

Say **NO** to Myocardial Infarction with **NoMyocardial**

BC2406 Seminar 7 Group 3



Group Members

01. Lam Hao Fah

02. Toh Jing Hua

03. Eugene Wee

04. Jayaraj Vinayak

05. Guo Zhiqi



Content Outline

Topic For Discussion

01. Problem Statement

02. Business Opportunity

03. Current Methods

04. Our Solution

05. Key Insights

06. Way Forward for NHCS

07. Conclusion



Background

Target: Acute Myocardial Infarction (AMI) complications



Impact of Covid-19 🦠

- AMI complications observed in a larger proportion of patients
- Increase in morbidity and mortality rates



Why? 🤔

- Services supporting AMI & post-AMI care (e.g. respiratory therapy) were swamped during Covid-19 surges



Concerns 😞

- New variants & waves of Covid-19
- Expected increase in AMI complication rates



Problem Statement

- ① Complications of AMI are **time-sensitive** & **life-threatening**.
- ② Lack of a pre-diagnosis process & timely preventive measures could lead to **adverse developments** of these complications.
- ③ Doctors unable to provide suitable & timely post-AMI rehabilitation treatments as **insufficient insights** into complications are available.



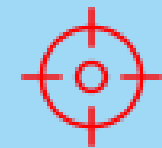
Business Opportunity

Primary Objective



Early detection of AMI complications assists doctors' decision making during emergency treatment

Secondary Objective



- Complement & improve existing post-AMI recovery processes
- Enhance AMI patients' quality of life in the post-emergency phase



National Heart Centre Singapore (NHCS)



“ A people-centred organisation serving patients through **passion and innovation** in cardiovascular care, research and education. ”

In 2021

NHCS had over **120,000** outpatient visits and performed approximately **17,000** cardiovascular scans.

In 2022

NHCS established the CSV.AI research laboratory.



Objectives:

- A. Provide AI techniques for capturing & interpreting cardiac images
- B. Conduct in-depth assessments of cardiovascular disease among SG's at-risk populations
- C. Discover complex patterns of cardiovascular disease

