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Lean Management: As an Approach to Reduce Cycle Time of Patient Discharge Process

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Abstract:
Background*: Lean management is a type of quality improvement approaches that is used to improve productivity, eliminating waste and promoting activities that really add value to the patients. Using lean management to improve cycle time of patient discharge process should therefore lead to an increase in patient satisfaction. The current study aimed to reduce cycle time of patient discharge process and increase patient satisfaction from discharge process.*
Materials and Methods*: A convenience sample of patients were included, who were discharged from in-patient units at the selected setting. Quasi-experimental research design was used in this study. The study was conducted in private hospital in Cairo at inpatient units. Two tools were used to collect the study data. First tool was the time flow sheet to assess time of patient discharge process. The second tool was patient satisfaction questionnaire from discharge process.*
Results*: The mean time of discharge process was reduced from 275,6 mins to 127,7 mins after applying lean management. Additionally, the majority of patients were highly satisfied after applying lean management and decrease cycle time of discharge process.*
Conclusion: *Reduction in total time of patient discharge process after applying lean management. As well, the majority of patients were highly satisfied from discharge process after applying lean management. It was recommended that All departments involved in the discharge process should be adequately staffed, depending on the patient load in the hospital. Staff recruited for these departments should be trained in discharge procedures.*
Key Word*: Lean management; discharge process; patient satisfaction.*

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I. Introduction

Healthcare systems are facing growing challenges as the aging society is increasing the demand for care. Healthcare systems are required to meet this growing demand, while increasing accountability and improving the quality of care [1,2,3]. In response to this phenomenon, healthcare providers are striving to improve outcomes while simultaneously achieving greater efficiency. To meet these goals, many organizations have turned to improvement approaches. One proven approach is Lean [4,5]. Lean management is a set of operating philosophies and methods that help to create the maximum value for patients by reducing waste and waits. It aims to fundamentally change organization thinking and value, which ultimately leads to the transformation of organization behavior and culture over time [6,7].

The way of working should be analyzed and standardized according to the best practices. More consistent practices lead to more consistent quality. It is often to focuses on doing the value-added work in a faster or more efficient way. Technical tools are very helpful and necessary in analyzing and diagnosing processes and eliminating waste, as they allow turning philosophy and concepts into action. An example of such tools in Lean management implementation is kaizen [8,9,10]. The term kaizen includes in the early stages sharing ideas in the resolution of problems. It may involve a process redesign, a speed improvement, a cycle time reduction, or any other reducing waste in a manufacturing process [11,12].

Patient discharge process is deemed to have started when the consultant formally approves discharge and ends with the patient leaving the clinical unit. It is a very important indicator of quality of care and patient satisfaction. Delay in patient discharge also increases the pressure on beds of the hospital. Increasing in cycle time of patient discharge process is bad for both hospitals and patients. It increases cost to the hospitals and is depressing to the patients. So, effective strategies must be in place to solve this issue [13,14,15]. Using lean management to improve cycle time of patient discharge process should therefore lead to an increase in patient

satisfaction. A fast discharge process can ensure early availability of patient beds, which in turn, can reduce the waiting time of patient admissions or even reduce the incidence of patient rejection due to unavailability of beds [16,17].

As a result, patients are likely to return to a healthcare setting where they have experienced an efficient discharge process when they next seek treatment. In turn, efficiency and productivity are increased at the hospital. Available beds are a hospital's most important resource. The unnecessary occupation of hospital beds and rooms and consequent low hospital bed turnover rate represent a waste in healthcare resources, and result in heavy associate organizational costs [18,19,20]. Thus, it is necessary to study lean management in patient discharge process and locate the bottlenecks in order to improve the healthcare setting. The current study aimed to reduce cycle time of patient discharge process by using lean approach.

II. Material And Methods

The study was conducted at private hospital in Cairo at in-patient units; day care have 10 rooms; 7th floor has 30 rooms (4 rooms double and 26 rooms single with total number of beds 34); 8th floor has 14 rooms; and 9th floor has 8 rooms double and 32 rooms single with total number of beds 48).

