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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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INTRODUCTION

An STEMI is the most serious type of heart attack where there is a long interruption to the blood supply. The door to balloon time (DBT) is the time interval from the patient's arrival at the hospital's emergency department to the inflation of the balloon in the affected artery during primary PCI. The DBT is a crucial indicator of the quality of care for STEMI patients, and it is associated with improved patient outcomes. Implementation of LEAN process shows significant improvement in DBT. Re-engineering of the work process shows positive result in total time taken by the whole DBT processes. LEAN principles can make a significant impact in reducing door-to-balloon time and thereby improves outcomes for AMI patients. By applying LEAN, the organization can identify and eliminate inefficiencies in the system, leading to faster and more effective care for AMI patients.

AIM

The objective of the project is;

- To achieve average time taken for primary PCI (door to balloon) time within 90 minutes.
- To improve management of STEMI process flow by implementing LEAN.

METHOD

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.

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

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

With the above data, LEAN principle was implemented into the work process. **Value Stream Mapping (VSM)** was done and a comprehensive analysis was done to identify all activities, bottlenecks and area of waste that contribute to delays to door-to-balloon time. 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 reduce hand offs and minimized delays between different stages of care.

RESULTS

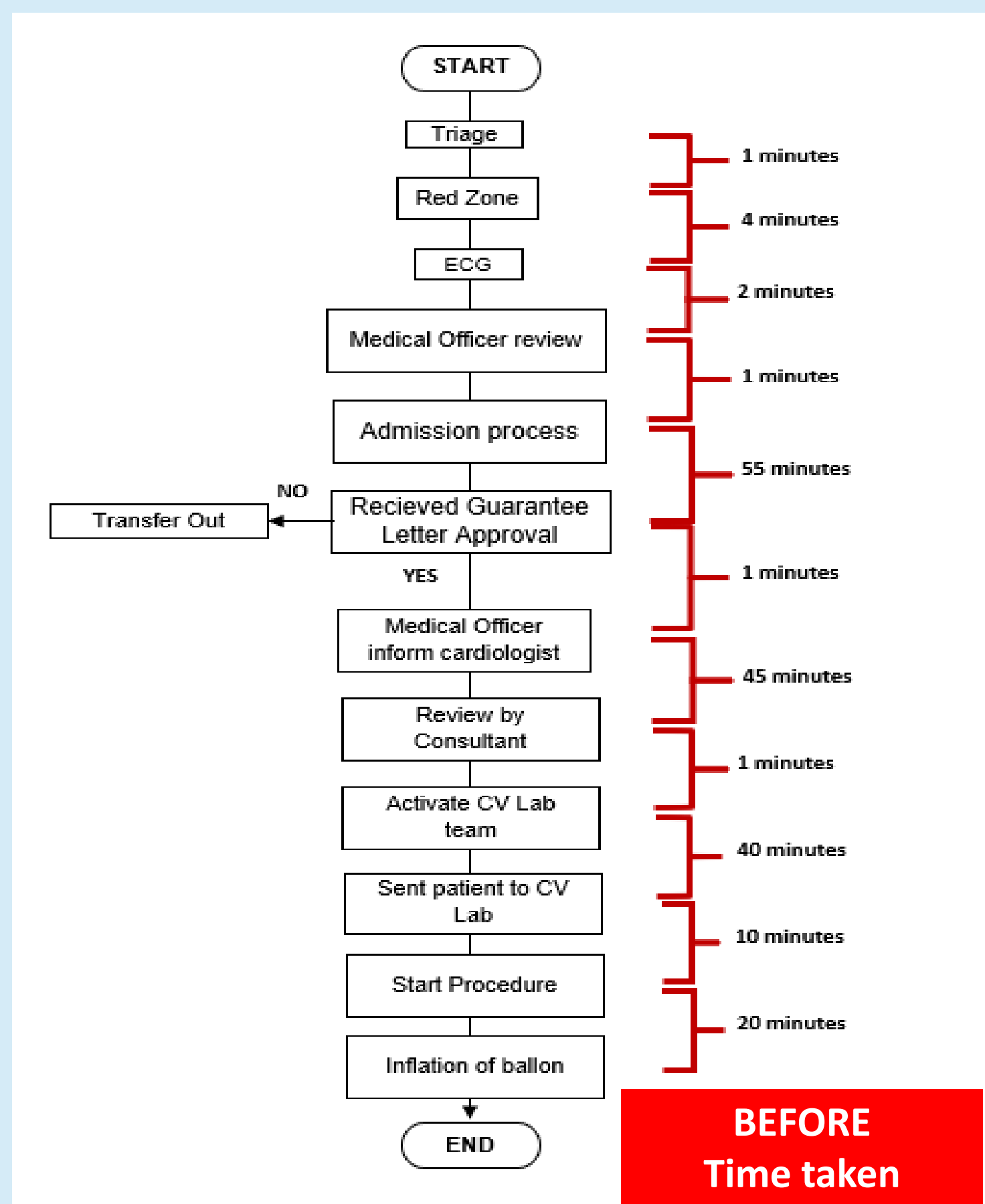
In year 2020, we have identified that only 10% of cases (2 cases out of 20 cases) achieved the standard of 90 minutes Door-to-Balloon Time.

