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A Project To Improve Service Delivery Of Medical Clinic In A State Hospital In Sri Lanka By Application Of Lean Principles

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ABSTRACT

Lean is a set of operating philosophies and methods that could create maximum value for patients by reducing waste and waits when applied for health care. The study aimed to improve the service delivery of medical clinic in Base Hospital Dambadeniya (BHD) in Sri Lanka through the application of lean principles to the clinic process. Focus Group Discussions (FGDs) with patients and staff, Key Informant Interviews (KIIs) with the medical superintendent and Consultant Physician, survey of patient satisfaction with the use of self-administered questionnaire, and process mapping were carried out to gather data at pre and post-intervention stages. Long waits, congestion at the clinic, undue queuing at pharmacy, and unnecessary movements had led to poor patient satisfaction and raised concerns in the staff regarding unsatisfactory work environment.

Application of lean management based on the elimination of waste, combining, rearranging and simplifying of elements of the process, reduced waits by 52%. The total

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requirement of staff reduced by 26% and patient satisfaction improved in selected attributes by 40%.

Keywords: Lean Principles, Medical Clinic, Process Mapping, Service Delivery, Waiting Time

INTRODUCTION

Lean is a set of operating philosophies and methods that could create maximum value for patients by reducing waste and waits. Changing organizational thinking and values to lead the transformation of organizational behaviour and culture over time is the fundamental aim of lean principles (Lawal et al. 2014). 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 (Holweg 2007).

A lean implementation involves value stream mapping (VSM) 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 (TPM), and mistake-proofing (Jidoka), supply and demand through just in time (JIT) pull systems and level scheduling (Heijunka) are other important components of lean principle (Teich and Faddoul 2013).

Successful application of lean philosophy has reportedly improved quality, safety, efficiency, and appropriateness of health care delivery in other countries (Houchens and Kim 2014) (Fine et al. 2009). Lean principles are used to increase efficiency in patient flow (Radnor and Walley 2008), reduce patient's waiting time (Mazzocato et al. 2012) and improve satisfaction of staff and patients (Radnor et al. 2012).

Further, lean thinking has been applied in health care to eliminate delay, repeated encounters, errors and inappropriate procedures (Young 2004).

The 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 the 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-Patients Department (OPD) and medical practitioners within and outside the hospital.

Due to 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 spend the whole day in the clinic (Mathugama 2011). Moreover, the chaotic working environment could increase the staff stress and incidence of medical errors in clinics where patients' safety gets compromised (Houchens and Kim 2014).

The current study aimed to assess how the service delivery process of the medical clinic could be improved through the application of lean principals to achieve better external and internal customer satisfaction.

METHODOLOGY

The study was conducted in the medical clinic of BHD, a secondary care hospital with 258 beds situated in Kurunegala district of Sri Lanka.

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

The process of the medical clinic was mapped both pre and post-intervention stages and average waiting time at each component of the process was estimated.

FGDs with patients and staff, KIIs with Medical Superintendent and consultant physician and Patient satisfaction survey were performed. FGDs were carried out with multiple groups consisted of 8 participants in each. Separate FGDs were conducted with patients and staff of the medical clinic. Altogether one FGD with the staff and three with 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 which was prepared by the investigators and pretested. Patient satisfaction survey was conducted with the use of a 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 designed by the investigators themselves and it 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 one year in the clinic were included while those who were illiterate and could not respond to the questionnaire independently were excluded. Non-responders were not considered for calculations.

A lean Improvement Team (LIT) was established with 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 (PDCA) cycle which underpins many lean principles and offers a paradigm for continuous improvement of design and operations (International Group for Lean Construction 2014). According to lean principles, process redesign was done through eliminating, combining, re-

arranging 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 (Green et al. 2015). 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 analysed. 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. Pre and post-intervention "waiting times" were compared using Mann-Whitney U test.

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

RESULTS

The medical clinic served patients two days per week. In 2019, the number of registered patients of medical clinic was 30572 (Medical Statistics Unit, Base Hospital,Dambadeniya 2019). Usually, each patient was seen at the clinic once a month since the first visit.

According to the pre-intervention process map, three types of waiting were noticed namely, waiting for the registration (W1), waiting for the consultation (W2), waiting at the pharmacy (W3) and the total average waiting time was 211 minutes (Table 3).