Study Design: Quasi-experimental research design was used in this study.

Study Duration: December 2019 to February 2020.

Sample size: 200 patients.

Subjects & selection method: A convenience sample of patients were included, who were discharged from in-patient units at the selected setting.

Procedure methodology

After written informed consent was obtained, two tools were used to collect the study data. First tool was the time flow sheet. It was used to assess the time of every item of patient discharge process from confirmation of discharge by consultant and ends with the patient leaving the room. It was developed by the researcher through reviewing of the related literature [21,22]. It consisted from 17 steps. It starts with consultant confirm discharge and ends with patient leaves the room.

The second tool was patient satisfaction questionnaire. It was developed by the researcher through reviewing of the related literature [15,23]. This tool was used to assess patient satisfaction from discharge process in the hospital. It consisted from (8) items. It includes patient satisfaction from overall discharge process, time taken for discharge process, patient informed about discharge date and time in advance, ward secretary gives patient all discharge documents, medication prescription was clear and explained, financial department employee responds to any questions about financial issues, doctor informed patient about discharge instructions before discharge permission and nurse prepares patient for discharge. Responses were measured on 5-point Likert rating scale ranging from (1) very un-satisfied to (5) very satisfied. Patient satisfaction questionnaire scoring system ranged from (8 - 40). It was calculated according to three levels: Low (8 - < 19); Moderate (≥19 - < 30); and High (≥ 30 - 40).

The researcher collected data by himself through meeting the subjects and explaining the purpose of the study to them in the study settings. Patient satisfaction questionnaire sheets were distributed and completed by patients or by asking them. The researcher was present all the time during fulfilling the forms to answer any questions. The time needed by patients to complete patient satisfaction questionnaire was ranged between (3-5) minutes, this tool was collected after the patient leaving the room. The researcher checked the completeness of each filled sheet after the subjects completed it to ensure the absence of any missing data.

After assessing the time of each item of patient discharge process and patient satisfaction toward discharge process, By analyzing voice of the customer (patient satisfaction from discharge process), it was indicated that there is need to reduce discharge time, which was the main reasons of inpatient dissatisfaction. kaizen team was developed through selection of multidisciplinary team; in-patient department manager, two physicians, two nurses, two head nurses, one pharmacist; one financial employee, and one ward secretary and one quality specialist. Kaizen team carried on kaizen event to explain lean management and its effect on removing process waste and reducing patient discharge process cycle time.

By dividing kaizen team into groups and make a discussion, actual mapping of discharge process. Process improvement ideas was generated through lean management tools as brain storming, cause and effect diagram, and key driver diagram. These lean tools used to detect the problems of increasing cycle time of discharge process. Many suggestions were reported and applied to solve these problems. After applying the suggestions and at the last day of kaizen event, assessment of cycle time of discharge process and patient satisfaction from discharge process was done on 10 % of the study sample to detect the rapid improvement. Reassessment the time of each item of patient discharge process and patient satisfaction toward discharge process within one month after kaizen event. The typical value stream mapping with a timeline is applied in this paper before lean intervention.

