Implementation of LEAN in STEMI Management and Primary Percutaneous Coronary Intervention (Primary PCI) process flow in KPJ Selangor Accident and Emergency Department

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ABSTRACT

An STEMI is the most serious type of heart attack where there is a long interruption to the blood supply. This is caused by a total blockage of the coronary artery, which can cause extensive damage to a large area of the heart. This is why it is important for a patient who are diagnosed with STEMI have to undergone cardiac catheterization (primary PCI) as soon as possible. Improvement action taken by implementation of LEAN process into the work flow shows significant improvement in Door-to-Balloon time. Removing waste from the work process shows positive result in total time taken by the whole processes. Issues identified and improvement action implemented. PDCA cycle applies through the whole processes.

INTRODUCTION

In KPJ Selangor, door-to-balloon time is one of hospital KPI to ensure patient safety. In year 2020, we have identified that 90% of cases (18 out of 20 cases) did not achieved the standard given. The management of KPJ Selangor decided to overcome the issue as compliance to the standard will have a major impact to the patient outcome. Encouraging healthcare provider to provide earlier patient management not only improves patient outcome, but also will improve patient experience.

METHODS AND MATERIALS

A total of 25 patient with AMI symptoms present in A&E and requires Primary PCI were monitored from Jan 2020 till March 2021.A GEMBA walk was conducted and patient journey through the process flow and time taken at every point of engagement (POE) were recorded in Data Checklist for Primary PCI/STEMI form. Issues identified and **ISHIKAWA** diagram used to identify the root cause of the problem (Diagram 1).

From the data, **waste** are identified from the main issues:-

1. Medical Officer delay in attending to emergency patient due to lack of knowledge (Waste of Skill)
2. Delay in getting GL approval from the insurance / company (Waste of waiting)
3. Consultant Cardiologist delay in attending to the patient in A&E (Waste of waiting)
4. CV Lab team delay in responding to call (Waste of waiting)
5. Delay in sending patient to CV Lab due to waiting the lift (Waste of waiting).
6. Inefficient work process (Over processing)

With the above data, LEAN principle was implemented into the work process. **Value Stream Mapping (VSM)** tabulated and a comprehensive analysis was done to identify all activities, bottlenecks and area of waste that contribute to delays to door-to-balloon time (Flow 1). Value added and Non-Value added activities are identified and process flow were reviewed (Flow 2). A clear protocols and guidelines in managing AMI patient then developed to ensure **standardized workflow**. Implementation of mechanism for **rapid decision-making** such as pre-emptive activation of the CV Lab team based on electrocardiogram (ECGs) result. Foster **cross-functional collaboration** between ED staffs, medical practitioner, cardiologist consultant, registration and finance staffs, and CV Lab staffs. Effective communication and shared responsibilities are encouraged to the patients and relatives as it gives a big impact to waiting time for the whole process flow.

REFERENCES

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RESULTS

In year 2020, we have identified that only 10% of cases (2 cases out of 20 cases) achieved the standard of 90 minutes Door-to-Balloon Time. As at Dec 2021, there are total of 25 cases of Primary PCI. Out of 25 cases, only 4 (16%) cases did not achieved the standard of 90 minutes Door-to-Balloon time. After the LEAN implementation in April 2021, 21 (84%) cases had achieved the target of 90 minutes. With continuous monitoring and enforcement on the compliance of STEMI protocol to staffs and consultant, the achievement of door-to-balloon 90 minutes time continues in 2022 with 87.5% achievement where 14 cases out of 16 cases achieved 90 minutes door-to-balloon time.

The achievement of door-to-balloon time from year 2020 to 2022, are remarkably seen from 10% (2020), to 84% (2021), further increased to 87.5% (2022) and as at May 2023 with 100% achievement (Graph 1).

After enhancement of the AMI management process flow using LEAN methodology, there is significant reduction of 97 minutes, from 180 minutes before implementation (Flow 3), to 83 minutes after implementation (Flow 4).

The positive impact of this project, not only can be seen in the acheivement of getting the 90 minutes of door-to-balloon time, but also can be seen in the patient satisfaction survey. By engaging the patient and relatives in the treatment plan, patient and their relatives gives a positive response by giving their full cooperation in their treatment plan. The project is a journey towards patient-centered, value-driven healthcare that benefit all stakeholders involved.



GRAPHS AND TABLES

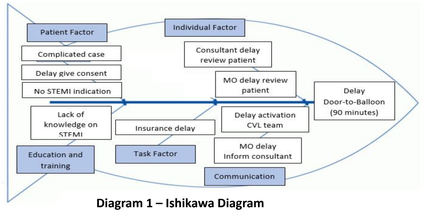
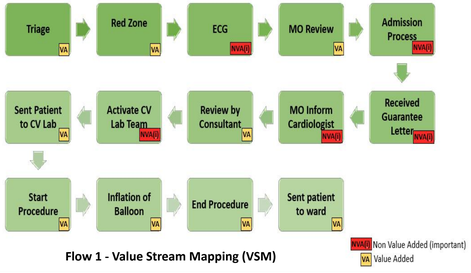
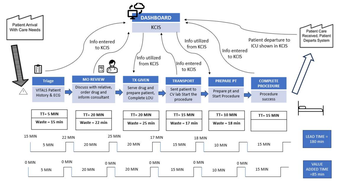


Diagram 1 – Ishikawa Diagram

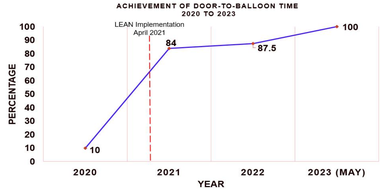


Flow 1 - Value Stream Mapping (VSM)

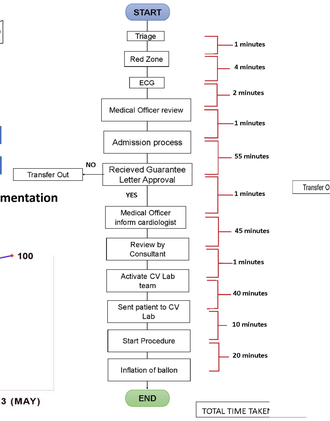
NVA(I) Non Value Added (important)
VA Value Added



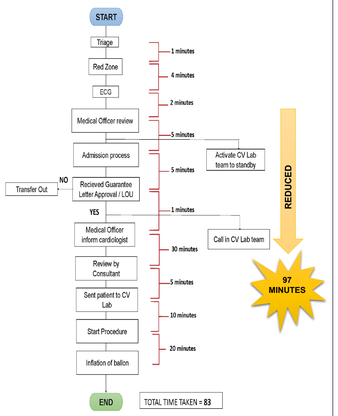
Flow 2 – Tact Time and Cycle Time Pre and Post LEAN Implementation



Graph 1 – Door-to-Balloon Time Achievement from 2020 to 2023



Flow 3 – Before LEAN Implementation



Flow 4 – Before LEAN Implementation

CONCLUSIONS

Improving door-to-balloon time is crucial for AMI patients, and LEAN methodology offers a valuable approach to achieving this goal. Through the application of LEAN principles, KPJ Selangor are able to enhance their ability to provide timely intervention, improve patient outcomes, and ultimately save lives.

After implementation of LEAN into the process flow of management of patient with AMI in April 2021, we notice that there is a remarkably improvement of door-to-balloon time from 10% achievement in year 2020 to 84% in 2021, further improves to 87.5% in 2022 and as at May 2023 with 100% achievement.

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