



Cost Saving of Ambulance Service for Secondary Transfer of Emergency Stroke Patients

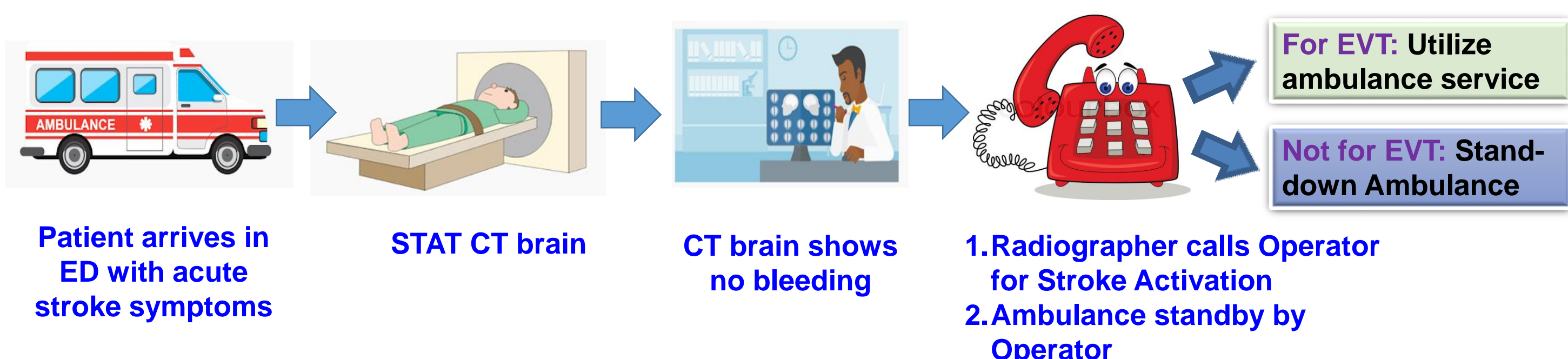
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Project Background

Stroke is a leading cause of death and disability globally, and it remains the fourth most common cause of death in Singapore¹. Endovascular Thrombectomy (EVT) is the gold standard treatment for acute ischemic stroke. It is a time-sensitive emergency procedure for stroke with large vessel occlusion, done physically by removing clot from the blocked vessel in the brain. However, EVT is a complex care intervention and currently not all public hospitals in Singapore are able to provide such a service. Changi General Hospital (CGH) is one of the institutions which require secondary transfer for eligible patients to the centres that can provide EVT. The effectiveness of this procedure is extremely time-dependent; therefore, CGH has developed a workflow to ensure efficient emergency transportation.

Inter-hospital transfer is a potential source of cost inefficiency within the healthcare system². Due to limited hospital ambulance service, CGH sourced for private emergency transportation to be on standby during stroke activation in the Emergency Department (ED). Prior to December 2019, an initial work process for ambulance standby as follow:



From January to December 2019, a total of 159 ambulance standby were activated during office hours. A base charge of S\$32.10* is applied for each ambulance standby. Once the ambulance reaches hospital, S\$90* is charged for the first 30 minutes followed by S\$10* charge for every block of 10 minutes' waiting until the ambulance service is stood-down.

Out of the 159 cases, only 24 cases (15.1%) utilized the ambulance service for EVT transfers. The low ambulance utilization rate resulted in a cost wastage that could have been prevented.

To better understand the cause for low ambulance utilization rate and cost wastage, the team conducted an analysis of the work process. It was discovered that the ambulance standby was upon stroke activation, which was for both potential thrombolysis and EVT cases. However, a large proportion of these cases are only eligible for thrombolysis which do not require the ambulance service at all.

Aim

The aim of this project is to reduce unnecessary ambulance standbys and achieve cost saving by improving ambulance service utilization rate from 15.1% to 80% by June 2021.

Methodology

The team brainstormed and designed this quality improvement project using the two PDSA cycles.

Intervention

During PDSA cycle one (Jan-Dec 2020), Stroke Case Managers were empowered to withhold ambulance standby if the patient did not fulfil the criteria for EVT during office hours. With an improved ambulance utilization rate and cost saved shown in PDSA cycle one, Stroke Case Managers streamlined the work process during PDSA cycle two (Jan-Jun 2021). The team further tightened the work process to trigger an ambulance standby only if the patient is a potential EVT candidate.

