Relationship between Nursing Continuous Improvement Process and Waste Management

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Abstract: **Background:** The purpose of this paper is to investigate working in a continuous improvement process and using waste management in nursing activities. Data were collected from nurses in the Great Cairo hospitals. Factor analysis and multiple regression analysis were conducted to understand the relationship between these factors. The results of this study highlight the importance of a continuous improvement process with waste management through all the nurses' activities to increase the value and quality of care and remove the non-added-value activities. The waste management approach is one of the coming revolutions for better, improved, high-value-based care to maximize the benefit from nursing care activities. Additionally, it is an improvement strategy based on the concept of eliminating waste and creation value-added care practices for the patients. **Methods:** An empirical research design was used in the current study and the questionnaire was adapted from two tools were used for data collection in this study. **Results:** There is a significant positive correlation between the two domains, and There is a strong relationship between" Continuous improvement " with "waste reduction".

Key Words: Continuous improvement, Waste Management, Nursing, Egypt

Introduction

Waste management is a process that constantly eliminates waste and progresses workflow to capably create a product or service which is apparent to be valuable to the individuals who practice it . Waste management introduces principles to get rid of actions or processes that do not add value, straightly to any waste such as long waiting time of care, duplication of activities. These wastes do not allow the care process to effect without interruption, complication, backward, or delay. for this reason, when these things are eliminated, the competence of activities and services will be simultaneously raised **(Toussaint & Berry, 2013).**

Healthcare may be a complicated environment within which health procedures, the shape of the interface, and therefore the quality improvement in care are related factors for service provision. Therefore, there should be equity and optimization of resources moreover because of the relationship between client and service provider within the healthcare model. Continuous improvement is taking an established production process and looking for ways to incrementally improve the production process. Although individual changes may not seem to have a major impact, the aggregate means significant change and improvement to the manufacturing process. By taking small measured steps, as a course of everyday activities, also allows for improvement while eliminating the risk of making one huge bound to try to achieve the same result.

I. AIM OF THE RESEARCH

This paper aims to identify the relationship between continuous improvement and waste management by nurses in Great Cairo hospitals.

II. RESEARCH QUESTION

What is the relation between continuous improvement and waste management?

III. LITERATURE REVIEW

Healthcare waste management allows the hospital to minimize waste, reduce the waiting time for patients and processed materials, increase productivity, capacity, and hence its profitability through focused management knowledge and focusing on people as changes in the vehicle. The demand for the health lean model is gaining acceptance, not because he is a "new movement", but because it leads to sustainable results for these organizations and higher quality services to customers. **(Machado et al., 2015)**

Those who perform direct services are in an excellent position to identify the need for change in service delivery processes. Based on this premise, the staff nurse--who is at the heart of the system--is the best person to assess the status of health care services and to work toward improving the processes by which these services are provided to clients in the health care setting. The nurse manager must structure the work setting to facilitate the staff nurse's ability to undertake constructive action for improving care. The use of quality circles, quality councils, or quality improvement forums to facilitate the coordination of quality improvement efforts is an effective way to achieve success.

Continuous improvement tends to come from the ground up. By encouraging and supporting first line employees to identify and find solutions to achieve improvements in the health care process, there are wins all around. First, first line employees feel more valued and listened to, thereby creating a bridge between the shop floor and management team. Secondly, when their recommendations are implemented, it gives employees a sense of pride that they achieved improvement for the company. Another reason the continuous improvement strategy works is that the production employees are more likely to adopt change from their peers, people who they know have first-hand knowledge of the production process.

Waste management strategy is a universal management tool used in any business or production process for optimizing work flows that relies on deliver value; eliminate waste, and continuous improvement. **(Ali et al., 2020)**

.RESEARCH DESIGN:

This empirical research is characteristic stems from its objective that is the careful and systematic investigation of the relation between Nursing Continuous Improvement Process and Waste Management within Great Cairo Hospitals by nurses.

