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Assessing Staff Nurses' Knowledge and Practice about Waste Management at Mansoura University Children's Hospital

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Abstract: Background: As members of the healthcare team, nurses must work together to provide patients with high-quality treatment. They deal with a lot of waste, complexity, unpredictability, and dynamism in their day-to-day work. Nurses play a crucial part in locating and getting rid of waste in healthcare systems by understanding and putting waste management principles into practice. Aim: To assess level of staff nurses' waste management knowledge and practice at Mansoura University Children's Hospital. Methods: A cross-sectional, descriptive method was used employing 99 staff nurses as a sample at Mansoura University Children's Hospital. Data collection tools were; Waste Management Knowledge Questionnaire and Nurses' Observational Checklist for Wastes Identification Practice. Results: The majority of studied staff nurses (99%) had poor level of knowledge about waste management and the highest percentage of them were at low level of practice about all waste management subscales. Recommendations: Introducing orientation programs to foster a waste management culture at the top and lower management levels. Offering chances for nurses to participate in training and educational initiatives that emphasize waste management techniques.

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1. Introduction

Healthcare societies are challenged with major difficulties that force them to become accustomed to the concerns of a time of persistent change. Therefore, it is predictable that organizations will make investments to enhance the efficacy and quality of their healthcare organizations **(Inuwa and Rahim, 2020).** Under these conditions, customers are demanding new, high-quality management solutions such as lean. Lean management is gaining popularity as a management strategy that may help increase efficiency, find and remove waste, improve patient value, lower expenses, and create a safer environment **(Mendes and França, 2025).**

Waste is any process, material, or action that does not enhance patient care and wastes resources excessively. Waste, as seen by the patient, is any procedure or action that does not enhance or add value to medical care. The three primary types of waste in lean management are muri, mura, and muda **(Hosen, Alam, Tushar & Syduzzaman, 2024).**

Waste causes inconsistent care, erroneous delivery and delays in the healthcare delivery system that raises costs, causes errors, and demotivates staff. The staff nurses and care team are also frustrated and emotionally and physically worn out from spending time on things that don't help the patient. When patients receive care that is redundant or inefficient, they may feel irate, miss out on time with their families or jobs, pay extra expenses, and even choose to change healthcare providers **(Morales et al., 2020).**

Wastes are categorized into eight categories which include inventory, excess transportation, excess motion, waiting, overproduction, over processing, defects, and underutilized staff **(Leksic et al., 2020).**

Staff nurses make up the bulk of employees in hospitals that provide 24-hour care; they are the medical experts who have the most impact on delivering safe, effective care **(Kim, et al, 2023)**. Nurses deal with a lot of waste in their daily practice; therefore they are in a position to reduce it while ensuring that what is left is managed in the most effective and efficient way **(Schenk et al., 2023)**.

Nurses are essential to maintain waste management practices in healthcare environments since they are directly involved in certain wasteful processes **(Udod,**

et al, 2020). They have a unique perspective on optimizing workflow and practices. They can identify sources of waste, such unnecessary paperwork, surplus supplies, or poor communication. Implementing effective waste management procedures, reducing waste generation, streamlining processes, and fostering a sustainable culture within healthcare companies all benefit from their expertise, abilities, and dedication **(Torkayesh et al., 2021).**

Waste management is typically linked to a management strategy that aims to increase output while using fewer resources **(Sim et al., 2024)**. Implementing waste management principles and practices in healthcare has become more increasingly necessary in recent years for a number of reasons, the main among them is the need to reduce waste, costs and increase financial sustainability **(Mendes and França, 2025)**.

Waste management also encourages a more predictable and tidy work environment, which makes it easier to handle tasks and organize daily agendas. Staff nurses can benefit greatly from waste management. By focused on eliminating non-value-added tasks and streamlining processes, lean management reduces unnecessary labor and administrative duties, improving the use of nurses' time and resources **(Crisostomo, 2023).**

Significance of Study

Mansoura University Children's Hospital provides a widespread variety of health services for children, who have severe health illnesses consequently resources of this hospital are inadequate and required to be used judiciously also other waste that wastes the time and energy of staff nurses and delays patient care such as excessive mobility, staff who are underutilized, long waiting times, Workflow disruptions and disorganization, therefore staff nurses need to be able to understand and identify the wastes that happen in the hospital. Thus, the purpose of the current study is to evaluate staff nurses' level of waste management knowledge and practice at Mansoura University Children's Hospital.