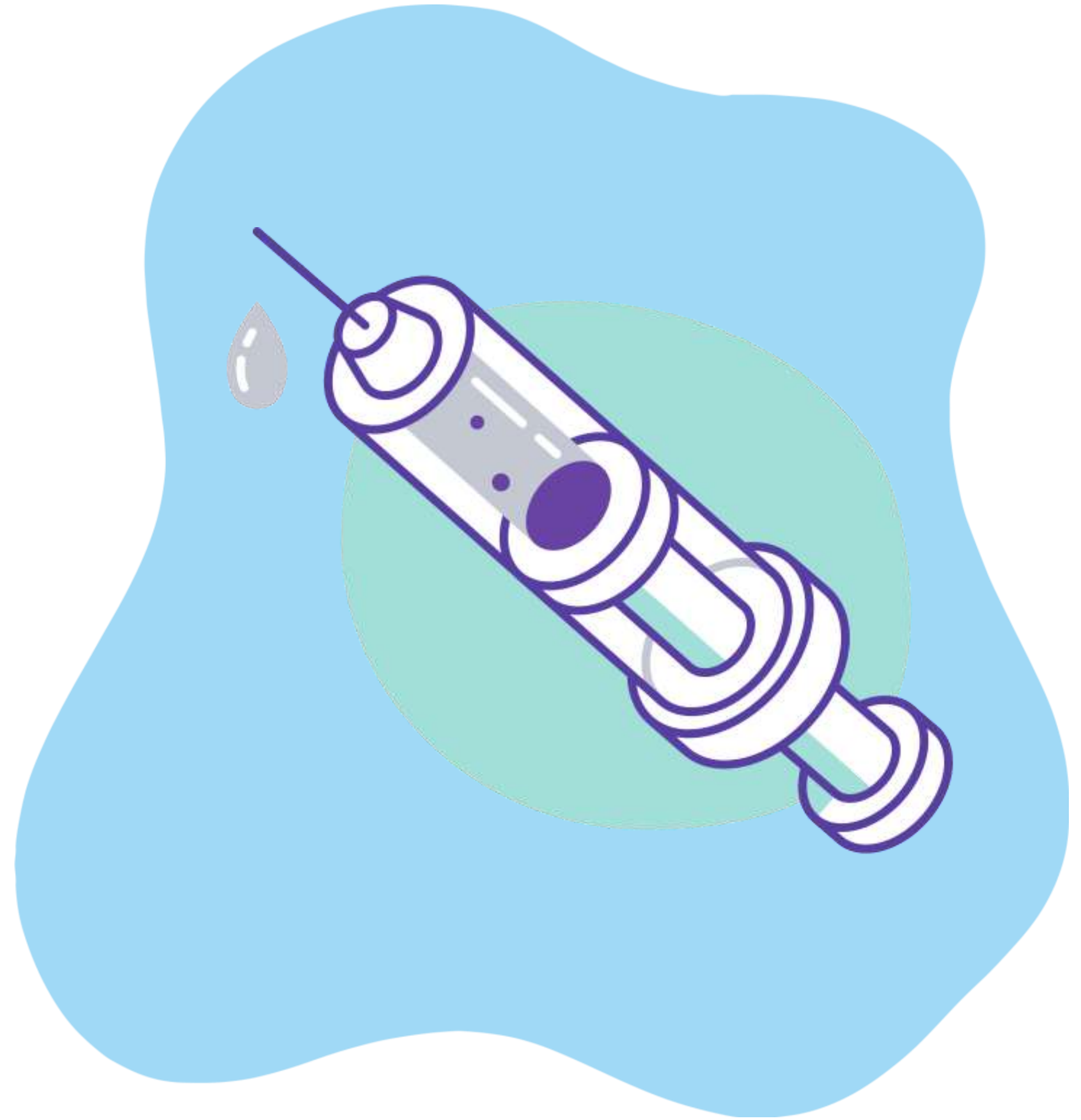
Current Methods

Time-consuming manual evaluation ☒☒

Multiple **lengthy** tests that require doctor judgement at every step

Cardiac Rehabilitation Programme ❤️

A team of cardiac specialists monitor the patient's health



Our Solution

NoMyocardial

Straight to the Crux 🎯

Provide **key indicative** risk factors which can be **easily** identified upon hospital admission

Amazing Accuracy 🚀

Predict Myocardial Infarction with an amazingly high accuracy of more than **90%**!



How we achieved amazing accuracy

Optimising the data 🔍

- Selected 112 indicators that are **easily measured** and have **high importance**.
- Handled missing values while **retaining information** and **high accuracy**.

Balancing the Imbalance 🌱

- Utilised **ROSE** to balance the data
- Established a **5% baseline** to drop indicators