I. RESEARCH METHODOLOGY:

Empirical research is a type of research methodology that makes use of verifiable evidence to arrive at research outcomes. In other words, this type of research relies solely on evidence obtained through observation or scientific data collection methods. The objective of this research is the development of a framework that supports the management assisting in cultural change focused on minimizing waste based on continuous improvement in Great Cairo hospitals. The study is a survey, based on data collected from nurses in governmental Great Cairo hospitals. The research Sample has been focused on professionals who have direct contact with patients, as nursing director, supervisors, head nurses, staff, and technicians.

Questionnaire The questionnaire consist of twenty eight questions in two categories as It included Personal data (Demographic data), two basic which are (**Continuous Improvement**, and **Waste Reduction**). The questionnaire questions are answered through Likert's five models, and the relative weight of the answers has been established. Adopted from (**Mabrouk et al., 2018**) Developing an Instrument to Measure Penetration of Lean Thinking For Frontline Nursing Staff., and (**Roszell et al., n.d.,2013**) Measuring Lean Management Penetration on the Hospital Nursing Frontline: Instrument Development.

II. RESULTS AND FINDINGS

Sample Responses Rate : 519 Nurses

Demographic variables: -

1- Analysis of the relationship between demographic variables, basic dimensions and questionnaire axes:

Table (1) The relation between Gender and all Domains

Domains	Male		Female		ANOVA	
	Mean	SD	Mean	SD	F	P-value
" Continuous Improvement"	42,7368	7,25330	42,2477	6,8264 4	,547	,460
" Waste Reduction "	28,1349	5,76076	27,2523	5,6578 4	,906	,342

It is evident from the results of the previous table that there are no statistically significant differences between males and females on all the axes of the questionnaire where the value came (P- Value> 05).

Table (2) The relation between the position and all Sub-domains

Domains	Nursing Director		Nursing Supervisor		Head Nurse		Staff Nurse		ANOVA	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	F	P-value
" Continuous Improvement "	45.56	8.65	40.59	7.35	42.22	6.83	42.55	7.08	3.34	.019
" Waste Reduction "	27.81	8.84	25.68	5.42	27.53	4.98	28.41	5.85	4.47	.00

It is evident from the previous table that there are differences between the degrees of the sample on some domain due to position this domain:-

- Continuous Improvement""(P-Value .000<,05)
- Waste Reduction ""(P-Value .000<,05)

Table (3) The relation between the Work Experience and all Sub-domains

Domains	<5years		from 5-9 years		From 10-15		More than 15 years		ANOVA	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	F	P-value
"Continuous Improvement"	42.5615	6.77094	42.3952	8.00388	42.1556	6.83170	43.7778	6.80203	.561	.641
"Waste Reduction "	27.4500	5.96267	27.8710	6.04316	28.2333	4.98098	28.6222	4.92807	.806	.491

It is evident from the results of the previous table that there are no statistically significant differences between the sample scores on the questionnaire axes due to the Work Experience.

Table (4) The relation between the quality course and all Sub-domains

Domains	Yes		No		ANOVA	
	Mean	SD	Mean	SD	F	P-value
" Continuous Improvement"	42.7368	7.25330	42.2477	6.82644	1.608	.201
" Waste Reduction "	28.1349	5.76076	27.2523	5.65784	2.796	.062

It is evident from the previous table that there are statistically significant differences between the sample members on the questionnaire axes due to the quality course variable.

2. Analysis of the results related to the respondents' answers to the questionnaire: -

- The results of the respondents are reviewed on the statements of the questionnaire, so that the questionnaire is divided into ten axes as follows: Table (5) shows the Questionnaire Axes.

Table (5) Represent the "Questionnaire Axes":

Basic Axes	
1	Continuous Improvement
2	Waste Reduction

Table (6) The relation between the Work Experience and all Sub-domains

Domains	<5years		from 5-9 years		From 10-15		More than 15 years		ANOVA	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	F	P-value
"Continuous Improvement"	42.5615	6.77094	42.3952	8.00388	42.1556	6.83170	43.7778	6.80203	.561	.641
"Waste Reduction "	27.4500	5.96267	27.8710	6.04316	28.2333	4.98098	28.6222	4.92807	.806	.491

It is evident from the results of the previous table that there are no statistically significant differences between the sample scores on the questionnaire axes due to the Work Experience.

