation of a professional practice model in cancer care. *Br J Nurs*, **30**, 1110-6.
- Al-Ruzziieh MA, Ayaad O, Hess RG (2022). The Role of Participation in and Effectiveness of Shared Governance Councils in the Nurses' Perception of a Professional Practice Work Environment. *J Nurs Adm*, **52**, 51–6.
- Al-Ruzziieh MA, Ayaad O, Qaddumi B (2020). The role of e-health in improving control and management of COVID 19 outbreak: current perspectives. *Int J Adolesc Med Health*, **2020**.
- Antony J, Sunder MV, Sreedharan R, et al (2019). A systematic review of Lean in healthcare: a global prospective. *Int J Qual Reliab Manag*, **36**, 1370–91.
- Ayaad O, Alloubani A, Thiab F, Yousef D, Banat B (2018). Adopting a shared governance model to improve nurses' working environments. *Br J Health Care Manag*, **24**, 594–602.
- Ayaad O, Al-Ruzziieh MA, Qaddumi B, et al (2022). Outsourcing services in the healthcare sector: balancing risks and benefits. *Br J Health Care Manag*, **28**, 96–103.
- Ayaad O, Haroun A, Yaseen R, et al (2019). Improving Nurses' Hand-off Process on Oncology Setting Using Lean Management Principles. *Asian Pac J Cancer Prev*, **20**, 1563–70.
- Borges GA, Tortorella G, Rossini M, et al (2019). Lean implementation in healthcare supply chain: a scoping review. *J Health Organ Manag*, **33**, 304–22.
- CostaL BM, Filho MG, Rentes AF, et al (2017). Lean healthcare in developing countries: evidence from Brazilian hospitals. *Int J Health Plann Manage*, **32**, 99–120.
- de Sousa PR, Barbosa MW, Tontini G, et al (2021). A qualitative analysis of Lean implementation in Brazilian surgical centres: A multiple-case study. *Int J Health Technol Manag*, **18**, 168–85.
- Hallam CA, Contreras C (2018). Lean healthcare: scale, scope and sustainability. *Int J Health Care Qual Assur*, **31**, 684–96.
- Haroun A, AL- Ruzziieh MA, Hussien N, et al (2021). Using Failure Mode and Effects Analysis in Improving Nursing Blood Sampling at an International Specialized Cancer Center. *Asian Pac J Cance Care*, **22**, 1247–54.
- Henrique DB, Godinho Filho M (2018). A systematic literature review of empirical research in Lean and Six Sigma in healthcare. *Total Qual Manag Bus Excell*, **31**, 429–49.
- Kruk M E, Gage AD, Arsenault C, et al (2018). High-quality health systems in the Sustainable Development Goals era: time for a revolution. *Lancet Glob Health*, **6**, 1196–252.
- Kruk M E, Gage AD, Joseph NT (2018). Mortality due to low-quality health systems in the universal health coverage era: a systematic analysis of amenable deaths in 137 countries. *Lancet*, **392**, 2203–12.
- Moraros J, Lemstra M, Nwankwo C (2016). Lean interventions in healthcare: do they actually work? A systematic literature review. *J Qual Health Care*, **28**, 150–65.
- Qaddumi B, Ayaad O, Al-Ma'aitah MA, et al (2021). The factors affecting team effectiveness in hospitals: The mediating role of using electronic collaborative tools. *J Interprof Educ Pract*, **24**, 100449.
- Ramireddy JK, Sundaram DS, Chacko RK (2017). Cost Analysis of Oral Cancer Treatment in a Tertiary Care Referral Center in India. *Asian Pac J Cancer Biol*, **2**, 17-21.
- Reponen E, Jokela R, Blodgett JC, et al (2021). Validation of the Lean Healthcare Implementation Self-Assessment Instrument (LHISI) in the Finnish healthcare context. *BMC Health Serv Res*, **21**, 1–9.
- Rowe AK, Rowe SY, Peters DH, et al (2018). Effectiveness of strategies to improve health-care provider practices in low-income and middle-income countries: a systematic review. *Lancet Glob Health*, **6**, 1163–75
- Sharikh EA, Shannak R, Suifan T, et al (2020). The impact of electronic medical records' functions on the quality of health services. *Br J Health Care Manag*, **26**, 1-13.
- Shortell SM, Blodgett JC, Rundall TG, et al (2021). Lean Management and Hospital Performance: Adoption vs. Implementation. *J Comm J Qual Patient Saf*, **47**, 296–305.
- Tlapa D, Zepeda-Lugo CA, Tortorella GL, et al (2020). Effects of Lean Healthcare on Patient Flow: A Systematic Review. *Value Health*, **23**, 260–73.
- Vaishnavi V, Suresh M (2020). Modelling of readiness factors for the implementation of Lean Six Sigma in healthcare

- organizations. *Int J Lean Six Sigma*, **11**, 597–633.
- Vashistha V, Poulouse R, Choudhari C, et al (2019). Quality of Life among Caregivers of Lower-Income Cancer Patients: A Single-Institutional Experience in India and Comprehensive Literature Review. *Asian Pac J Cance Care*, **4**, 87-93
- Zaker MR, Hazrati-Marangaloo A, Hosseini SR (2019). Quality of Life in Iranian Breast Cancer Survivors and Affecting Factors: A Review Article. *Asian Pac J Environ Cancer*, **2**.
- Zaroushani V, Mousavi Jarrahi SZ, Rahimi S, et al (2020). Occupational Cancer Protection by Most Recommended International Administrative Control. *Asian Pac J Environ Cancer*, **3**. 1-7.
- Zepeda-Lugo C, Tlapa D, Baez-Lopez Y, et al (2020). Assessing the Impact of Lean Healthcare on Inpatient Care: A Systematic Review. *Int J Environ Res Public Health*, **17**, 5609.
- Zoure AA, Bayala B, Bambara HA, et al (2020). Epidemiological Situation and Medical Management of Gynaecological and Breast Cancers from 1998 to 2018 in West Africa: A Systematic Review. *Asian Pac J Cancer Biol*, **5**, 211-19.



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