2nd Edition 2023 SAKCON CAHO

IMPROVEMENT OF PATIENT CARE SERVICES BY USING LEAN SIX SIGMA TECHNIQUE IN EMERGENCY DEPARTMENT

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CAHO Committed to Safer Healthcare

INTRODUCTION / BACK GROUND OF THE STUDY

Health care accessibility to everyone is the motto of the governments, pan world, to improve the wellbeing of its populace. Value of health care has been correctly identified in recent times and efforts are being attempted to improve and implement the efficacy of the health care system and machinery.

Research attempts by experts and academia to improve the functional efficiency of hospitals are constant. One such attempt is the present study wherein understanding and suggestions regarding improvement of patient flow by using lean six sigma technique in the emergency department is taken up for research.

Emergency department is the area that can expect the unexpected. The patients need to be guided to the proper and less time-consuming route. No delay in patient care or safety can be afforded. In addition, the emergency department leaves a mini picture or first impression regarding the services provided, the extent of care towards patient and patient's relatives.

By using the waste identifying technique under Lean method, i.e., Muda, Mura and Muri and the DMAIC method of six sigma, this will not only help in patient satisfaction but also will improve employee and employer satisfaction. Cost effectiveness for the patient and the organization would also get improved and maintained.

Research had identified several non-value-added activities during the patient care process in emergency department; which includes:

- Emergency department patient idle/waiting time
- Increased diagnostic test time
- Unevenness in Workflow
- Defects/Errors
- Unnecessary transportation of patient
- Inventory Management

AIM AND OBJECTIVES

To understand the patient flow, process and activities occurring in the emergency department of a hospital.

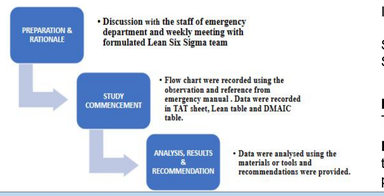
To determine the average turn-around time of red, yellow and green zone cases.

To identify and categorize emergency department waste into Muda, Mura and Muri as per lean technique.

To analyze the emergency department activities as per DMAIC of six sigma technique.

To develop improvement strategies for the emergency department (ED) as per the findings of lean six sigma techniques.

METHODOLOGY



It is an observational study conducted over a period of two months .

Sampling technique - Conditional sampling
Sample size - 167 cases

Inclusion criteria : The patients who are registered under the emergency department. Technically those cases termed as "ER refresh" and "OTC" are considered for the study.

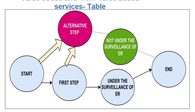
Exclusion criteria : Those patients who did not satisfy the inclusion criteria are not taken under the study data. The data did not consider patients visiting the emergency department for minor procedures as OPD registered patients/Health check patients.

MATERIALS

Lean Technique - Table

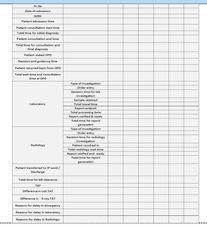
DMAIC TABLE

Value added and non- value added services- Table



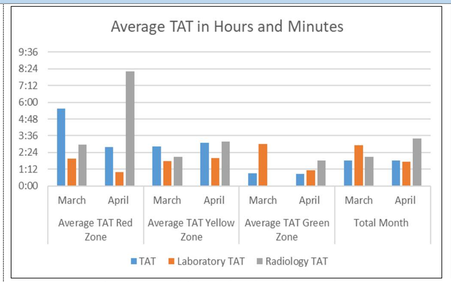
PERT- Patient Evaluation and Review Technique

The charts and tables served the purpose of documenting the pathway, proposing alternative paths, identifying areas of waste within the Emergency Room (ER) process, and recommending strategies for improvement and control.



Turnaround Time Sheet - This sheet was utilized to record the Turnaround Time (TAT) for each case meeting the inclusion criteria.

RESULT AND DISCUSSION



The average turn-around time of red, yellow and green zone cases.