Table (7) The relation between the quality course and all Sub-domains

Domains	Yes		No		ANOVA	
	Mean	SD	Mean	SD	F	P-value
" Continuous Improvement"	42.7368	7.25330	42.2477	6.82644	1.608	.201
" Waste Reduction "	28.1349	5.76076	27.2523	5.65784	2.796	.062

It is evident from the previous table that there are statistically significant differences between the sample members on the questionnaire axes due to the quality course variable.

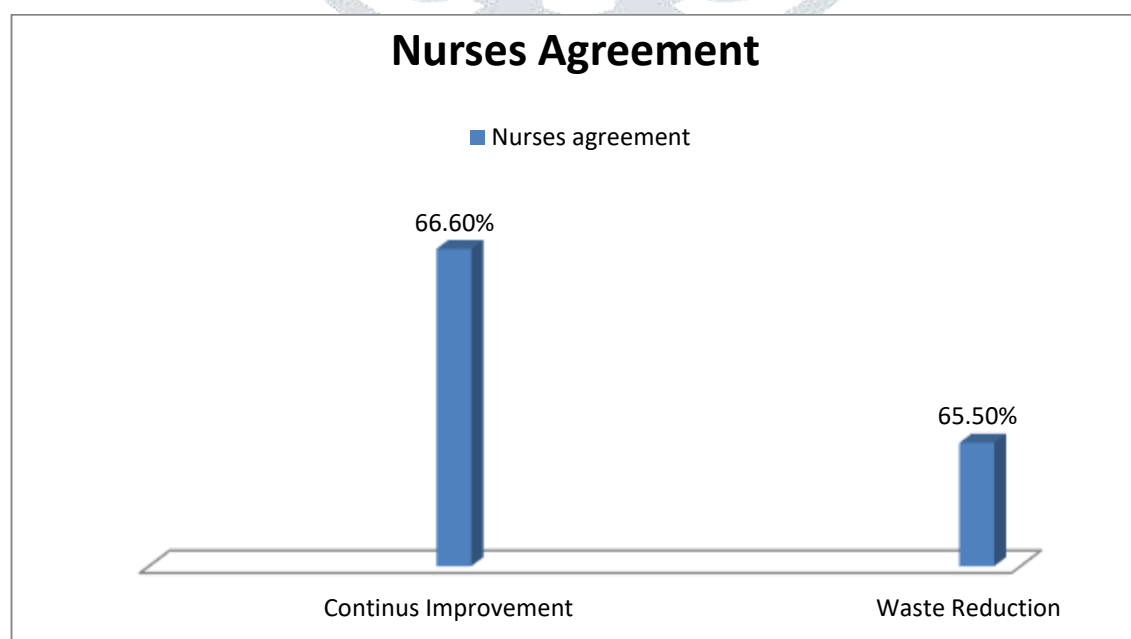**3. Analysis of the results related to the respondents' answers to the questionnaire: -**

Figure (1) Percentage of the nurses agreements with the all axis

It is evident from the previous figure that the percentage of respondents' approval of the" Continuous Improvement " is the highest axis. Exceed the average results with (66.6 %).

3. Analysis of the relationship between demographic variables, basic dimensions and questionnaire axes:

Table (8) The relation between Gender and all Domains

Domains	Male		Female		ANOVA	
	Mean	SD	Mean	SD	F	P-value
"A4- Continuous Improvement"	42,7368	7,25330	42,2477	6,82644	,547	,460
" C3- Waste Reduction "	28,1349	5,76076	27,2523	5,65784	,906	,342

It is evident from the results of the previous table that there are no statistically significant differences between males and females on the two axes of the questionnaire where the value came (P- Value> 05).

