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Applying Lean Principles to Improve the Processes and Practices of a Medical Clinic in a State Hospital in Sri Lanka

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Abstract
The study aimed to improve the service delivery of medical clinic in Base Hospital Dambadeniya in Sri Lanka by applying lean principles. Focus group discussions with patients and staff, key informant interviews with medical superintendent and consultant physician, survey of patient satisfaction using self-administered questionnaire, and process mapping were carried out to gather data at pre- and post-intervention stages. Long waits, congestion at clinic, and undue queuing at pharmacy had led to poor patient satisfaction and raised concerns in the staff. Application of lean management reduced waits and total requirement of staff and improved patient satisfaction in selected attributes.

Keywords: Hospital; Lean principles; Medical Clinic; Service delivery.

1. INTRODUCTION

Lean is a set of operating philosophies and methods that could create maximum value for both organizations and patients by reducing waste and waits. Changing organizational thinking and values to lead the transformation of organization behavior and culture over time is the fundamental aim of lean principles [1]. The concept, which originated in Japan at the Toyota car manufacturing facility, paved the way to understand the purpose of any production or service by deeply analysing the workflow to identify and eliminate non-value-adding activities [2].

A lean implementation involves value stream mapping that defines the journey of improvement followed by flexible work systems and 5S (sorting, straightening, systematic cleaning, standardizing, and sustaining). Standard work, total productivity maintenance, and mistake proofing (Jidoka), supply and demand through just in time, pull systems, and level scheduling (Heijunka) are other important components of lean principle [3].

Successful application of lean philosophy has reportedly improved quality, safety, efficiency, and appropriateness of health-care delivery in other countries [4,5]. Lean principles are used to increase efficiency in patient flow [6], reduce patient's waiting time [7], and improve satisfaction of staff and patients [8]. Furthermore, lean thinking has been applied in health care to eliminate delay, repeated encounters, errors, and inappropriate procedures [9].

Medical clinic is one of the major points of service delivery in a hospital, where a team of health workers including doctors, nurses, and health assistants is led by a consultant physician and assisted by a nursing sister. The clinic is supported by laboratory, pharmacy, and radiology department. Majority of clinic attendees are patients with chronic non-communicable diseases. New patients are directed to the clinic by wards, out-patient department, and medical practitioners within and outside the hospital.

Because of increasing patient loads and higher patient expectations, clinic operations at secondary level hospitals could be complicated and inefficient. This can result in congestion, creating long queues. Increased waiting time has reportedly made the patients to spend the whole day in the clinic [10]. Moreover, the chaotic working environment could increase the staff stress and incidence of medical errors in clinics where patients' safety gets compromised [4].

This study aimed to assess how service delivery process of the medical clinic could be improved by applying lean principles to achieve better external and internal customer satisfaction.

2. METHOD(S)

The study was conducted in the medical clinic of Base Hospital Dambadeniya (BHD), a secondary care hospital in Kurunegala district of Sri Lanka with a bed strength of 258. The medical clinic, which was open 2 days per week, catered a total of 30,572 registered patients in 2019 [11]. Usually, each patient visits the clinic once a month after the first visit.

This study was carried out from January 2019 to June 2019 in three phases, namely, assessment of current process of medical clinic, application of lean management principles to manage the identified issues, and evaluation of the effectiveness of the intervention.

Focus group discussions (FGDs) with patients and staff, key informant interviews (KIIs) with medical superintendent and consultant physician, and patient satisfaction survey were performed. FGDs were carried out with multiple groups, each comprising 8 participants. Separate FGDs were conducted with patients and staff of the medical clinic. Altogether one FGD with the staff and three with the patients were conducted. FGDs were recorded in audio format and the main concerns raised by the participants were documented. Interviews were conducted according to a KII guide. Patient satisfaction survey was conducted using self-administered questionnaire in which perceived level of satisfaction regarding the selected attributes of the process of medical clinic was captured by a Likert scale.

The questionnaire was pretested and validated. Purposive sampling was adopted to recruit the patients for the survey, and 332 patients were selected. Patients followed up for more than 1 year in the clinic were included while those who were illiterate and could not respond to the questionnaire were independently excluded. Non-responders were not considered for calculations.

A lean Improvement Team (LIT) was established, which comprised one medical officer, one nursing sister, two nurses, three paramedical officers, one clerical officer, and one health assistant who volunteered for the purpose. Process mapping was carried out by the LIT and gaps identified were prioritized.