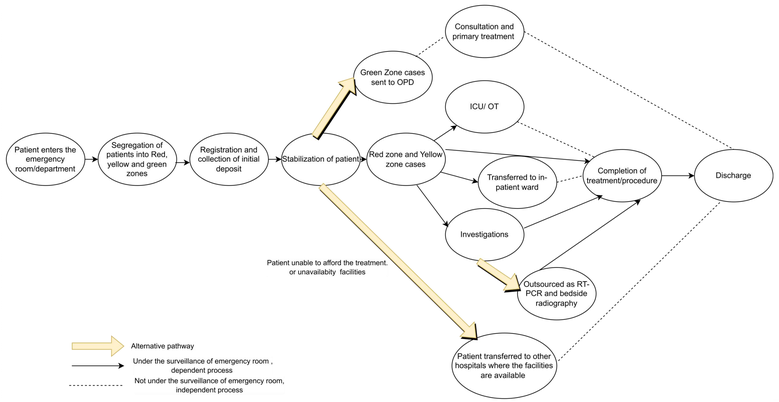
Type of waste	Observation	Suggestions
Muda	Error in registration of patient details.	A software for patient relative can directly feed data along with customer care agent assistance
	Unavailability of customer care agent in the counter for billing and registration	Can appoint extra trained workers during the case of increased patient load.
	Unavailability of ED beds	As the patients are observed to increase in ED temporary extra beds need to be allocated.
	Materials unavailable	The materials in ED use needs to be checked by staff at the end of each night or during free hours, and replenished in case of reaching the buffer limit.
Mura	Lack of communication regarding registration and collection of cash.	Can have a communication messenger to raise orders regarding registration of patients along with red, yellow, green zone details.
	Travel time for depositing collected laboratory sample	The presence of electric chut and placement of laboratory near to ED will be helpful to decrease travel time. An extra employee may be assigned for the transportation sample.
	Patients and patient relative's duplication of walk	Proper guidance delivery should be practiced. Clear signages displaying connectivity to various areas of hospital can be placed in visible areas in ED. Before transferring the patient to ward all details of documents to be checked and sent.
	Low dexterity	Training and retraining of staff
Muri	System error	Presence of only one billing and registration system brings in hindrance to work efficiency. Two systems to be kept, as one can work as a backup to another system.
	QR code error and card machine error	The reprinting QR code needs to be done. The maintenance check of card machine should be carried out regularly
	Staff's overload of work	There should be clear and understandable assignment of tasks between various staff in order to eliminate the duplication of work and completion of work within stipulated time.

Identification and categorization of emergency department waste into Muda, Mura and Muri as per lean technique.

Name of the activity	Define	Measure		Analyze	Improve (Suggested)	Control (Suggested)
		March 22	April 22			
Total time for initial diagnosis	Delay in registration	00:09	00:08	Lack of communication from the nursing station to the customer care agent	A software set-up or communication messenger to raise orders regarding registration.	Periodical meeting with human resources involved; maintenance check and updating of software on timely basis
	Error in feeding patient details			Customer care agent depends on verbal information rather than ID proof details	A software where patient relative can directly feed data along with customer care agent assistance	
Total time for consultation and final diagnosis	Delay in raising order entry for the test	1:18	1:21	The employees are not having proper delegation of work.	The strategic management of work to be done by each employee can be defined on weekly basis	Weekly team meeting regarding work delegation and resolving the issues.
	Delay in communication to collect amount to initiate investigation process			A separate messenger software can be installed for immediate notification of amount collection	Maintenance check and updating of software on timely basis	
Total wait time and consultation time at OPD	Patients do not return back to ED for further procedure	00:59	-	Lack of guidance from OPD staff and ED staff.	A pending note can be added in Hospital information system to send the patient back to ED	The patient needs to be verbally concerned of the pending completion of procedure and clearance of bills to be initiated until

Name of the activity	Define	Measure		Analyze	Improve (Suggested)	Control (Suggested)
		March 22	April 22			
	Total travel time	Delay in receiving of sample	00:30	00:28	Sample transported manually from ED to laboratory	Electric chut can be installed	Maintenance and check of the system
	Total processing time	Occurrence of false delay	00:48	00:36	Delay in entry of sample results	Time management	Weekly team discussion on repetition of same kind of delay
	Total time for report generation	Delay in print out of detailed report	1:33	00:41	The in-charge needs to verify the report.	ED report to be treated as first in queue for verification	Always prioritize ED report verification
	Decision time for radiology investigation	Multiple investigation and change in order entry	1:04	1:18	Lack of communication between doctor and nursing staff	Doctor verification window can be installed for confirmation	Para medical staff should be treated as per time the doctor verification and information from the doctors
	Total radiology wait time	Unavailability of slot	00:37	1:16	Lack of communication to confirm availability of slot	To have one slot always free for ED cases	Obtain clarification of slot information before raising order entry
	Total time for report generation	Wait time to collect the detailed report	1:24	2:08	The ED patient needs to wait to collect detailed report even after completion of ED procedures	To promote sending soft copy to the registered e-mail address of the ED patients	To ask the patient to drop confirmation message on receiving e-mail
Total time for bill clearance	The issue is not communicated through proper channels to take action.	Non-functionality of QR code and card machine	00:26	00:26	Daily check of machine functionality to be done	Daily check of machine functionality to be done	Maintenance check

The emergency department activities as per DMAIC of six sigma technique.