Our amazing accuracy

Atrial Fibrillation ⚡

- Accuracy: 94.0%
- False Positive Rate: 1.0%
- False Negative Rate: 5.0%

Chronic Heart Failure 💔

- Accuracy: 90.7%
- False Positive Rate: 5.5%
- False Negative Rate: 3.8%

Relapse of MI ⌚

- Accuracy: 94.7%
- False Positive Rate: 1.5%
- False Negative Rate: 3.8%



Our Findings

NoMyocardial

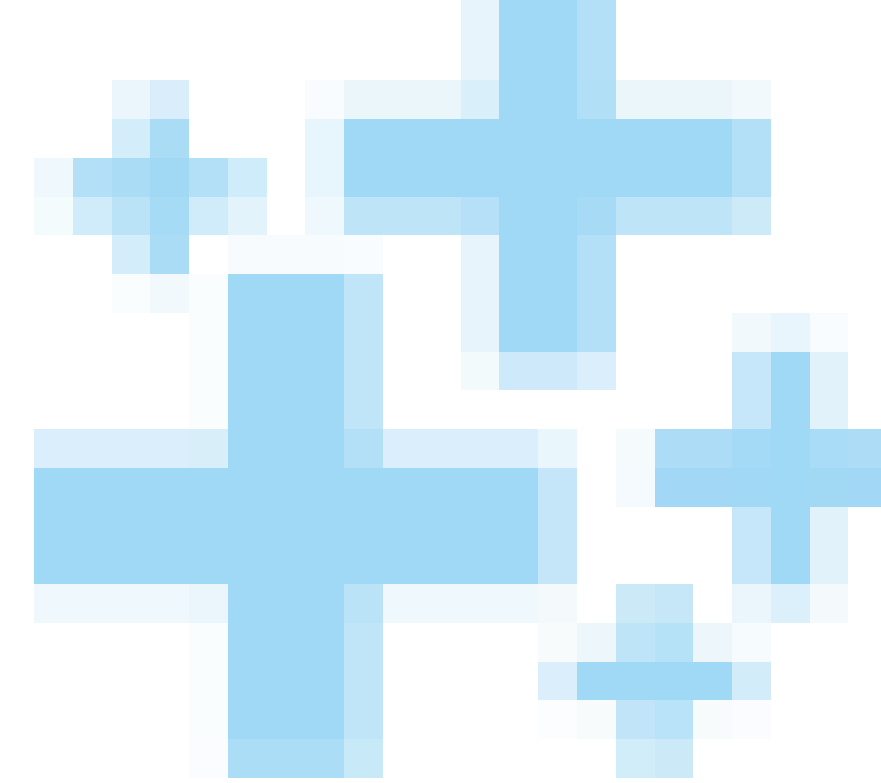
Our approach to analyzing the results

General Risk Indicators ⚠️

- Commonly-sighted risk factors across all MI-related complications
- Used for preliminary analysis (**Emergency**)

Specific Risk Factors ⚠️

- More detailed analysis for each complication
- Used for subsequent analysis & monitoring of likelihood of AMI complication development (**Recovery**)



General Risk Factors

Patient's Medical History

- History of **External Heart Pain**
- **Longer duration** of Arterial Hypertension
- Presence of **Essential Hypertension**
- **Quantity of MI** in the past



ECG Readings

- Presence of **Left Ventricle MI**
 - Lateral
 - Anterior
 - Posterior
 - Inferior



Specific Risk Factors



Complications	Atrial Fibrillation ⚡	Chronic Heart Failure 💔	Relapse of MI ⌚
Medical History	<ul style="list-style-type: none"> - Diabetes Mellitus - Chronic Heart Failure - Hypertension 	<ul style="list-style-type: none"> - Diabetes Mellitus - Chronic Heart Failure - Stage III Hypertension - Coronary Heart Disease - Obstructive Bronchitis - External & Functional Heart pain 	<ul style="list-style-type: none"> - Diabetes Mellitus - External & Functional Heart pain
ECG Readings	Lateral LV MI (QR & Qs Complex)	Lateral LV MI (QR & QS Complex)	Lateral LV MI (QRS no change & QR Complex)
	Abnormally fast/ normal ECG Rhythm		Anterior LV MI (Qr Complex)