Table (9) The relation between the hospital location and all domain

Domains	1.Cairo		2.Giza		.Qaluobia		ANOVA	
	Mean	SD	Mean	SD	Mean	SD	F	P-value
" Continuous Improvement"	42,4217	6,52848	42,6667	7,56916	41,6333	6,02246	,789	,558
" Waste Reduction "	27,9578	6,08760	27,5435	5,75641	27,0167	4,26452	3,359	,005*

It is evident from the previous table that there are differences between the degrees of the sample on As a nurse in a hospital: "Waste Reduction" (P-Value <.05) according to the hospital site, while the results came that there were no significant in "Continuous Improvement ". Where the value is (P- Value> .05)

The averages and standard deviations of the respondents' answers to the statements of the first axis:

Table (10) Averages and standard deviations of the respondents' answers to the statements of the first axis " Continuous Improvement"

Perspective	Strongly Disagree		Disagree		Neither agree or disagree		Agree		Strongly Agree		% of agree ment	Mean	S D
	N	%	N	%	N	%	N	%	N	%			
There is time into the unit staff's schedule	53	10.2 %	99	19.0%	134	25.8%	87	16.7%	146	28.1 %	58.3 %	3.34	1.335

Perspective	Strongly Disagree		Disagree		Neither agree or disagree		Agree		Strongly Agree		% of agreement	Mean	S D
	N	%	N	%	N	%	N	%	N	%			
to work on improvement and problem-solving issues.													
Follow up in audits is important for improving care	36	6.9%	44	8.5%	91	17.5%	93	17.9%	255	49.0%	75.2%	3.94	1.276
Find opportunities to improve care every working-day.	62	11.9%	166	31.9%	171	32.9%	52	10.0%	68	13.1%	38.54%	2.80	1.177
Understand that process analysis improves the care I give.	20	3.8%	60	11.5%	99	19.0%	161	31.0%	179	34.4%	74.6%	3.81	1.145
Improvement of care requires a plan.	44	8.5%	57	11.0%	87	16.7%	215	41.3%	116	22.3%	71.9%	3.58	1.192
Most of nurses worked on a number of improvement projects.	62	11.9%	43	8.3%	65	12.5%	157	30.2%	192	36.9%	73.4%	3.72	1.352
Nurses are looking forward to know the results of previous improvement plans in care improvement	0	0	44	8.5%	177	34.0%	141	27.1%	157	30.2%	74.2%	3.79	.970
Patient care is one of the whole team work efforts.	25	4.8%	57	11.0%	74	14.2%	179	34.4%	184	35.4%	76.7%	3.85	1.162
Stock of supplies in unit is sufficient for optimal patient	51	9.8%	63	12.1%	104	20.0%	96	18.5%	205	39.4%	67.7%	3.66	1.361

Perspective	Strongly Disagree		Disagree		Neither agree or disagree		Agree		Strongly Agree		% of agree ement	Mean	S D
	N	%	N	%	N	%	N	%	N	%			
care.													
Work can be accomplished in a non-rushed manner	47	9.0%	41	7.9%	72	13.8	217	41.7%	142	27.3%	76.4%	3.71	1.208
Time saving adds up to the patient time	118	22.7%	79	15.2%	166	31.9%	75	14.4%	81	15.6%	45.8%	2.85	1.346
Statistics on falls, central line infections and others quality indicators are displayed for staff to see.	52	10.05%	56	10.8%	100	19.2%	193	37.1%	118	22.7%	69.6%	3.52	1.235

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- It is clear from the result analysis of the previous table for the axis "Continuous Improvement" that most of the sample members agreed on the statements of the questionnaire, and the most of statements, **were approved by the sample members as the follows:**
- Audits in Follow up are important for improving care. Mean (3.94) and (75.2%) agreement.
- Patient care is one of the whole teamwork efforts. Mean (3.85) and (76.7%) agreement.
- **While most of the sample individuals expressed their dissatisfaction with the paragraphs:**
- Find opportunities to improve care every working-day. Mean (2.80) and (38.54%) agreement.
- Time-saving adds up to the patient time. Mean (2.85) and (45.8%) agreement.

