

## Mission Statement

To increase enrolment of cardiac rehabilitation (CR) package from 7.8% to 50% in eligible post-Acute Coronary Syndrome (ACS) patients over 6 months

- Cardiac Rehabilitation Package: Consist of 8 or 10 sessions of exercise sessions with 2 pre and post assessment, and 6 interactive talks.
- ACS (Acute Coronary Syndromes): Include ST elevation myocardial infarction, Non ST elevation myocardial infarction and Unstable angina.
- Eligible post-ACS patients: Defined as patients admitted under Cardiology, who have been revascularized and suitable/fit to proceed with exercise.

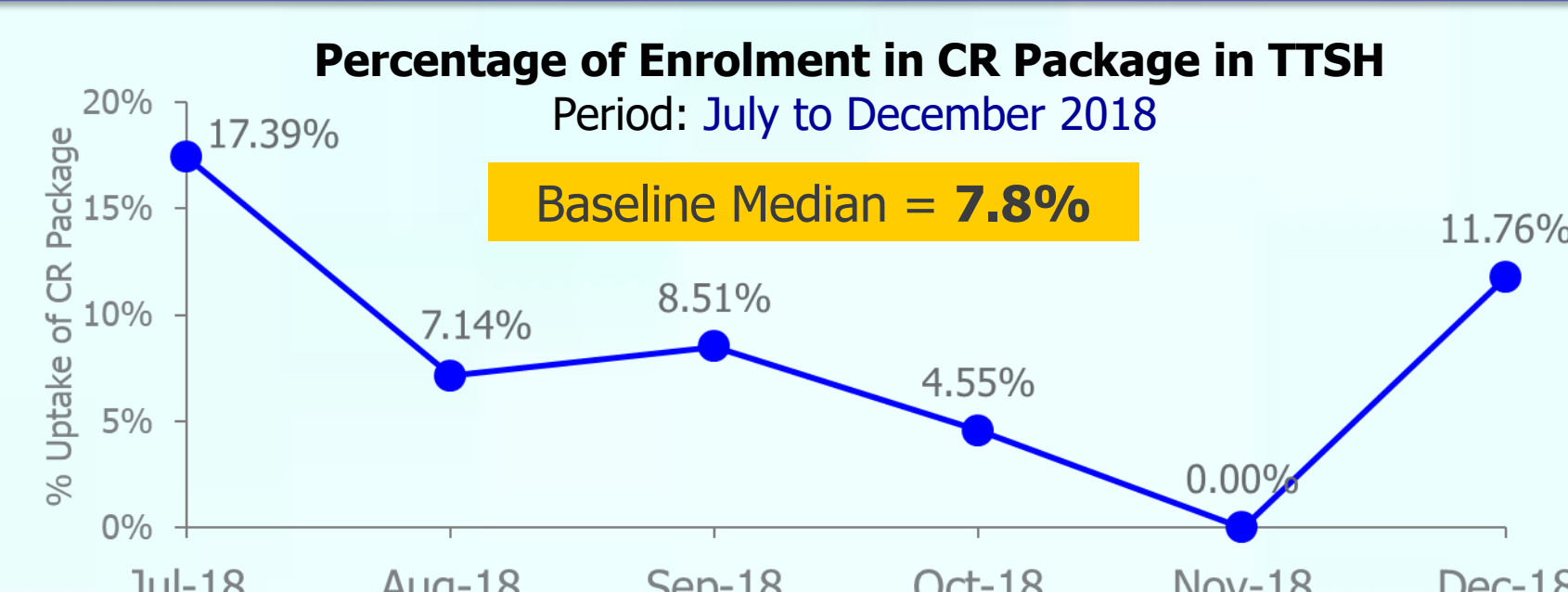
## Team Members

	Name	Designation	Department
<b>Team Leader</b>	Dr Violet Hoon Hui Qing	Consultant	Cardiology
<b>Team Members</b>	Ms Yvonne Chow Mei Wan	Nurse Clinician	Nursing Service
	Ms Jaclyn Chow Jie Ling	Senior Physiotherapist	Physiotherapy
	Ms Jamie Lim Chuen	Assistant Director of Nursing	Nursing Service
	Ms Gao Juan	Nurse Clinician	Nursing Service
	Dr Benita Chiang Shu Qi	Senior Resident	Cardiology
	Ms Grace Fung Yu Si	Executive	Operations (Medicine)
<b>Sponsor</b>	Adj A/Prof Chia Pow-Li	Head of Department	Cardiology
<b>Mentor</b>	Dr William Chan Wai Lim		