Our Key Insights

NoMyocardial

What we learnt from our results



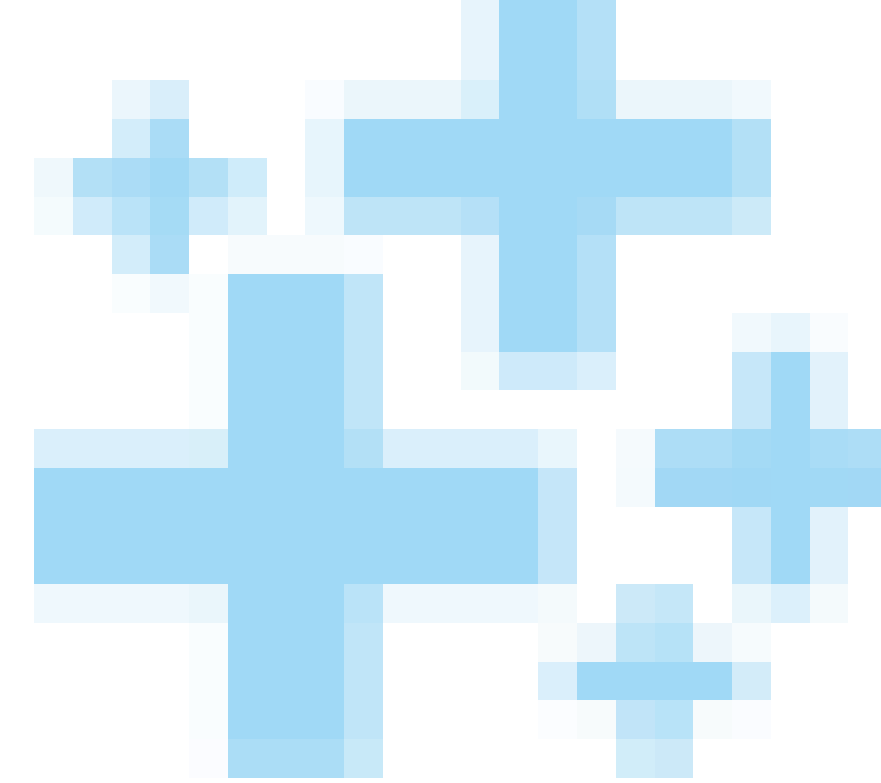
**Relevance of
Medical History**



**Value of ECG
Readings**



**Clarity into
Risk Factors**



Way Forward

- Existing Methods are time consuming!

- When it comes to administering cardiac tests and performing medical evaluation of the patients, NHCS till now followed an adequate methodology.

- Patients are first asked to go through with a Pre - participation cardiac screening which helps the doctors in identifying underlying cardiac conditions or cardiovascular diseases that a patient may have.



Cardiovascular Diagnostic Testing

- Depending on the clinical situation, the doctor or cardiologist may do any of the following heart tests before proceeding with further treatment:

- **Electrocardiogram (ECG)**
- **Echocardiogram**
- **Advanced functional cardiac imaging:**
- **CT coronary angiogram**
- **Cardiopulmonary Exercise Test**

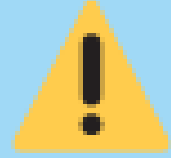
"Through this paper we have conducted a thorough analysis of the dataset, which provided us with insights on the risk indicators that may create potential complications in a patient."

Data Driven Insights

- **History of External Heart Pain , Duration of Arterial Hypertension, ECG readings for Inferior Left Ventricle** are important indicators when it comes to developing key complications.
- Valuable information that can be used during the post recovery phase during the post recovery phase.

Cardiac Rehabilitation Programme

After the emergency phase



- Doctors recommend a cardio rehabilitation programme, which normally spans across 16 sessions.
- Existing programmes comprises a multidisciplinary approach involves a team of cardiac specialists, to monitor the patient's health.



Sessions include:

- Diet modifications
- Medications
- All focused on helping the patient to gradually resume a normal lifestyle.



Opportunity for further improvement

- Tailor made recommendations of healthcare specialists based on AMI complications.
- By leveraging on our data-driven insights, we believe that NoMyocardial can complement the implementation of these existing programmes.

Fast response to the complications of AMI

- By determining possible complications using NoMyocardial. Doctors can pre-prepare medications required for the specific complications before admission.
- The doctors are more likely to quickly identify the complication with the aid of the data provided
- Patients are treated quickly which will reduce the fatality rate