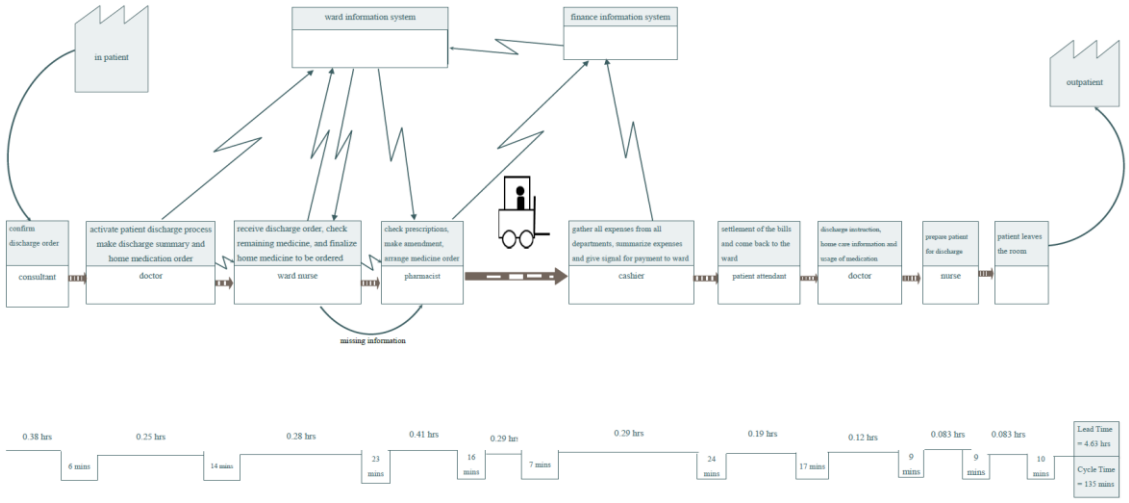


Figure (1). Current value stream mapping of discharge process

In order to locate the reasons for the delay in each of the sub processes of the Patients discharge process, cause and effect diagram was used.

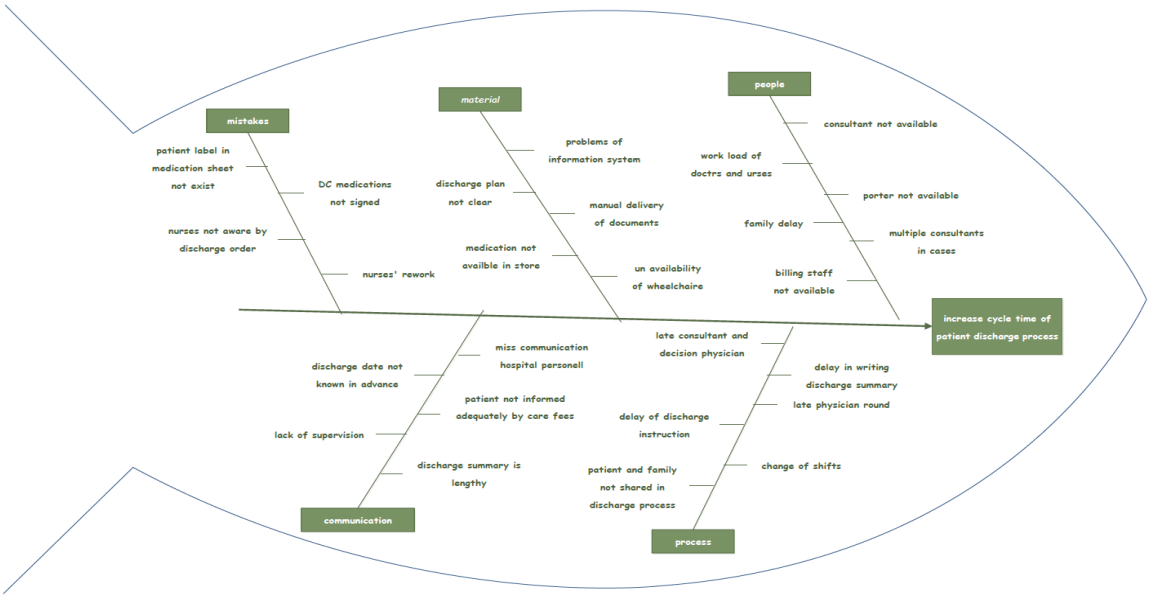


Figure (2). Fishbone diagram of increase cycle time of discharge process

Eliminating wastes between steps of a process and creating smooth workflow for high efficiency. Creating flow by analyzing each step in the process, finding ways to maximize efficiencies, and reducing waste. Brain storming sessions was created to generate ideas to eliminate wastes in discharge process and find a solution for discharge process problems by kaizen team. Brain storming works best with a varied group of people. Participants came from various departments from hospital and have different backgrounds. Key driver diagram in figure (3) shows possible solutions of discharge process problems.