Aim of the study

The aim of this study is to evaluate staff nurses' waste management knowledge and practice at Mansoura University Children's Hospital.

2. Methods

Research design:

Descriptive cross-sectional design was the research methodology used in this study.

The study setting:

The study was implemented in all medical and surgical departments at Mansoura University Children's Hospital which linked to Mansoura University Hospitals and offers a wide variety of health services for children.

Study participants:

A convenience sample was used, comprising staff nurses (n= 99) who were there when the data was being collected and in charge of patient care in all medical and surgical departments.

Data collection tools:

Two tools were used to gather data: Waste Management Knowledge Questionnaire and Nurses' Observational Checklist for Wastes Identification Practice**.**

Tool (I): Waste Management Knowledge Questionnaire

The researcher created this tool based on relevant literature review as **(Bharsakade et al., 2021; Mahmoud et al., 2021; Miranda and Silva, 2022).** It is divided into two sections. **The first section**: aimed to identify Personal attributes of research participants, including years of experience, gender, and age, educational qualification, and work department.

The second section: aims to assess staff nurses' level of knowledge about waste management. It consists of (35) questions in the form of (20) true /false and (15) multiple choices questions (MCQ) that are related to waste management.

Scoring system

Every statement response was regarded as (1) for right response and (zero) for wrong response. One point was awarded for each right response. The scoring system is based on statistically cutoff point; these scores convert into percent score and divided as:

- Poor level (<60% of the total score).
- Average level (60 %-< 80% of the total score).
- Good level (≥80% of the total score).

Tool (II): Nurses' Observational Checklist for Wastes Identification Practice

The researcher created this tool based on relevant literature review as **(Minh et al., 2022)**. It aims to assess staff nurses' waste management practice. It includes 68 items; covers eight subscales that cover eight types of waste. Waste of inventory (10 items), waste of transportation (5 items), waste of motion (6 items), waste of waiting (11 items), waste of overproduction (9 items), waste of over processing (5 items), waste of defects (16 items), and waste of underutilized nurses (6 items). Each statement response was considered as done (1) and not done (zero).

Scoring system

The scoring system is based on statistically cutoff point and divided as:

- Low level (<60% of the total score).
- Average level (60 %- <75% of the total score).
- High level (≥75% of the total score).

Validity and reliability

Validity: Five nursing administration experts reviewed the Arabic-language translations for the instrument to ensure that it was clear, comprehensive, applicable, intelligible, pertinent, and useful. They also assessed each item to ensure that it was appropriate and pertinent for assessing the instrument's objectives, and the required adjustments were made based on their suggestions. Considering the experts' opinions, the instrument's face validity was determined and it was **97%** and the content validity indexes (%) of its items were **95%** for Waste Management Knowledge Questionnaire and **94.1%** for Nurses' Observational Checklist for Wastes Identification Practice. **Reliability**: The participants' pilot assessed the instruments to determine Cronbach's Alpha, which proved to be (**0.802**) for the Waste Management Knowledge Questionnaire and (**0.814**) for Nurses' Observational Checklist for Wastes Identification Practice. $p<0.05$ was the significance level for interpreting study findings.

Pilot study

The data collection tool was used to conduct a pilot research. Ten percent of the research sample, or eleven staff nurses, took part in a pilot study at Mansoura University Children's Hospital. They were eliminated from the study after being chosen at random. The goals of the pilot study were to determine the items' clarity, identify any difficulties or problems throughout the data collection process, and calculate the amount of time needed to complete each sheet.

Ethical Considerations:

The Mansoura University Faculty of Nursing's Research Ethics Committee granted ethical permission. Formal authorization to carry out the study was granted by the responsible hospital administrator. After being briefed on the study's concept and goal, each participant completed an informed consent form. Every participant was made aware that their participation in the study was completely voluntary and that they might withdraw at any moment. Participants were given guarantees about the confidentiality of the data and the anonymity of the study sample at each step of the data collection procedure.