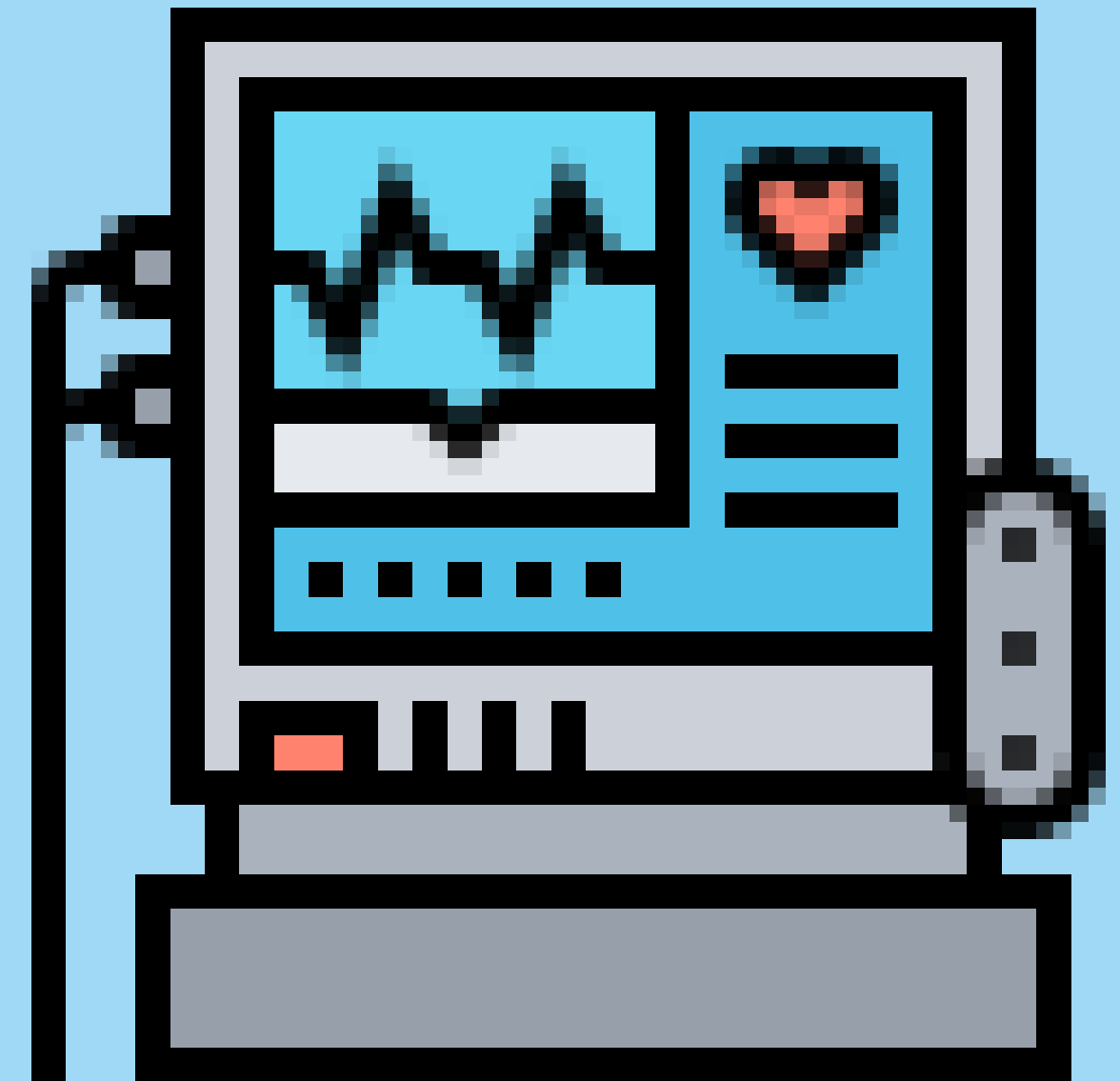
Tailored Cardiac Rehab Programmes

- Using insights on a patient's likelihood of developing a certain AMI complication, NHCS can structure their rehabilitation programme towards reducing further development of these complications
- Depending on the type of complication, NHCS can also refer its patients to their respective cardiac specialists for further diagnosis and treatment.
- Having more specialised teams can also significantly reduce the overhead requirement (costs incurred) of an extensive healthcare team.