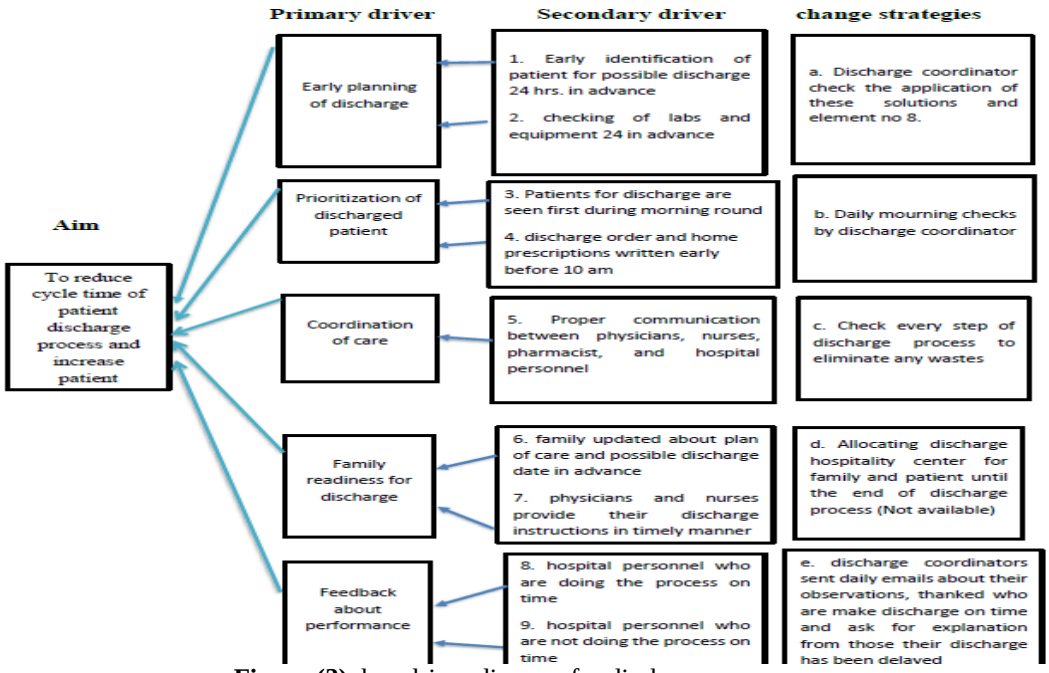


Figure (3). key driver diagram for discharge process

The ideal state of the value stream mapping for the discharging process after applying lean management helps to identify the areas of concern that need to be improved.