The lean intervention was planned to handle the gaps based on Plan-Do-Check-Act cycle that underpins many lean principles and offers a paradigm for continuous improvement of design and operations [12]. According to lean principles, process redesign was done through eliminating, combining, rearranging, and simplifying the clinic process. The process was assessed to detect the presence of any of the seven wastes introduced in lean thinking, namely, defects, unnecessary motion, overproduction, transport of products or material, unnecessary waiting, unnecessary inventory, and inappropriate processing [13]. Necessary steps were taken to eliminate wastes while being cautious not to disrupt the core activities identified during the process-mapping phase.

The intervention was evaluated with the same research tools used at the pre-intervention stage.

Responses of FGDs and KIIs were coded and analyzed. Pre- and post-interventional patients' satisfaction in selected attributes were compared using Z test for proportions. During analysis, P value of <0.05 was considered significant.

Ethical clearance was obtained from the Ethical Review Committee, Postgraduate Institute of Medicine, University of Colombo (ERC/PGIM/2019/01). Informed written consent was obtained from participants.

3. RESULTS

The following concerns were identified during the FGDs with patients of the medical clinic.

1. Having to come to the clinic very early to secure an appointment
2. Long waiting time at the clinic
3. Inconvenience of investigation procedure (sample collection for investigations was arranged only in Wednesdays and the report had to be collected by patient from the laboratory)
4. Lack of proper information desk

The concerns raised during the FGDs with staff of the medical clinic were:

1. Excess paperwork
2. Congested and noisy working environment
3. Frequent and repeated disturbances by patients and relatives for information/inquiries

The concerns raised during KIIs were:

1. Unduly dragged clinic sessions
2. Poor working environment

The following intervention were planned and carried out considering the gap analysis.

1. Establishment of an information desk
2. Introduction of an appointment system
3. Allocation of a separate waiting area for clinic patients with adequate seating facilities
4. Making the investigation facilities available for clinic patients on all 5 weekdays
5. Delivery of lab reports directly to the clinic
6. Displaying instructions with direction boards
7. Arranging an extra drug dispensing outlet at pharmacy on medical clinic days

A nursing officer with good communication skills was appointed to the information desk (Intervention I). The patients, relatives, and public were offered the opportunity to obtain information and clarify doubts. A date and a time for the next clinic

visit was given for each patient after considering his/her preferences and available options (Intervention II) and it was carried out by the nursing officer at the information desk which also served as the registration point. During the clinic hours, only those patients allocated for a specific time slot were allowed into the clinic waiting area (Intervention III). This reduced the congestion, rush, and noise in the clinic and smoothened the clinic flow. The hospital was able to reduce three security officers out of those who were assigned for crowd handling within the clinic. The patients had a choice in planning the day they came for investigations if there were any (Intervention IV), which was noted down by at the registration itself. This allowed the laboratory to be informed in advance the number of patients from the medical clinic to be expected at a given day so that they could plan the schedule better. Once the number of planned investigations for a given date reached an agreed maximum, the medical clinic was informed to be cautious by letting the patients know that the date has been overbooked and offering them other available time slots. Burden on the lab staff was relieved with the reduction in congestion, enabling a better work environment. Patients did not have to go to the lab to collect the reports as they were delivered to the clinic in advance (Intervention V). Patients were better informed with the direction boards and displayed patient guides (Intervention VI) and they could go to the information desk (intervention I) for further queries. The main intention of all these was to eliminate unnecessary patient movements while enhancing responsiveness. As a result, the undue disturbances to the clinic staff with repeated haphazard inquiries of patients and relatives were reduced and the overall working environment was improved and more organized. Opening of additional drug-dispensing counter contributed to the reduced waits at the pharmacy.

The main intention of the interventions was to eliminate wastes while adding value to the process flow and it was found that the utilization of human resource had been improved where the total staff requirement was reduced by 26.31% parallel to the reduction of steps from 9 to 6 in the process.

As the collection of blood samples for investigations was carried out in all 5 working days of the week and the time slots were issued to the patients in a better planned manner, the number of investigations performed for medical clinic patients had increased by nearly 20% (Table 1).

Overall waiting time had reduced with 52% improvement (Figure 1).

Table 1: Number of investigations done by the laboratory pre- and post-intervention for medical clinic.

Type of investigations	Month of March	Month of May
Fasting blood sugar (FBS)	368	432
Full blood count (FBC)	55	68
Post- prandial blood sugar (PPBS)	17	21
Lipid profile	103	119
Serum electrolytes	29	41
Liver enzymes (SGPT/SGOT)	17	28
Total	589	709

Figure 1: Waiting time in the medical clinic before and after the intervention.