Data Collection:

Tool (I) was provided to all available staff nurses. The researcher gave an explanation of the study's goal as well as how to fill out the questionnaire. Staff nurses completed the tool by reading the questions and filling out the sheets which took 20-25 minutes. Additionally the researcher began to observe each nurse in order to complete tool (II). It took 50 minutes to finish. The data gathered 4 days/week in the morning and evening shift (Sunday, Monday, Tuesday and Wednesday).

The process of collecting data started in January 2024 and ended in late April 2024.

Data Analysis:

The collected data was coded, entered, arranged, and analyzed using IBM Corporation's SPSS (Statistical Package for Social Science) version 25 in Armonk, New York, USA. The standard deviation, mean, and range were computed for quantitative data. The percentage, frequency, or proportion of each category should be taken into account when applying qualitative methods to characterize a categorical set of data **(Dawson & Trapp, 2001).**

3. Results:

Table (1) demonstrates personal characteristics of staff nurses who served as the study's subjects at Mansoura University Children's Hospital. With an average score of 37.20±8.37, over half (54.5%) of the study's staff nurses were in the 40–49 age range. They were mostly married women (85.9%). As for the staff nurses' educational level, it shows that more than one third (40.4%) possessed over 20 years of expertise with a mean score of 2.20±0.76, and nearly two thirds (61.6%) had a bachelor's degree.

Table (2) illustrates level of the studied staff nurses' knowledge about waste management at Mansoura University Children's Hospital. It showed that the majority of studied staff nurses (99%) had poor level of waste management knowledge.

Table (3) illustrates practice levels of waste management subscales of the studied staff nurses at Mansoura University Children's Hospital. It revealed that the majority of staff nurses under study had low levels of practice across all waste management subscales.

Table (1): Personal characteristics of the studied staff nurses (n=99).

Personal characteristics	The studied staff nurses (n=99)	
	N	%
Age years		
23-<30	20	20.2
30-<40	25	25.3
40-49	54	54.5
Mean±SD	***37.20±8.37***	
Gender		
Male	14	14.1
Female	85	85.9
Experience years		
<10 years	20	20.2

10-20 years	39	39.4
>20years	40	40.4
Mean±SD	***2.20±0.76***	
Educational qualification		
Diploma of Nursing	18	18.2
Technical Nursing Institute	20	20.2
Bachelor Degree	61	61.6
Marital status		
Married	89	89.9
Not Married	10	10.1
Work department		
Surgical	24	24.2
Medical	75	75.8

Table (2): Knowledge level of the studied staff nurses about waste management (n=99).

Total knowledge level of the studied staff nurses (n=99)		
	N	**%**
Poor level (0-41)	98	99.0
Average level (42-55)	1	1.0
Good level (56-70)	0	0

N.B. Knowledge level was classified into; poor level (<60% of scores), average level (60% -<80% of scores) and good level (≥ 80% of scores)

Table (3): Practice levels of waste management subscales of the studied staff nurses (n=99).

Practice level of waste management subscales	**Practice score of the studied staff nurses through training program phases**	
	Pretest	
	No.	**%**
A-Waste of inventory		
Low level (0-5)	85	85.9
Average level (6-7)	13	13.1
High level (8-10)	1	1.0
B-Waste of transportation		
Low level (0-2)	87	87.9
Average level (3-4)	2	2.0
High level (5)	10	10.1
C- Waste of motion		
Low level (0-3)	88	88.9
Average level (4)	8	8.1
High level (5-6)	3	3.0
D- Waste of waiting		
Low level (0-6)	92	92.9
Average level (7-9)	7	7.1
High level (10-11)	0	0
E-Waste of overproduction		
Low level (0-5)	94	94.9
Average level (6-7)	4	4.0
High level (8-9)	1	1.0
F-Waste of processing		
Low level (0-2)	81	81.8
Average level (3-4)	15	15.2
High level (5)	3	3.0
G-Waste of defects		
Low level (0-9)	96	97.0
Average level (10-12)	3	3.0
High level (13-16)	0	0
H- waste of underutilized nurses		
Low level (0-3)	94	94.9
Average level (4)	4	4.0
High level (5-6)	1	1.0

N.B. Practice level was classified into; low level (<60% of scores), average level (60% ->75% of scores) and high level ≥75% of scores.