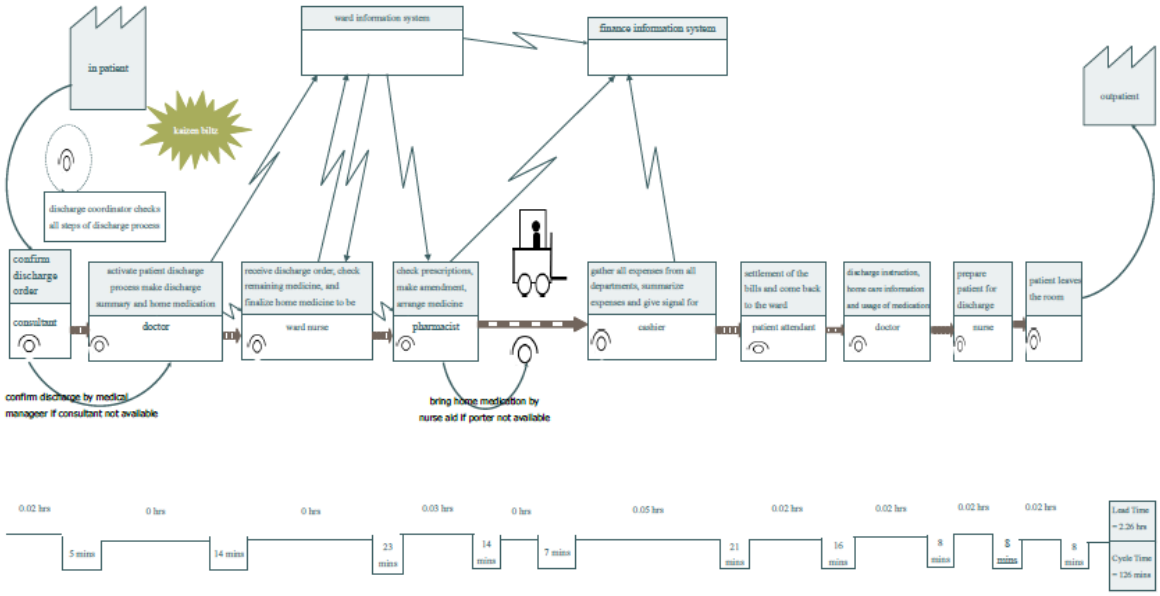


Figure (4). Ideal value stream map after applying lean management.

Statistical analysis

Data entry and quantitative data analysis were done by the IBM - SPSS (Statistical Package for the Social Sciences) software (Version 24.0). Data were presented as mean and standard deviation (SD), values and percentages. A chi-square ($\chi 2$) statistic used to measure how a model compares to actual observed data. Pearson correlation coefficient was used to determine significant correlations between the variables. The significance level was set at $P \leq 0.05$.

III. Result

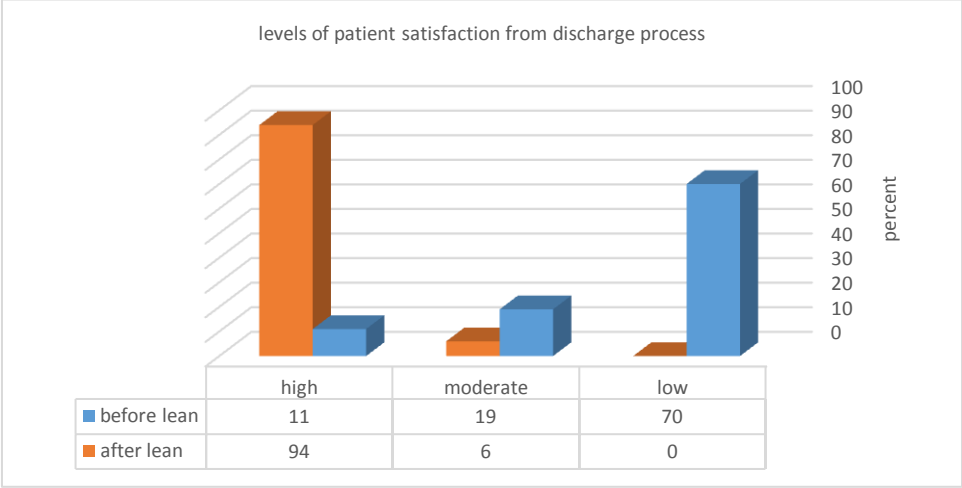
Table no (1) shows mean and SD of time of discharge process items before and after applying lean management. Item no (7) which concerned with the pharmacist, after receiving the home medicine order, check the prescription has the highest mean time before applying lean management with mean and SD (28.15±13.72) while the item concerned with consultant confirm discharge has the lowest mean time after applying lean management with mean and SD (5.51±2.55). According to total time of discharge process, mean time was (275.65±62.39) before applying lean management and (127.73±5.68) after applying lean management.

Table no (1). Mean and SD of discharge process time before and after applying lean management.