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

I. Having to come to the clinic very early to secure an appointment

II. Long waiting time at the clinic and pharmacy

III. 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)

IV. Lack of proper information desk

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

I. Excess paperwork

II. Congested and noisy working environment at the clinic and pharmacy

III. Frequent and repeated disturbances by patients and relatives for information/inquiries

Concerns raised during KII s were,

I. Unduly dragged clinic sessions

II. Poor working environment.

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

I. Establishment of an information desk

II. Introduction of an appointment system

III. Allocation of a separate waiting area for clinic patients with adequate seating facilities

IV. Making the investigation facilities available for clinic patients on all five weekdays

V. Delivery of lab reports directly to the clinic

VI. Displaying instructions with direction boards

VII. Arranging an extra drug dispensing outlet at pharmacy on medical clinic days as a measure of reducing waiting time and congestion

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 were 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, 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 clients from the medical clinic to be expected on 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 for lab staff was relieved with the reduction in congestion enabling a better work environment. The patient 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 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. The opening of additional drug dispensing counter contributed to reducing 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% (Table 1) parallel to the reduction of steps from 9 to 6 in the process.

Table 1: Human resource utilization pre and post-intervention.

Resource	Pre-intervention	Post intervention
Security personal	05	02
Minor staff	09	07
Pharmacist	02	03
Nurses	03	02
Total	19	14

As the collection of blood samples for investigations were carried out in all five 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 nearly by 20% (Table 2).

Table 2: 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

Overall waiting time had reduced significantly which showed 52% improvement (Table 3).

Table 3: Waiting time in the medical clinic before and after the intervention

	Pre-intervention	**Post-intervention**	**P value**
Waiting for the registration (W1)	116 min	50 min	0.001
Waiting for the consultation (W2)	59min	42 min	0.263
Waiting at the pharmacy (W3)	36 min	09 min	0.001
Total waiting time	211 min	101 min	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 4).

Table 4: 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 numbers in parenthesis indicate the number of patients satisfied, out of total responded to the relevant question

DISCUSSIONS AND CONCLUSIONS

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, has 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 healthcare settings (Trebble et al. 2010) than value stream mapping which is used more commonly in lean method (Henrique et al. 2016).

Healthcare is known to have its specific types of waste regarding information, process, and physical environment (Campbell 2009). The main wastes identified in the current study were 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 (LaGanga and Lawrence 2012) (Jamjoom et al. 2014). A project has shown a 94% reduction in patients' average waiting time by application of lean Six Sigma methodology in the registration process of a hospital (Bhat et al. 2014). Introduction of the topre-appointment schedule in the current study, prevented the congestion and smoothened the flow at the clinic where the waiting time from door to registration (W1) was reduced by 43.01% (116 minutes to 50 minutes). 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 time taken for the doctor to finish the previous patient's appointment (length of the previous consultation) which is associated with different patient and physician characteristics (Kabeya et al. 2017). There are arguments that since healthcare is predominantly designed to be capacity-led and there is limited space to make full use of freed-up resources (Radnor et al. 2012). But here the process simplification helped to reduce the human resource utilized in the clinic and the hospital administration had the opportunity to deploy them in other needy sections. Similarly, 48% reduction scheduled utilization of staff through lean management has been reported in a study conducted in a Medical College hospital in India (Bhat et al. 2014). In the current study, the only occasion where there was an addition to the human resource requirement was where deploying an additional pharmacist to the extra drug dispensing counter. Still, that was proven to be an

investment when the gain in patient satisfaction and reduced waiting time (W3) were considered.

The increase in the 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.

The application of lean management has reportedly improved the patient flow in international settings (Chan 2014). Process simplification in the current study, based on the elimination of waste, Combining, Rearranging and Simplifying (ECRS) of elements was able to make the clinic flow more organized and less congested.

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. It has been discussed globally, the potential to improve health care delivery with lean principles is realistic only upon some methodological and practical considerations (Joosten et al. 2009) . Lean healthcare implementations are claimed to have a limited impact on improving patient satisfaction unless care providers pay considerable attention to integrating the patient's perspective (Poksinska et al. 2017). Process redesign was carried out in the current study 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 the clinic process and flow in selected attributes improved.

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

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