## Evidence for a Problem Worth Solving

1. Enrolment in the Cardiac Rehabilitation (CR) Package in TTSH has been very low in post-myocardial infarction (MI) patients:

- Year 2016 = 23.2%
- Year 2017 = 13.4%
- Year 2018 = 8.5%



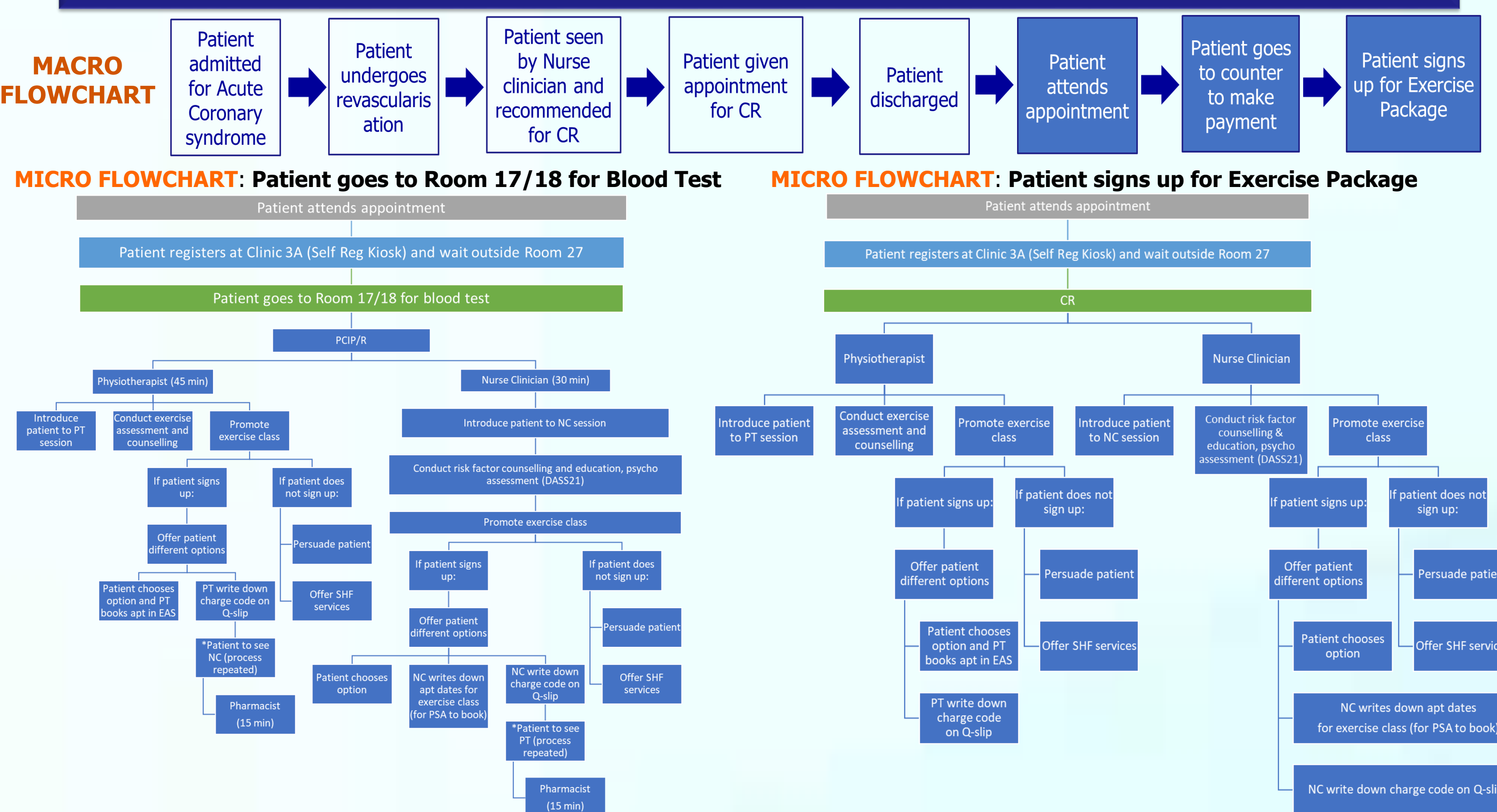
	Jul 2018	Aug 2018	Sep 2018	Oct 2018	Nov 2018	Dec 2018
No. of Patients who signed up for CR Package	8	3	4	2	0	4
No. of Eligible Patients	46	42	47	44	37	34