Time flow sheet items	Before lean intervention	After lean intervention	$\chi 2$	p
	Mean ± SD	Mean ± SD		
1- Consultant confirm discharge	26.26±17.82	5.51±2.55	87.168	.000**
2-Physician activates discharge in the system	12.36± 7.13	7.75±1.51	18.0	.000**
3-Making discharge summary and home medication order	16.47±6.39	7.91±1.09	71.532	.000**
4-Ward nurse receives the discharge order	13.94± 4.73	7.89±1.36	61.813	.000**
5-Checks the patient's remaining medicine	13.87±4.88	7.96±1.11	62.411	.000**
6-Finalize the amount of take-home medicine to be ordered.	12.33±5.87	7.96±1.10	19.882	.000**
7-The pharmacist, after receiving the home medicine order, check the prescription	28.15±13.72	7.89±1.03	91.162	.000**
8- Make amendment	12.23±6.06	6.72±1.19	44.522	.000**
9- Arrange the medicine order and sends it to the ward.	24.44±12.51	7.97±1.25	80.010	.000**
10- The cashier gathers all expenses' bills from all the departments	16.03±6.17	7.66±0.85	93.041	.000**
11- Summarizes the expenses.	14.12±6.22	8.65±1.09	31.842	.000**
12-Then, the cashier gives the signal for payment to ward.	11.86±6.25	6.54±1.38	47.472	.000**
13- The patient/ patient attendant then goes to the finance department for payment and settlement of bills	15.17±5.12	7.73±1.11	91.162	.000**
14- The patient comes back to the ward.	13.73±5.79	7.81±0.91	48.269	.000**
15- The ward physician explains discharge instructions and home care information and the usage of medicine	16.07±5.51	7.64±1.02	80.667	.000**
16- Nurse prepare the patient for discharge	13.80±4.20	7.60±1.10	66.667	.000**
17- Patient leave the room	14.82±5.49	6.54±1.39	89.165	.000**
Total time of discharge process	275.65±62.39	127.73±5.68	95.040	.000**

Figure no (4) describes levels of patient satisfaction from discharge process before and after applying lean management. Slightly less than three quarters (70 %) of patients were dissatisfied from discharge process while only (11 %) of them were highly satisfied from discharge process before applying lean management. The majority of patients (94 %) were highly satisfied from discharge process while (6 %) of patients were moderately satisfied from discharge process after applying lean management.

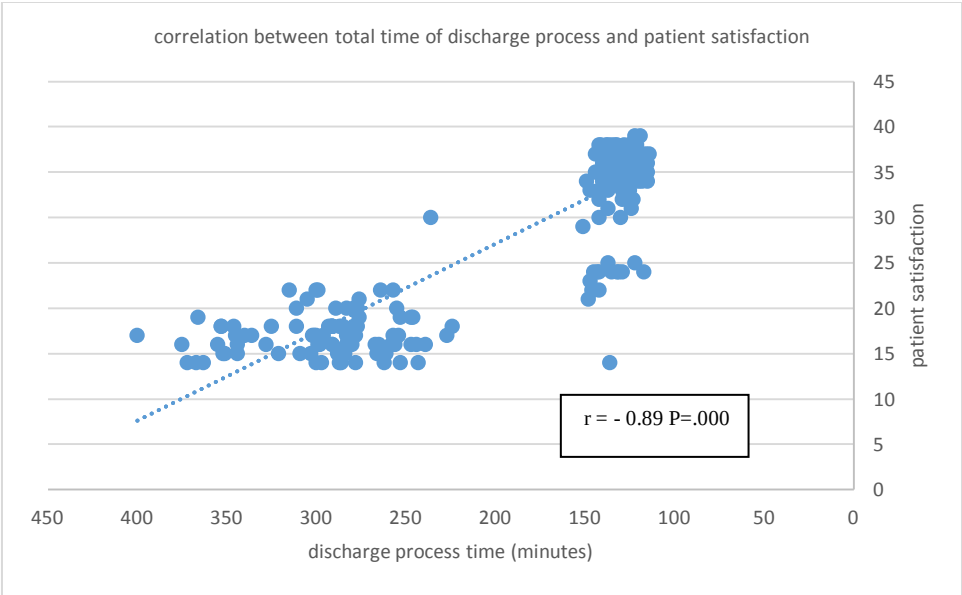
Figure no (4). Levels of patient satisfaction from discharge process before, after and follow up applying lean management.



Low (8 - < 19); Moderate (≥ 19- < 30); High (≥30 - 40)

Figure no (5). Correlation between total time of patient discharge process and patient satisfaction.