PDSA Cycle One was from January to December 2020

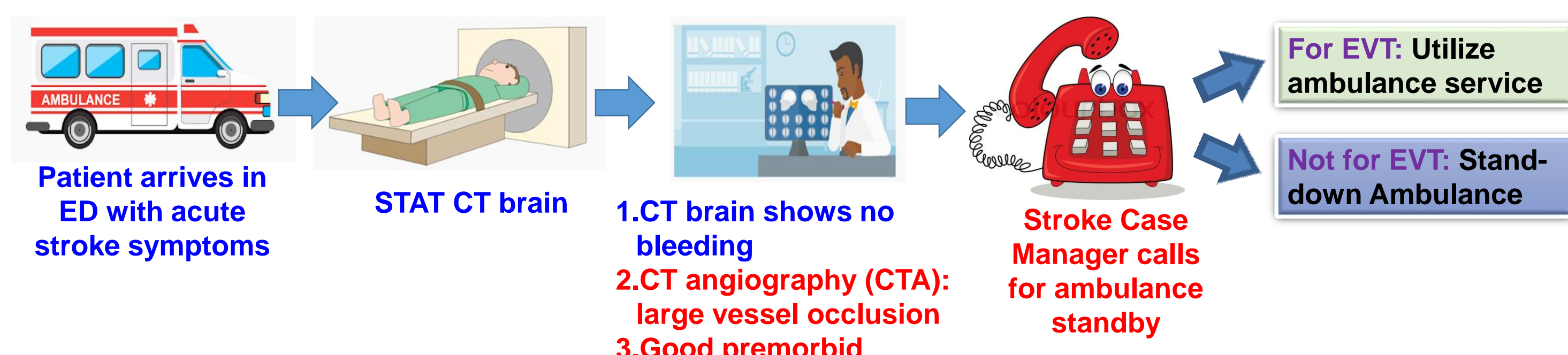
- Fine-tuned & formalised new initiative for ambulance standby workflow
- Ongoing monitoring of cost saving and potential negative impact of the new initiative

Improved work process during office hours to reduce unnecessary ambulance standby to enhance cost saving

Stroke Case Manager initiated the following measure to reduce unnecessary stroke activation calls during office hours:
 > Informed radiographer to hold off stroke activation if patient does not fulfil criteria for EVT

- Improved ambulance utilization rate from 15.1% to 32.7%
- Prevented 168 unnecessary ambulance standby which resulted in a minimum cost saving of S\$5392.80

Revised process for ambulance standby during office hours



PDSA Cycle Two was from January to June 2021

- Maintained new process during office hours
- To explore feasibility of implementing similar process after office hours

Implemented revised process from Cycle One

Improved ambulance utilization rate from 32.7% to 81.5%

- Prevented 124 unnecessary ambulance standby which resulted in a minimum cost saving of S\$3980.40

- Ceased stroke activation call by radiographer during office hours
- Stroke Case Managers took over operator role to standby ambulance only for potential EVT cases

Results

All data was extracted from Research Electronic Data Capture (REDCap) from January 2019 to June 2021.

Outcome measures:

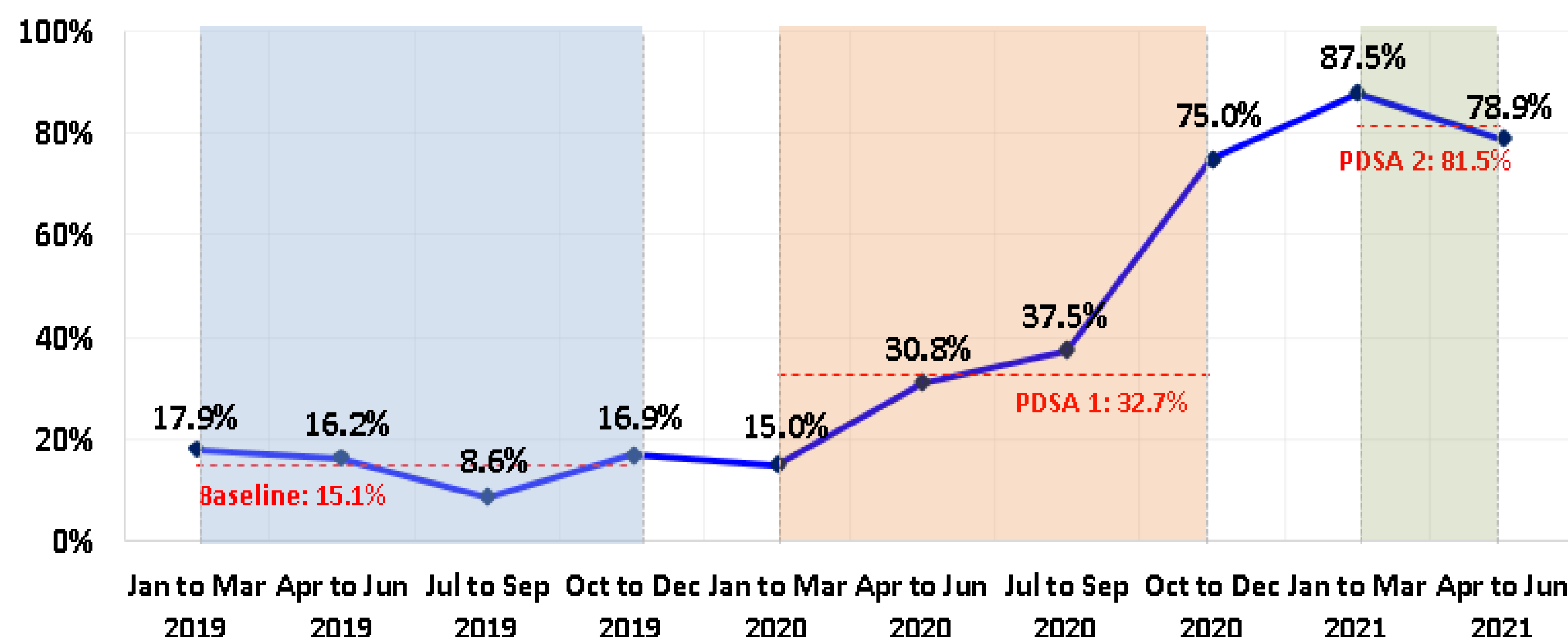
(1) Ambulance utilization rate; (2) Minimum cost saving for ambulance service

Balance measure:

Potential delay in transferring the patient because the ambulance standby was activated at a later stage; which is upon completion of CTA in addition to the CT brain.

As seen in the chart, the team managed to improve the ambulance utilization rate from 15.1% (Jan - Dec 2019) to 81.5% (Jan - Jun 2021).