2. CR is a comprehensive secondary prevention program designed to improve cardiovascular health following a cardiac-related event or procedure:

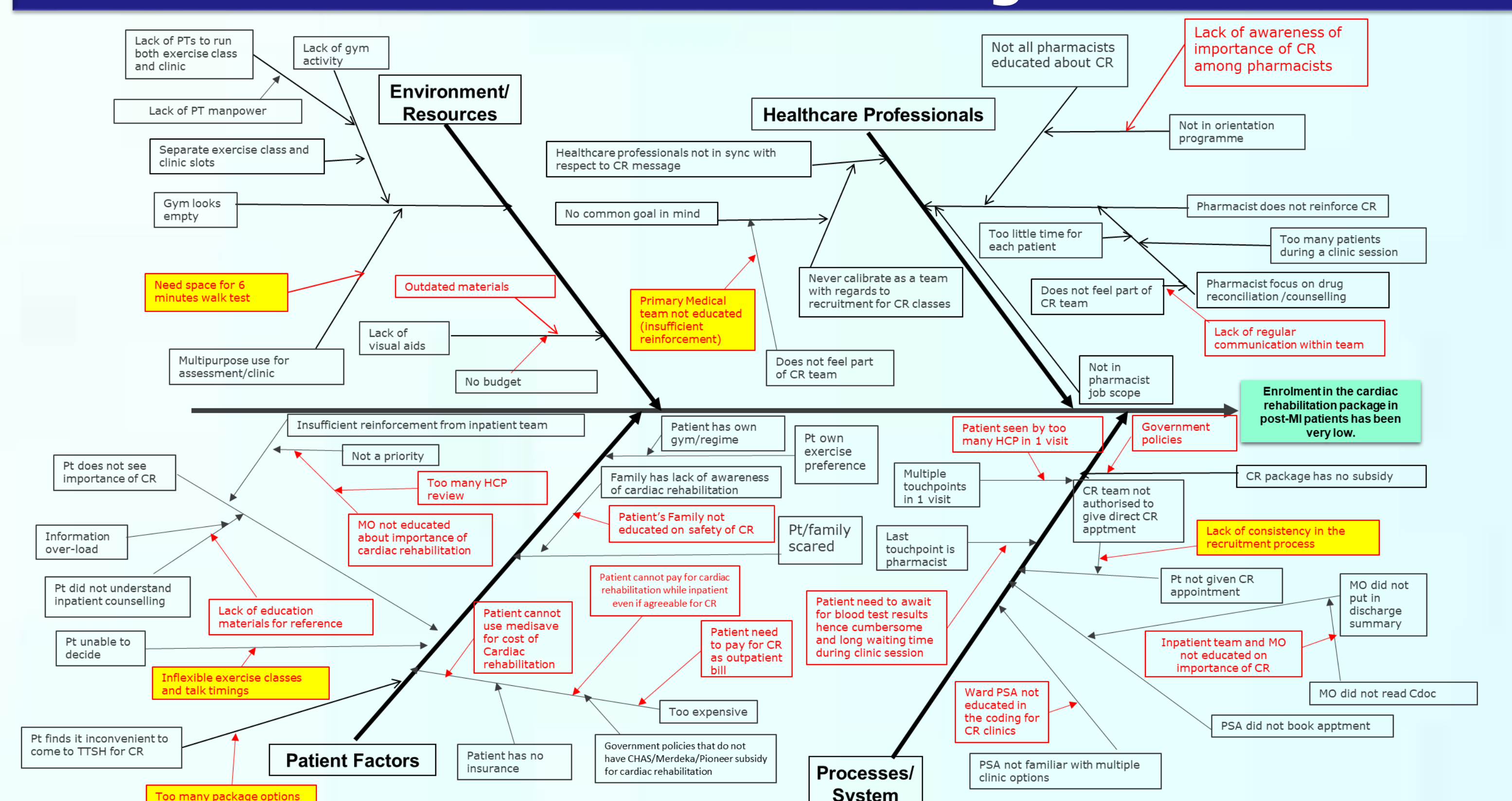
- Reduces the risk of death from any cause<sup>1,2</sup>
- Reduces the risk of death from cardiac causes<sup>2,3</sup>
- Reduces risk of recurrent myocardial infarction<sup>6</sup>
- Decreases hospital readmissions<sup>2,4</sup>
- Improves functional status<sup>1</sup>, quality of life<sup>2-4</sup> and mood<sup>5</sup>