Figure (3). Refers to the correlation between total time of patient discharge process and patient satisfaction, there was a highly significant negative correlation between total time of patient discharge process and patient satisfaction with r = - 0.89 P=.000



IV. Discussion

Patient discharge is a complex process involving cooperation and coordination of all departments and staff in the hospital. Discharging patient in a timely manner is a challenging task [16]. The current study presented decreasing in mean total time of discharge process from 275,6 mins to 127,7 mins after applying lean management. This is due to change strategies that used to decrease total time of discharge process. The main strategy was used is hiring discharge coordinator to expedite orders, assist with patient teaching, and discharge paperwork and coordinate among physicians, radiology, lab, pharmacy, financial department, and floor nurses, enhance communication between systems, and check every step of discharge process to eliminate any wastes.

In the same line, Vijay [22] suggested various improvement strategies to reduce the cycle time of Patients discharge process and after its implementation; there was a 61% reduction in the cycle time of the Patients discharge process. Ametlli [24] improved discharge process by using lean six sigma methodology. she created a value stream map to indicate inefficiencies occurring from the cycle time. she found the discharge cycle time greatly improved from the baseline data from 194 minutes to 162 minutes. At the same time, variation in cycle

time also decreased. Discharge completeness improved from 64% patients not having a complete discharge to 30% patients having a complete discharge. Additionally, Arafeh et al [25] Proposed improvements, which reduced patient discharge time by 54%. El-Eid et al [23] found discharge time decreased by 22.7% from 2.2 hours during the preintervention period to 1.7 hours post-intervention.

In this regard, Udayai & Kumar [21] showed that time for discharge process was reduced from 247 to 195 minutes, with 21% decrease. Kaur & Kochar [26] revealed that maximum turnaround time of 9:07 hours was consumed between discharge intimation to handover to patient. As well, Mundodan et al [27] stated the mean time for discharge process was 5 hours 41 minutes. Ou et al [28] stated the reasons of discharge delay and suggested existence of discharge nurse facilitator to facilitate and prompt communication about discharge needs within the hospital, liaising with service providers in the community, and actively facilitating the discharge of patients.

Assessment of patient satisfaction can be a potential source of information to identify the crucial problems for designing suitable plans to serve healthcare properly [29]. The results of the current study displayed approximately less than three quarters of patients were dissatisfied from discharge process before applying lean management. While the majority of patients were highly satisfied from discharge process after applying lean management. The dissatisfaction of patients from discharge process is due to increase time taken for discharge which, in turn, makes them wait after noon and they count for a new day. As well, waiting for medication prescription. Additionally, waiting for doctor to inform about discharge instructions before discharge permission and waiting nurse to prepare patient for discharge. By removing these, wastes patients become satisfied after applying lean management.

This finding was consistent with the finding of Hamid et al [30], who indicated that patients' response about time and steps involved in discharge process and revealed that most of the patients were not satisfied about the discharge process including time taken for completion of whole process and felt that discharge process was too lengthy and needs to be fast tracked and simplified. In this respect, Jayasinha [31] revealed Patient satisfaction ratings from discharge process increased from 87% to 95% after applying lean management methodology. Sunil et al [16] mentioned that most of patients rated their discharge process experience as average – below average and opined that the discharge process in the hospital was not well organized. As well, Gabriel [32] determined that results showed interprofessional rounds did not significantly decrease the time from order entry for medical discharge to the patient's actual discharge from hospital. However, overall patient satisfaction with discharge teaching was high.

V. Conclusion

The current study explores the effect of applying lean management to reduce cycle time of patient discharge process and found a statistically significant difference and reduction in total time of patient discharge process before and after applying lean management. As well, the majority of patients were highly satisfied from discharge process after applying lean management. It was recommended that allocating discharge hospitality center for family and patient until the end of discharge process. All departments involved in the discharge process should be adequately staffed, depending on the patient load in the hospital. Staff recruited for these departments should be trained in discharge procedures.

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