

Authors

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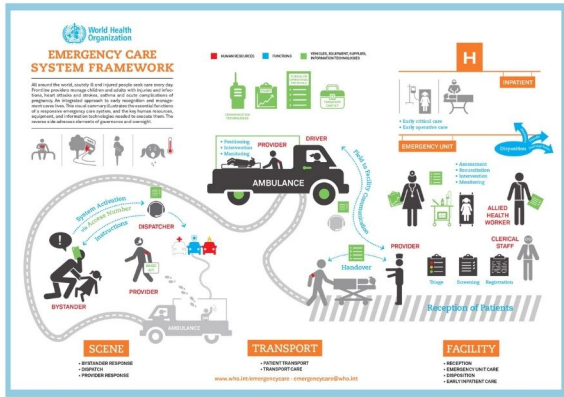
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Background:

Length of stay (LOS) in an Emergency Department (ED) is a critical metric that impacts patient outcomes, resource utilization, overall efficiency and patient satisfaction. To reduce LOS requires a systematic approach.

Aim

This project outlines using Lean Six Sigma (LSS) methodologies aimed to identify and eliminate waste while improving process efficiency ultimately reducing LOS, which is dependent on interplay of several factors (image below) both within and beyond the control of ED.



Project Duration: One month - March 2024

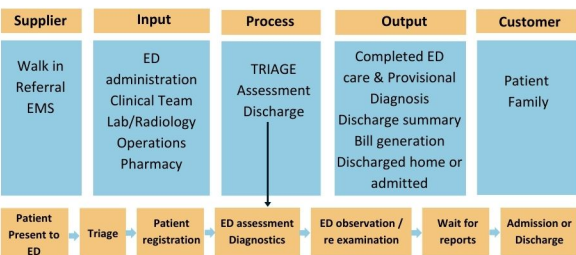
DMAIC Approach

Define:

Over a period of 4 months there were 6000 ED visits. Out of which 5690 were within 4hours target (LOS). Implying 95% of the patients were either admitted or discharged from the ED within the target time, with an overall mean of 1.7 hours.

Doesn't seem like a problem that needs solving?

SIPOC



SIPOC is utilized to understand the process in a high level

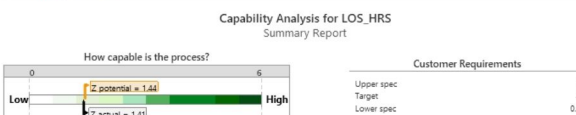
Measure:

Lean Six Sigma (LSS) tool were used to determine the baseline performance of the system. In addition, reliable data was collected through observations, and some was pulled out of the database of the hospital and analysed in a Statistical Analysis software - Minitab.

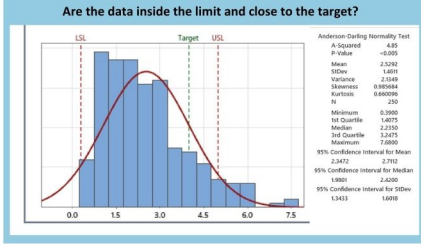
Sampling Technique: Systematic Random Sampling

$$\text{Formula used for calculating the sample size } n = \left(\frac{Z \times \sigma}{E} \right)^2$$

- n = sample size
- Z = Z-score (corresponding to desired level of confidence)
- σ = population standard deviation
- E = margin of error



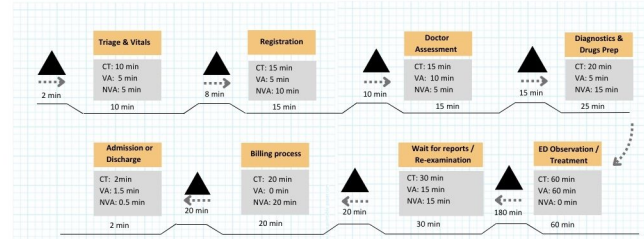
Actual (Overall Capability)



- The process mean differs significantly from the target (p<0.05).
 - The defect rate is 7.97%, which estimates the percentage of parts from the process that are outside the spec limits.
- Actual (overall) capability is what the customer experiences.
Potential (within) capability is what could be achieved, if process shifts and drifts were eliminated.

Inference: Current process is at 3 sigma level, wherein the highest process efficiency that can be achieved is 6 sigma level.

Value Stream Map:



Value stream map was constructed over a period of 20 days across different shifts by three members assigned.

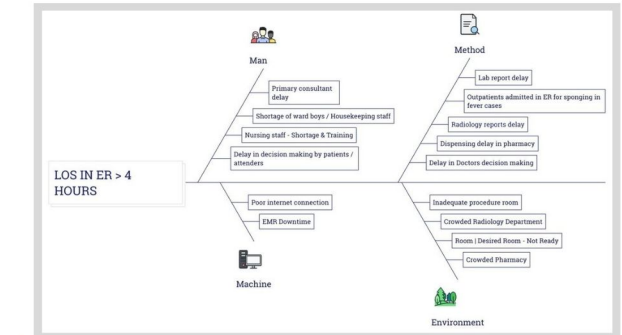
Total Avg. Value added time (VA) : 101.5 mins

Total Avg. Non-Value added time (NVA) : 71 mins

Total Avg. of Queue: 250 mins

Analysis:

Voice of Customer (VOC) = 4hours from NHS guidelines. Survey of 50 patients done to identify new VOC = 3hours. [Think Global, Act Local]



Improve:

Solutions to reduce the variability in the service and waiting time

Intervention	Impact
Dedicated ER Coordinator 24x7	Registration Time Billing Time Room preparedness Patient / attendee time taken for decision making by explaining administrative norms, treatment costs
EMR Process Optimization	Documentation Time Nursing Assessment / Reassessment Documentation Time Doctor Assessment / Reassessment Ordering Diagnostic Tests time Realtime Patient Admission Intimation
UPI & Card Payment Facility within ER	Payment time Beside side payment facility
Revised TAT for Investigations	Wait time for reports Doctor decision making time
Hired Additional ER Consultant	Doctor decision making time Expert counselling can bring down patient / attendee time taken for decision making

Control & Conclusion :

ED Quality Committee (EQC) has been constituted to monitor and sustain project. EQC will convene in the first week of every month.

Our journey through this Lean Six Sigma project, working with multidisciplinary teams and tailoring process improvements unique to our organization, resulted in reduced LOS (preliminary results), helped recognize and address elements critical to quality (CTQ).

1. Increased Adverse Events Agustin Clapponi et al, *Cochrane Database Syst Rev*, 2021 Nov 25:11(11)
2. Increase Mortality Torgny Wessman et al, *Intern Emerg Med*, 2022 Jan;17(1):233-240

3. Increase ED Boarding Jonas Andersson et al, *Int Emerg Nurs*, 2020 Nov;53:1009-30.
4. Decreased Patient Satisfaction Brendan Parker et al, *West J Emerg Med*, 2014 May;15(2)