**References**  
<sup>1</sup> Heran BS, Chen JM, Ebrahim S, Moham T, Oldridge N, Rees K, et al. Exercise-based cardiac rehabilitation for coronary heart disease. *Cochrane Database Syst Rev*. 2011;(7):CD001800.  
<sup>2</sup> Taylor RS, Brown A, Ebrahim S, Jolliffe J, Noorani H, Rees K, et al. Exercise-based rehabilitation for patients with coronary heart disease: systematic review and meta-analysis of randomized controlled trials. *Am J Med*. 2004;116(10):682-92.  
<sup>3</sup> Anderson L, Oldridge N, Thompson DR, Zwisler A-D, Rees K, Martin N, Taylor RS. Exercise-based cardiac rehabilitation for coronary heart disease. *Cochrane Database Syst Rev*. 2016;6(11):1-12.  
<sup>4</sup> Rejeski WJ, Foy CG, Brubaker PH, Brubaker PH, Focht BC, Norris JL 3rd, Smith ML. Older adults in cardiac rehabilitation: a new strategy for enhancing physical function. *Med Sci Sports Exerc*. 2002;34(11):1705-13.  
<sup>5</sup> Oldridge N, Strainer D, Hoffmann R, Guyatt G. Profile of mood states and cardiac rehabilitation after acute myocardial infarction. *Med Sci Sports Exerc*. 1995;27(6):900-5.  
<sup>6</sup> Thomas et al. Effect of cardiac rehabilitation on 24-month all-cause hospital readmissions: A prospective cohort study. 2019. 18(3): 234-244