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.

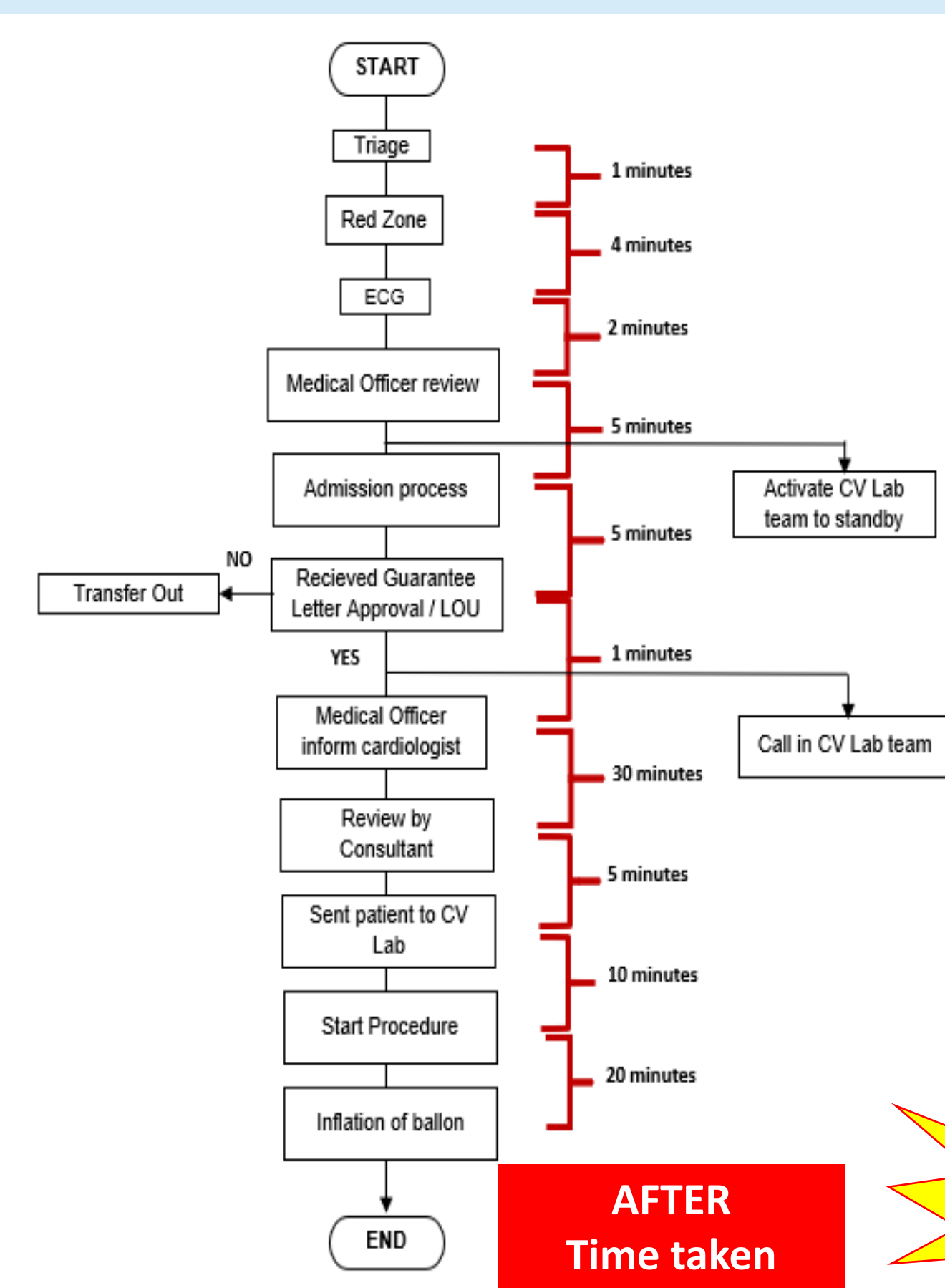
After enhancement of the AMI management process flow using LEAN methodology, there is significant reduction of 97 minutes, from 180 minutes before implementation, to 83 minutes after implementation.