4. Discussion

Nurses as frontline caregivers have a crucial and diverse role. They are essential in spotting inefficiencies, promoting process enhancements, and guaranteeing the success of waste management practices, they also have unique insights into the day-to-day operations of patient care **(Tan et al., 2023).**

In addition to their routine duties, nurses perform a variety of other tasks that help to establish a more effective, patient-focused healthcare setting. Their participation is essential to maintaining the advantages of lean management over time, from promoting communication and teamwork to advocating for patient demands **(Noviati and Yuliati, 2020).**

The goal of the present study was to assess staff nurses' level of waste management knowledge and practice at Mansoura University Children's Hospital. Finding of the present study revealed that the majority of studied staff nurses had poor level of knowledge about waste management. A lack of knowledge may result from nurses not receiving sufficient waste management training, lack of uniform, easily accessible, and strictly implemented waste management regulations as well lean is considered a novel idea that nurses not knowing anything about it as a result of their lack of participation in any training sessions about lean.

Following the same line as **Alazmi et al. (2025)** who introduced integrated framework to improve waste management practices and environmental awareness and revealed that participants had low awareness and limited knowledge of proper waste management principles. This insufficient knowledge was identified as a significant barrier to implementing sustainable waste strategies, prompting the need for an integrated framework combining education and process improvement to raise awareness and align practices with international standards.

The current study's findings are corroborated by **Omar et al. (2024)** who investigated the effect of lean training program for head nurses on their knowledge, readiness for lean transformation and lean culture in healthcare at Kafr EL- Dawar General Hospital and found that head nurses had a satisfactory level of waste management principles that improved after the program and emphasized the need for structured education to help nurses identify and reduce non-value-added activities.

Additionally, the current study's findings in accordance with **Mohame et al. (2024)** who examined effectiveness of the lean system concept in reducing time wasters among nursing personnel and found that nursing staff members knew very little about waste management principles and the concept of time wasters, and they stressed that this lack of knowledge hindered clinical practice's ability to manage time and resources effectively and highlighted the necessity of structured training programs to improve waste management awareness.

Moreover, the current study's findings concur with those of **Mohamed et al. (2023)**, who investigated how lean management training programs affected nurse managers' creativity and crisis prevention and revealed that nurse managers' had a low level of knowledge about waste management.

As well as these results are aligned with the findings of **Elsayed et al. (2023)** who assessed the effect of training program about lean strategies for head nurses on their leadership effectiveness and reported that minority of head nurses have adequate knowledge level about waste. In addition, finding of the present study is similar to **Abd Al Fadeel et al. (2023)** who examined the impact of lean management training programs on nursing staff members' waste management behaviors and understanding, and found that the minority of nursing staff had a good level of knowledge about waste management

Similarity to **Khashaba et al. (2023)** who explored The impact of a waste management intervention program on nurses' practices, attitudes, and knowledge and found that the knowledge level of waste management were significantly low. In the same line with **Hasaballah and Ahmed, (2021)** who evaluated hospital staff members' knowledge of lean management and found that most of them are not very knowledgeable about waste management.

Similar findings were made by **Sreedharan et al. (2020)**, who looked at managers' perceptions of lean and then created a customized training program to highlight it. They found that participants' knowledge of waste management was low and suggested that a training module was required to raise awareness.

These findings were the same with **Elzohairy et al. (2020)** who conducted a study to determine the impact of a lean strategies utilization training program on quality of environmental and occupational safety and came to the conclusion that few research participants had a high degree of overall waste knowledge. Also, This outcome is consistent with the research done by **Prado et al. (2020)** on boosting competitiveness in the healthcare industry by implementing lean management and revealed that mostly of studied sample had unsatisfactory knowledge about waste management.