## Flow Chart of Process

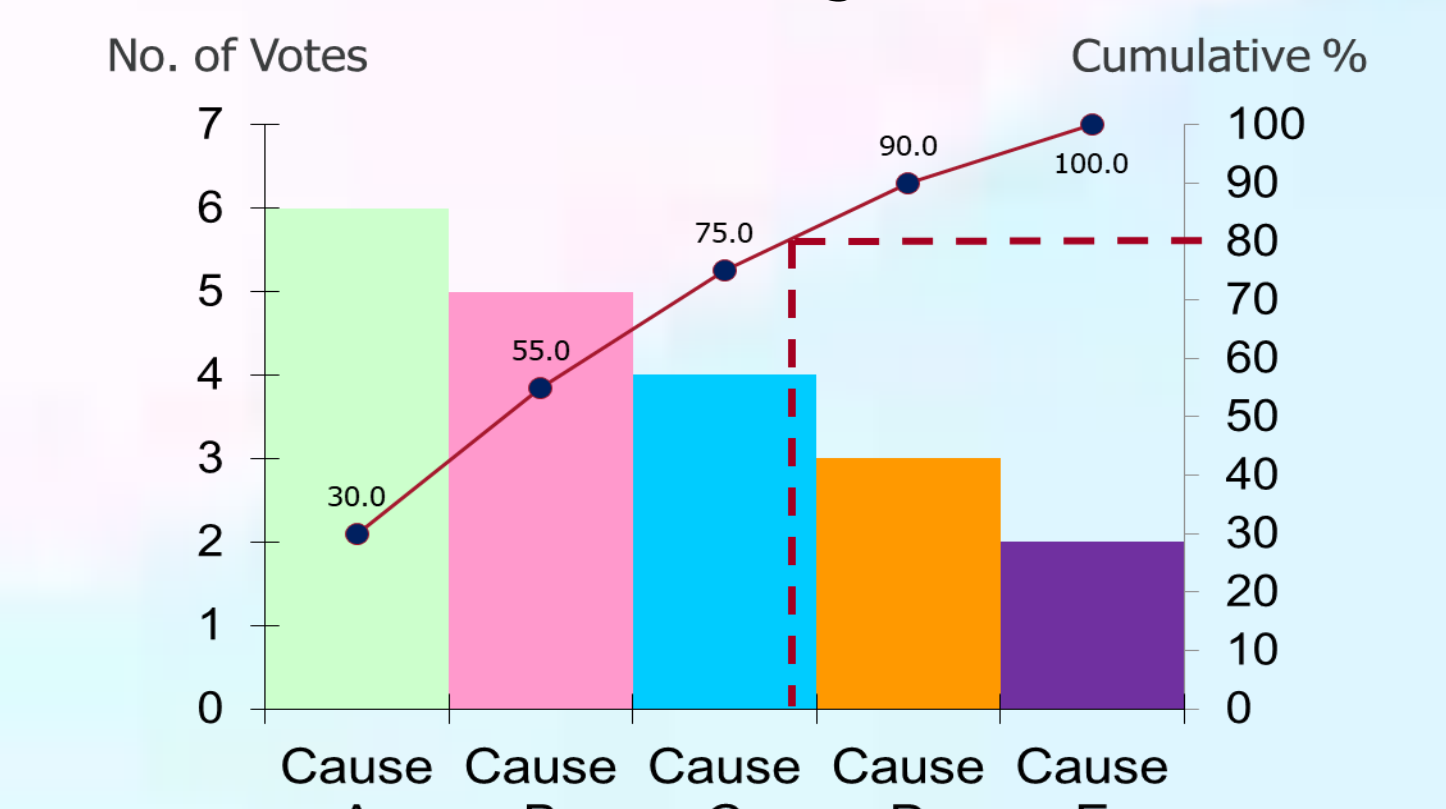


## Cause and Effect Diagram



## Pareto Chart

Causes of Causes on Low Enrolment in the Cardiac Rehabilitation Package in Post-MI Patients



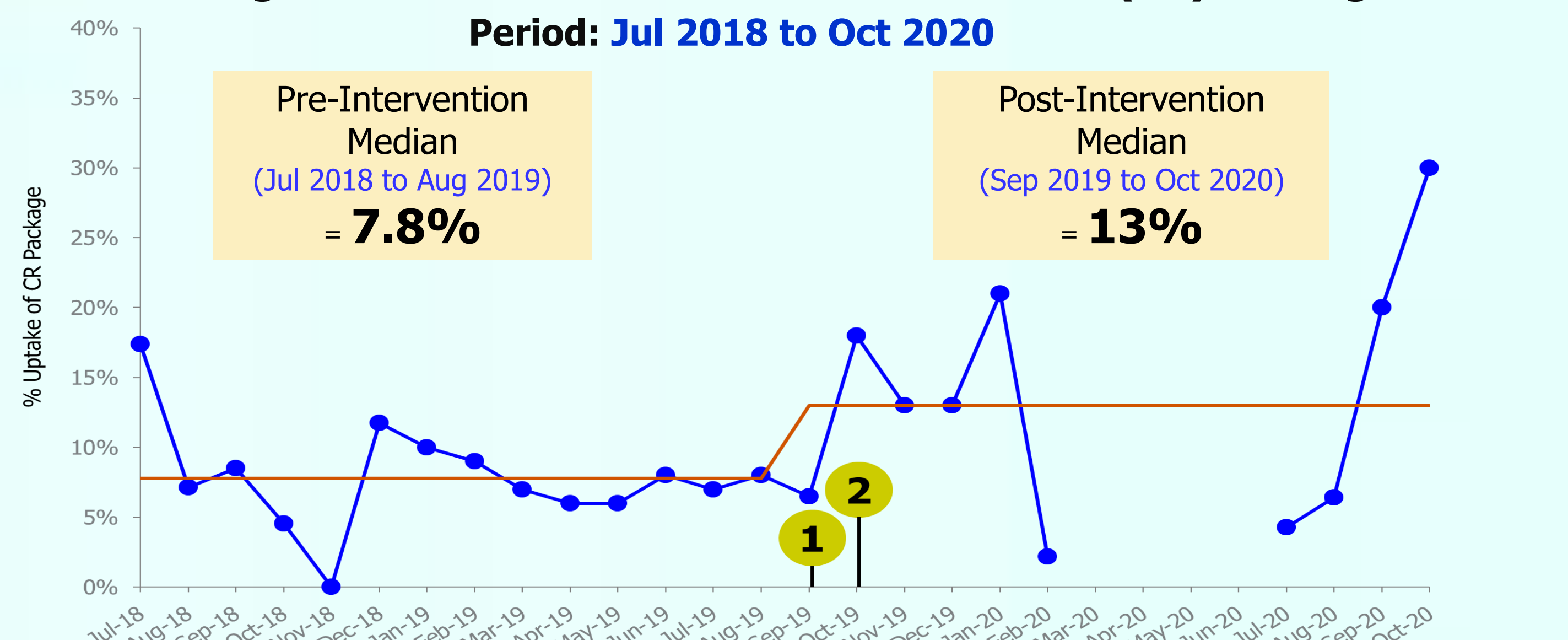
Cause	Description
<b>Cause A</b>	Lack of consistency in the recruitment process
<b>Cause B</b>	Primary Medical team not educated (insufficient reinforcement)
<b>Cause C</b>	Inflexible exercise classes and talk timings
<b>Cause D</b>	Need space for 6 minutes walk test
<b>Cause E</b>	Too many package options