AMI Management Process Flow
Before LEAN Implementation



BEFORE
Time taken
180 minutes

AMI Management Process Flow
After LEAN Implementation

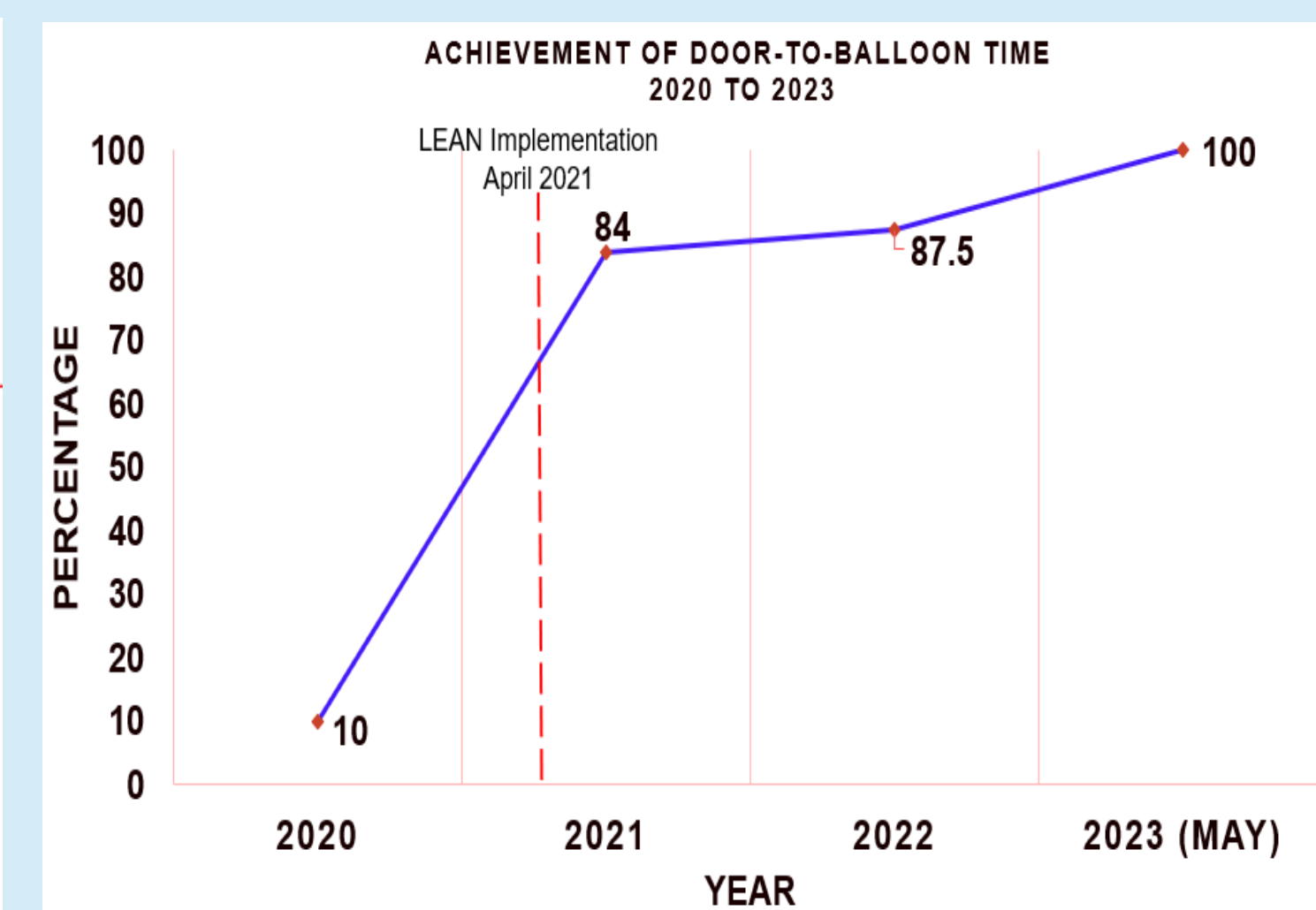
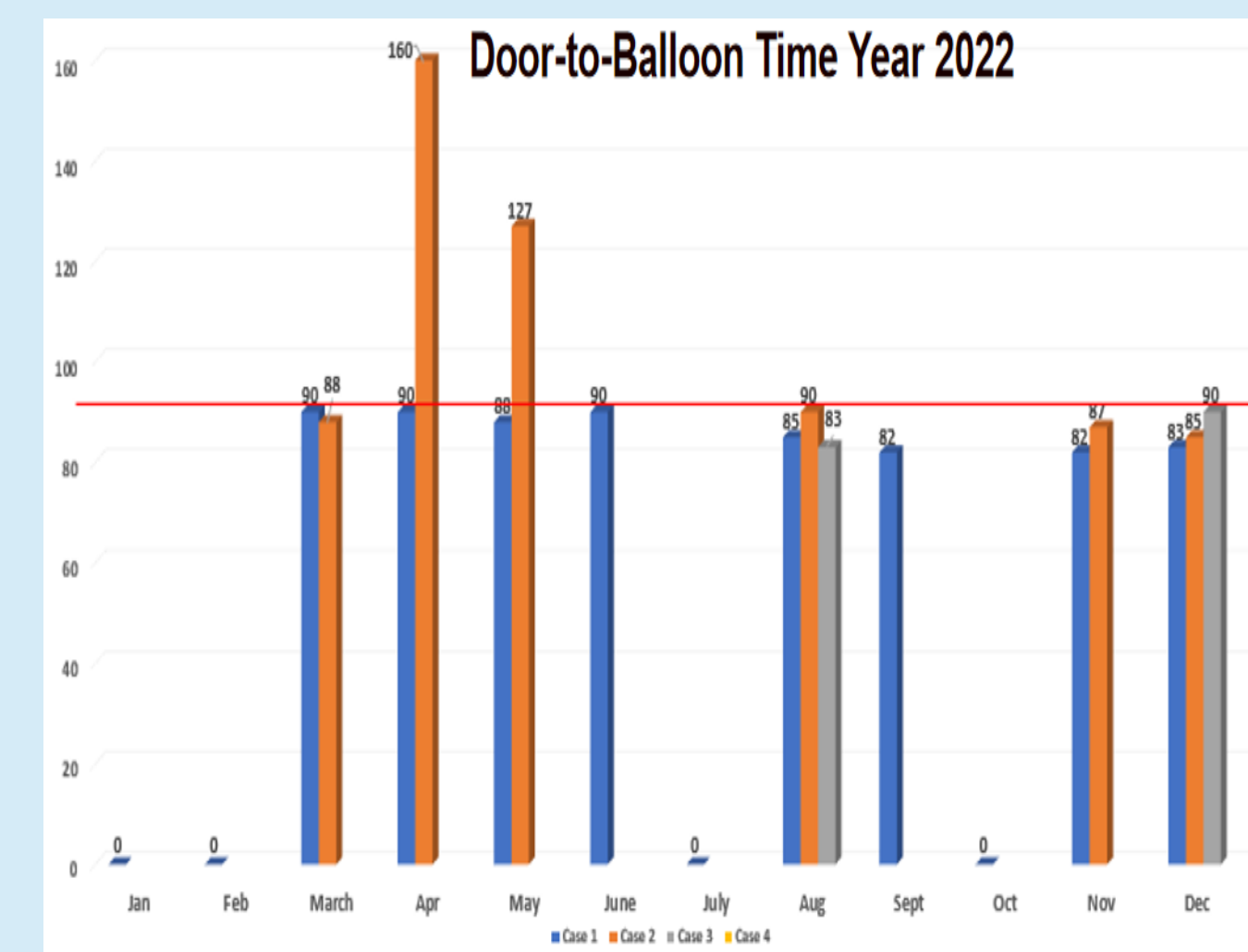
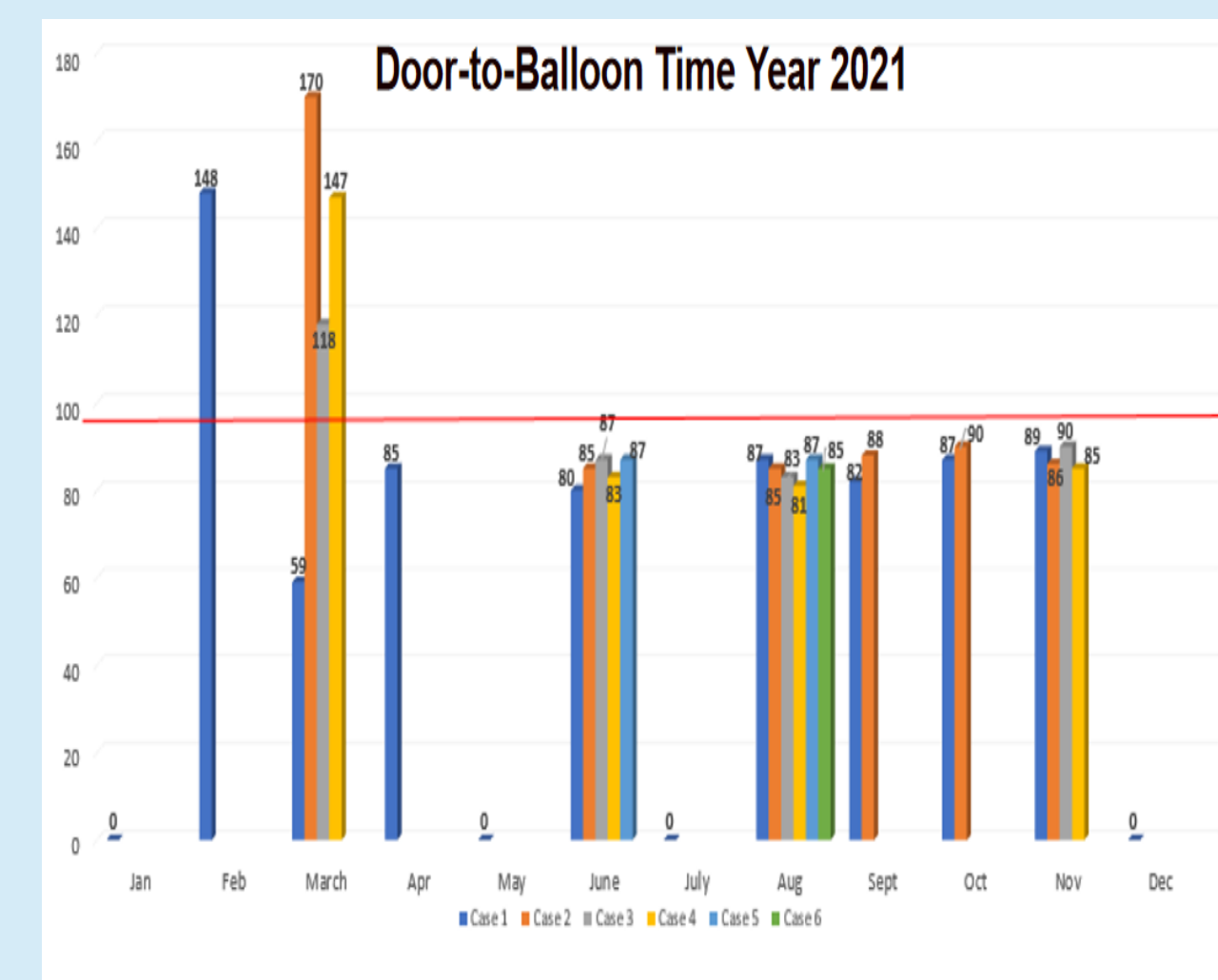


AFTER
Time taken
83 minutes

REDUCED

97 minutes

After Implementation of LEAN in April 2021



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.

ACKNOWLEDGEMENT

The project had been recognised by the management team from the KPJ Head Quarters as a LEAN successful stories. KPJ Group Clinical team had verified that the enhancement of door-to-balloon process flow as an efficient LEAN implementation.

Following that, KPJ Selangor has been issued with an appreciation award by KPJ Group Clinical Services. The best practices were shared within the group-wide for process flow standardization in order to improve other hospital clinical practices within the KPJ group.

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