Findings of the current study is supported by **Abou hashish and Abdel aal, (2019)** who conducted study to determine the impact of lean awareness on hospital nurses' understanding and preparedness for lean transformation and found that nurses' knowledge level of waste management was at a low level. On the same line with **Gaafer (2018)** who investigated the impact of implementing a training program for first line nurse managers using lean methodologies on the quality of occupational and environmental safety and reported that a few percentage of research participants had good level of knowledge.

Additionally, **Nema and Singh, (2015)** who investigated the hospital staff's knowledge and behavior regarding health care waste management at a medical college hospital and revealed that most of participating nurses had average level of knowledge, while few of them were ignorant of waste management and recommended the need of continuous training programs to create awareness among hospital staff.

Also, the goal of the present study was to assess level of waste management practices among staff nurses at Mansoura University Children's Hospital. Findings of the present study showed that the largest proportion of staff nurses' practice regarding all waste management subscales were at low level. One possible explanation for the low level of waste management practice is the absence of staff development initiatives to raise the caliber of their knowledge and abilities. In addition to the heavy workload and disruptions they experienced at work.

These results are agreed with **Taha et al.(2024)** who investigated the obstacles to green waste management practices among operating room nurses, demonstrating that all of the nurses in the study had inadequate waste management practices and that enhancing green practices in these settings requires tackling infrastructure and human factors deficiencies and, not just giving people more knowledge.

These finding went in the same track with **Mohamed et al. (2024)** who examined effectiveness of the lean system concept in reducing time wasters among nursing personnel and revealed that all head nurse

showed very low levels of practice regarding the identification and elimination of time waster. Delays in documentation, inefficient movement, and poor coordination of care activities were some of the predominant inefficiencies. Most of the staff was not utilizing any strategies to reduce non-value-adding activities, indicating a clear gap in performance in the areas of waste and workflow management.

Also, this finding was similar to **Elsayed et al. (2023)** who investigated how head nurses' leadership performance was affected by a training program on lean principles and clarified that head nurses had a low level of practical application of lean strategies in their daily roles and improved to high level after implementing the training program.

Also, finding of the current study is supported by **Mohamed et al. (2023)** who looked into how a lean management training program affected the creativity and crisis management of nurse managers and revealed that nurse managers had a low level of practical application of lean management concepts. Most participants lacked structured approaches for waste identification, workflow optimization.

Also, this result is in accordance with **Abd Al Fadeel et al. (2023)** who searched the impact of a lean management training program on the waste management practices and understanding of nursing staff and showed that nursing staff demonstrated a poor level of practice in applying lean-based waste management techniques and pointed that the majority of participants lacked the abilities necessary to systematically identify or cut down on tasks that did not bring value.

The study finding goes in the same line with **Elzohairy et al. (2020)** who examined the impact of lean strategy utilization training program on quality of environmental and occupational safety and showed that participants exhibited a low level of lean strategy utilization. Before the training, most staff did not follow structured methods for identifying and managing process waste.

The study finding was supported by **Hassanain et al. (2017)** who assessed effect of a lean methodology intervention on process efficiency and revealed that the participants under study had low levels of waste management practice subpar waste management practices, identified a lack of structured processes and waste-reduction strategies and recommended that lean management, could have a positive effect and improvement with time.

Also **Addo et al. (2017)** who showed that most respondents had poor practices pertaining to waste management. While **Elsayed et al. (2025)** who found that more than two-thirds of the nurses scored as a moderate level of practice for waste management and added that there was an opportunity for improvement by translating information into practice.

Conclusion

This study concluded that the majority of studied staff nurses had poor level of knowledge about waste management. Additionally, the highest percentages of them were at low level of practice about all waste management subscales.

Recommendations

- Introducing orientation programs to foster a waste management culture at the top and lower management levels.
- Offering chances to participate in educational and training programs that focus on waste management techniques in order to improve the efficacy and efficiency of organizational performance.
- Setting up frequent meetings and feedback systems to promote open communication and enable nursing staff to report problems, exchange ideas, and participate in efforts for continuous improvement.

Further research:

- Investigating the effectiveness of an educational intervention on improving waste management Knowledge and practice.
- Applying framework of lean management to analyze and enhance the waste management process.
- Investigating and analyzing the impact of waste management principles and practices on organizational effectiveness.

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