## Implementation

Root Cause	Intervention	Implementation Date
<b>Cause A:</b> Lack of consistency in the recruitment process	Direct referrals to Cardiac Rehab team by Nurse Clinician & Physiotherapist	16 Sep 2019
<b>Cause B:</b> Primary Medical team not educated (insufficient reinforcement)	Reinforce importance of cardiac rehabilitation to Medical Officers & Registrars	16 Oct 2019

## Results

Percentage of Enrolment in Cardiac Rehabilitation (CR) Package  
Period: Jul 2018 to Oct 2020



- 1 Intervention 1:** Direct referrals to Cardiac Rehab team by Nurse Clinician & Physiotherapist
- 2 Intervention 2:** Reinforce importance of cardiac rehabilitation to Medical Officers & Registrars

	Jul-18	Aug-18	Sep-18	Oct-18	Nov-18	Dec-18	Jan-19	Feb-19	Mar-19	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Oct-19	Nov-19	Dec-19	Jan-20	Feb-20	Mar-20	Apr-20	May-20	Jun-20	Jul-20	Aug-20	Sep-20	Oct-20	Nov-20
Take CR	8	3	4	2	0	4	5	3	3	4	4	0	4	4	6	10	11	9	2	1	0	0	0	0	0	2	3	13	12
Eligible	46	42	47	44	37	34	43	44	48	42	42	39	45	42	42	42	46	50	25	21	NA	NA	NA	NA	46	47	63	40	

## Cost Savings

	Pre-Intervention	Post-Intervention
Average Length of Stay (Per Patient)	5 Days	0 Day
Cost of ICU/HD Ward & General Ward Stay (Per Patient)	(2 x \$2080) + (3 x \$1114) = \$7,502	\$0
<b>Bed Days Saved in Monetary Terms (Per Patient)</b>		<b>-\$10,400</b>
Assume No. of Patients readmitted for STEMI/NSTEMI in 1 Year = 50		
Total Length of Stay (Annualized)	5 Days x 50 patients/year = 250 Days	0 Day
Total Cost of ICU/HD Ward & General Ward Stay (Annualized)	\$7502 x 50 = \$375,100	\$0
<b>Bed Days Saved in Monetary Terms (Annualized)</b>		<b>-\$375,100</b>

**Note:** Unit Cost for ICU / HD Ward Stay Per Day Per Patient = \$2,080 & Unit Cost for Inpatient Ward Stay Per Day Per Patient = \$1,114

## Problems Encountered

Following the 6 months CPIP project journey, the team noted that most patients miss the crucial part of rehabilitation as many of them need to return to work or other duties. Hence, there was a need to develop a strategy to empower patients to exercise safely and effectively beyond clinic walls. With that, the team continued with their strategies to sustain by using Heart-Track™ as an alternative to Cardiac Rehabilitation.

## Strategies to Sustain

To encourage patients to take charge of their health, the multi-disciplinary team comprising of physiotherapists, cardiologist and cardiac nurses co-developed the Heart-Track™, to make cardiac rehabilitation fun and convenient, while keeping care personalized. Heart-Track™ is a gamified, wearable technology that can automate patient progression and prescriptions, anytime, anywhere. It is a new collaborative model of care that empowers patients to exercise on their own while being monitored remotely for safety and effectiveness. Built to be a cost efficient and convenient care option, Heart-Track™ will pave the way for more activated patients, and a more sustainable continuum of care from hospital to community.