The averages and standard deviations of the respondents' answers to the expressions of the tenth axis:

Table (11) Averages and standard deviations of the respondents' answers to the statements of second axis: ''- Waste Reduction''

Perspective	Strongly Disagree		Disagree		Neither agree or disagree		Agree		Strongly Agree		% of agree ment	Mean	S D
	N	%	N	%	N	%	N	%	N	%			
Find the ways to	48	9.2	45	8.7	112	21.5	112	21.5	201	38.7	71.1	3,80	2,16

Perspective	Strongly Disagree		Disagree		Neither agree or disagree		Agree		Strongly Agree		% of agree ment	Mean	S D
	N	%	N	%	N	%	N	%	N	%			
keep the patient away from waiting		%		%		%		%		%	%		3
Return over-stocks of supplies back to central distribution	25	4.8%	56	10.8%	97	18.7%	237	45.6%	104	20.0%	74.9%	3,65	1,065
Get rid-off things that cause delay, repeated encounters, errors and inappropriate procedures	71	13.7%	76	14.6%	154	29.6%	139	26.7%	79	15.2%	56.4%	3,15	1,245
Transportation, inventory, motion, and waiting can be targeted for improvement	43	8.3%	123	23.7%	186	35.8%	87	16.7%	80	15.4%	51.5%	3,07	1,162
The supplies are in a designated place	63	12.1%	126	24.2%	104	20.0%	135	26.0%	91	17.5%	53.3%	2.13	1.295
Start discharge plan from the first day of patient admission in hospital	42	8.1%	49	9.4%	102	19.6%	205	39.4%	121	23.3%	72.5%	3.61	1.176
Decrease cost of care by using only the needed supplies	52	10.0%	53	10.2%	56	10.8%	220	42.3%	138	26.5%	74.2%	2.65	1.252
Reduce waste in waiting time, duplication, overstocking and over-processing	28	5.4%	52	10.0%	70	13.5%	251	48.3%	118	22.7%	77.9%	3.73	1.085

It is evident from the results of the previous table that most of the sample members agree to answer **the following statements:**

- Find the ways to keep the patient away from waiting. Mean (3.80) and (71.1%) agreement.

- Reduce waste in waiting time, duplication, overstocking and over-processing. Mean (3.73) and (77.9%) agreement.
- Return over-stocks of supplies back to central distribution. Mean (3.65) and (74.9%) agreement.
- Start discharge plan from the first day of patient admission in hospital. Mean (3.61) and (72.5%) agreement.
- Get rid-off things that cause delay, repeated encounters, errors and inappropriate procedures. Mean (3.15) and (56.4%) agreement.
- Transportation, inventory, motion, and waiting can be targeted for improvement.(3.07) and (51.5%) agreement.

While they rejected the phrases:-

- The supplies are in a designated place. Mean (2.13) and (53.3%)
- Decrease cost of care by using only the needed supplies. Mean (2.65) and (74.2%) agreement.

Table(12) The relation between the hospital location and all domain

Domains	1.Cairo		2.Giza		3.Qaluobia		ANOVA	
	Mean	SD	Mean	SD	Mean	SD	F	P-value
" Continuous Improvement"	42,4217	6,52848	42,6667	7,56916	41,6333	6,02246	,789	,558
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- It is evident from the previous table that there are differences between the degrees of the sample on As a nurse in a hospital: "Waste Reduction" (P-Value <.05) according to the hospital site, while the results came that there were no significant differences between the sample scores for the "Continuous Improvement" of the survey axes. Where the value is (P- Value> .05)

Table (13) Results of correlation coefficients between All Domains

	"Continuous Improvement"
" Waste Reduction "	.632**

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

The previous table clears that:

- There is a significant positive correlation the two domains.
- There are strong relation between the" Continuous improvement " with "waste reduction".

III. CONCLUSION

Summing up, it can state that the main factors for successful implementation of waste management in hospitals are concentration on process optimization, knowledge about main lean principles by adopting an attitude to change through the organization culture, and intelligent application of its tools through staff training, which affects continuous improvement, problem-solving, and waste reduction). For waste to tap its full potential, as well as engaging and leading employees with continuous improvement will lead to the success of waste management in the healthcare environment. The paper reviewed and identified the aim to examine the relationship between continuous improvement and waste management by nurses in Great Cairo hospitals.

IV. ACKNOWLEDGMENT

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