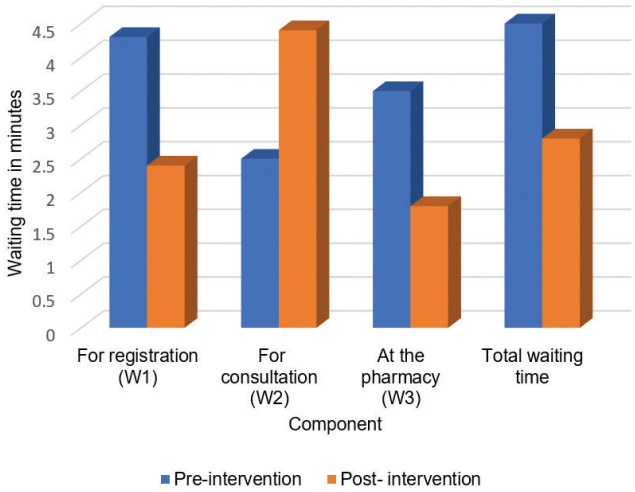

Table 2: Perceived level of patients' satisfaction regarding selected attributes of medical clinic pre- and post-intervention.

	Attribute	Percentage of satisfaction		Z value	P value
		Pre-intervention	Post-intervention		
1	Transparency of issuing numbers	22% (43/194)	96% (243/293)	16.1	0.001
2	Time taken to enter the clinic	05% (14/266)	39% (39/195)	05.0	0.001
3	Clarity of instructions given by clinic staff	78% (87/111)	88% (165/188)	02.3	0.02
4	Simplicity of the clinic flow	85% (162/190)	95% (210/221)	03.4	0.001
5	Unnecessary movements within the clinic	70% (162/230)	82% (160/195)	02.9	0.040
6	Efficiency of the clinic flow	79% (138/175)	95% (175/185)	04.5	0.001
7	Prompt attention	84% (178/212)	95% (200/211)	03.7	0.001
8	Time spent for the clinic	62% (120/193)	73% (147/202)	02.3	0.001
9	Leniency in fixing next appointment	60% (132/220)	70% (156/222)	02.2	0.030
10	Overall satisfaction regarding the clinic	53% (103/194)	93% (192/207)	09.1	0.001

The perceived level of satisfaction of patients regarding all attributes of medical clinic considered showed significant improvement and the overall satisfaction was improved by 40% (Table 2).

4. DISCUSSION

Medical clinic in secondary care hospitals is a core component in health-care service delivery. The satisfaction of internal and external customers reflects the efficiency of any clinic.

Major gaps, including congestion and queuing, increased waiting time, and poor record management in medical clinic of BHD, have negatively affected the experience of both service providers and the customers.

The project used process mapping that gave more detailed view of a selected process to assess patient-care pathway in health care settings [14] than value stream mapping that was used more commonly in lean methodology [15].

Health care is known to have its own specific types of waste regarding information, process, and physical environment [16]. The main wastes identified in this study mostly belonged to process and information categories, namely, unnecessary waiting for appointment, unnecessary movement of the patients to collect investigation reports, and over-processing while sorting clinic records.

Appointment scheduling to mitigate the detrimental effects of patient waiting and clinic overtime has proven to be successful in other countries [17,18]. Pre-appointment schedule here prevented the congestion and smoothened the flow at the clinic where the waiting time from door to registration (W1) was reduced by 43.01%. Yet the wait for the consultation (W2) from registration was not significantly improved. This could be due to the fact that wait for consultation depends on the length of previous consultation, which in turn depends on patient and physician characteristics [19]. Since health care is basically capacity driven, there could be limited space to make full use of freed-up resources [8]. But the process simplification has helped to reduce the human resource utilized in the clinic.

The increase in number of investigations carried out by the laboratory for medical clinic could be due to the fact that the patients who used to go to outside private laboratories might have started to get the tests done at the hospital after the procedure became more user-friendly with the interventions. The fact is also a proxy indicator of the success of the project.

Application of lean management has reportedly improved the patient flow in international settings [20]. Process simplification in this study, based on elimination of waste, combining, rearranging, and simplifying (ECRS) of elements, was able to make the clinic flow more organized and less congested and the number of steps in the process was reduced by 33%.

5. CONCLUSION AND RECOMMENDATIONS

Prolonged waiting, queuing, and congestion were observed in the medical clinic BHD. Process map analysis revealed wastes, including long waits, unnecessary movements of the patient, and over-processing. Process redesign was carried out by applying lean principles through eliminating, combining, rearranging, and simplifying the clinic process. As a result, total waiting time reduced significantly and the patients' satisfaction on clinic process and flow in selected attributes improved.

A key to success in quality improvement efforts in the health care is the coordination of patient-care efforts through better information management. Extending HHIMS to cover the medical clinic would enable elimination of delays in retrieval of clinic records.

Author Contributions

Concept, developing methodology, and data collection were carried out by APM. Data analysis and documentation were done by SMNSMM.

Conflict of Interest

There is no conflict of interest.

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