Ambulance Utilization Rate



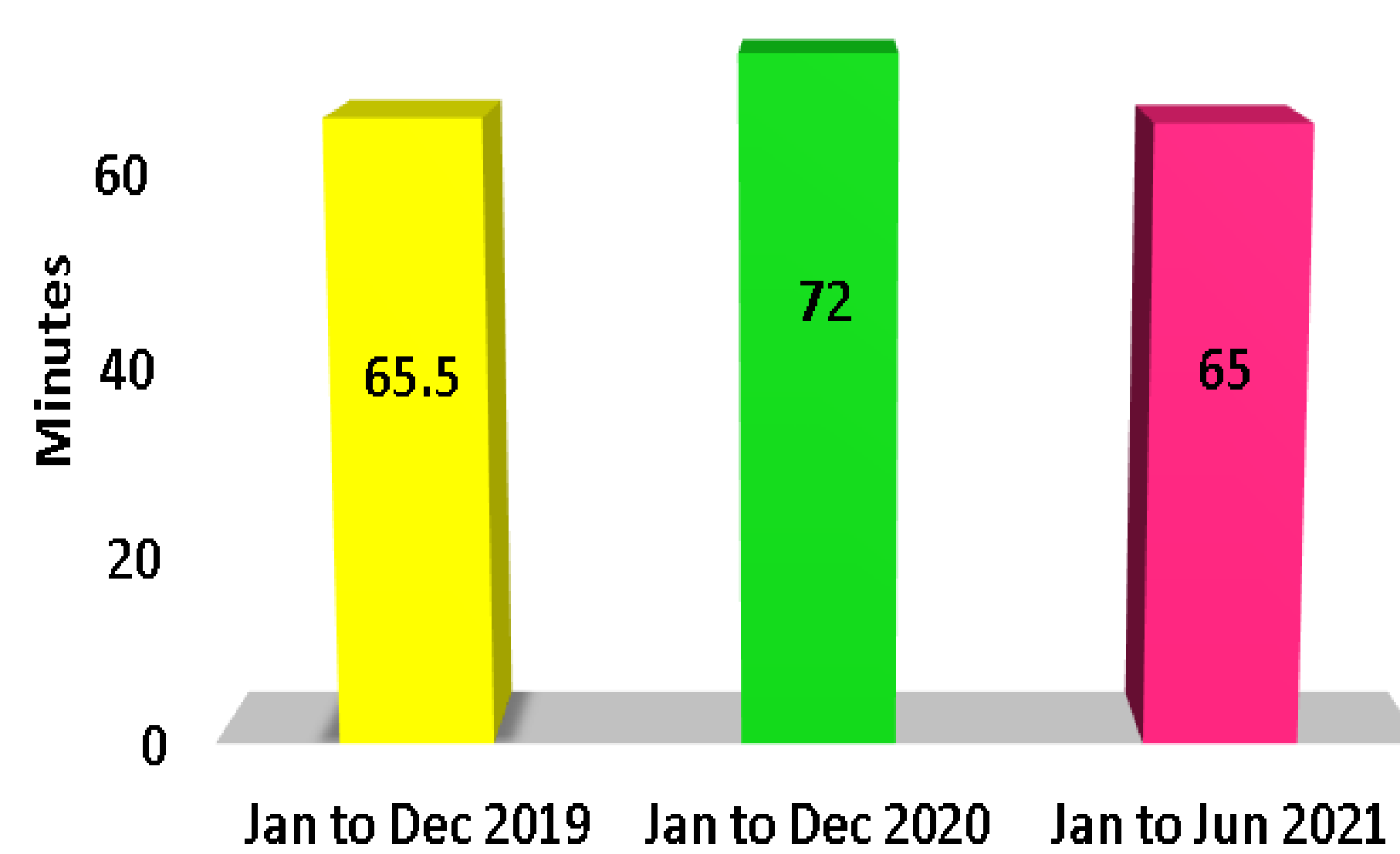
The table below shows the minimum amount of cost saved:

Period	Number of Unnecessary Ambulance Standby Prevented	Minimum Amount of Cost Saved
Jan - Dec 2020	168	S\$5392.80
Jan - Jun 2021	124	S\$3980.40
TOTAL	292	S\$9373.20

To ensure that there was no negative impact of the new workflow when the ambulance was notified at a later stage, the team monitored the time of patient arrival in ED to time of transfer.

The median time of ED arrival to transfer was similar between Jan to Dec 2019 and Jan to Jun 2021 in view of the complexity of the decision making process for EVT transfer. The prolonged time in 2020 was attributed to the additional COVID clearance process required prior to the transfer.

Median Time of ED Arrival to Transfer



Conclusion

With the implementation of the new work process for ambulance standby by Stroke Case Managers, the ambulance utilization rate improved fivefold, resulting in cost-saving and resource optimization. Patients' outcome was not compromised despite activating the ambulance standby at a later stage.

In March 2022, this similar process was extended to after office hours stroke activations aiming to achieve more favourable outcomes.

Moving forward, the team will continue to monitor for any potential cost wastage and focus on continuous improvement.

* Information accurate as of July 2021

References
 1. Ministry of Health. (2020). Principal Causes of Death. [Online]. Available at: <https://www.moh.gov.sg/resources-statistics/singapore-health-facts/principal-causes-of-death> [Accessed: 12 July 2021]
 2. Gattu, R., De Pee, A., Lichenstein, R. and Teshome, G., 2017. Consideration of Cost of Care in Pediatric Emergency Transfer—An Opportunity for Improvement. *Pediatric Emergency Care*, 33(5), pp.334-338.