PERT- (PATIENTFLOW EVALUATION AND REVIEW TECHNIQUE) for denoting alternative pathway

Lean techniques for the improvement of patients' flow in emergency department

Hy Chan [1], Sin Lo [1], Lily Lee [1], Wyi Lo [1], Wc Yu [1], Vf Wu [1], St Ho [1], Rsd Yeung [1], Jts Chan [1]

Affiliations + expand

PMID: 25215143 PMCID: PMC4123868 DOI: 10.5847/wjem.j.issn.1920-8642.2014.01.004

The most time-consuming processes in ED were to wait for an admission bed and blood testing results

Lean thinking to improve emergency department throughput at AORN Cardarelli hospital

Giovanni Improta [1], Maria Romano [2, 3], Maria Vincenza Di Cicco [4], Anna Ferrari [4], Anna Borrelli [3], Ciro Verdoliva [3], Maria Triassi [4], Marico Cesarelli [2, 3]

Affiliations + expand

PMID: 30509286 PMCID: PMC6376250 DOI: 10.1186/s12913-018-3654-0

Post-action implementation, ED performance improved - patient percentages per triage codes and waiting times. Lean approach demonstrated efficacy in boosting service efficiency and cutting waste.

Applying the Lean principles of the Toyota Production System to reduce wait times in the emergency department

David Ng [1], Gord Vail, Sophia Thomas, Nicki Schmidt

Affiliations + expand

PMID: 20078919 DOI: 10.1017/s1481803500012021

The mean registration to physician time has decreased from 111 minutes to 78 minutes. The number of patients who left without being seen has decreased from 7.1% to 4.3%. The length of stay (LOS) for discharged patients has decreased from a mean of 3.6 to 2.8 hours

Lean Management and Six-Sigma yield big gains in hospital's immediate response laboratory. Quality improvement techniques save more than $400,000

Martha Sunyog [1]

Affiliations + expand

PMID: 15493100

By establishing a more efficient workflow process within the laboratory, a single technologist could quickly move between stations and perform those tests that made up 80% of the work volume.

Journal for Healthcare Quality

Lean Six Sigma in Healthcare

Henk de Koning MSc, John P. S. Verver, Jaap van den Heuvel MSc, Soren Bisgaard PhD, Ronald J. M. M. Does

First published: 16 June 2011 | https://doi.org/10.1111/j.1945-1474.2006.tb00596.x | Citations: 24

ISO 9000 + Six Sigma enhance quality by cutting variation, defects, and costs. Lean adds tools for throughput via waste reduction. In healthcare, speed means quick access, less waiting; fewer defects mean fewer complications. Both speed and defect cuts lower costs. Thus, Lean Six Sigma suits modern healthcare challenges well.

Case Study

Applying Lean Six Sigma methods to reduce length of stay in a hospital's emergency department

Sandra L Furterer

Pages 389-404 | Accepted author version posted online: 27 Apr 2018, Published online: 04 Dec 2018

It was found that in just 3 months of implementation, patients' length of stay got reduced by 30% and patient satisfaction increased by 24%. Due to this the hospital achieving the credit of its ED achieved the top 1% level of hospitals nationally.

Discussion

CONCLUSION

•The study on "IMPROVEMENT OF PATIENT CARE SERVICES BY USING LEAN SIX SIGMA TECHNIQUE IN EMERGENCY DEPARTMENT OF A MULTISPECIALTY HOSPITAL" was conducted for a period of two month with sample size of 167 cases.

•The detailed recording of patient flow was done with help of Flow Chart and PERT (Patientflow Evaluation and Review Technique)

•The patient flow observation and Flow chart helped in formulation and to record TAT (Turnaround Time sheet) which gave the results of average time ranging from **51 minutes for green zone case to 5 hours 33 minutes for red zone case.**

•The strategies advised for effective and efficient functioning of ED and higher patient satisfaction includes; **Improvement of technology, improvement of staff dexterity, better communication system, regular maintenance check of machinery, well developed and refined layout.**

•It is observed that implementation of lean six sigma technique is beneficial for the functioning of the hospital and more specifically the emergency department of the hospital. The emergency department is very critical in terms of delivering high level patient care and thereby working as the face of the hospital as a whole.

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