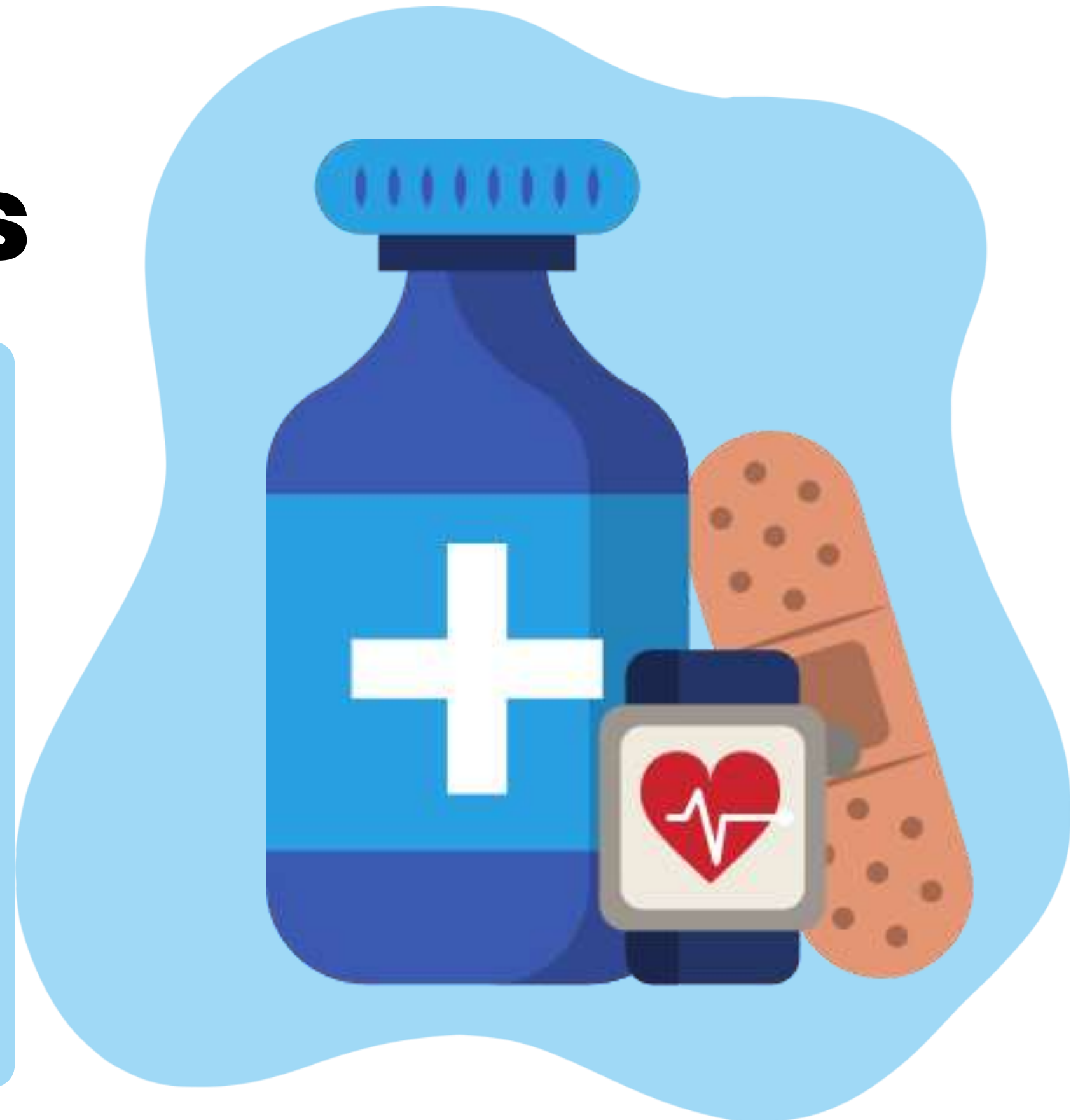
Enhancement of Monitoring Tools

- **Using our model as foundation, more accurate analytics tools can be developed and made available to existing patients with a history of cardiac diseases.**
- **Streamline the process of multiple rounds of screening. Healthcare professionals can mitigate the immediate complications upon the patient's admission, enabling them to enhance clinical and operational outcomes.**



Awareness towards Symptoms

- **Doctors has more clarity on the type of complication that can occur in AMI patients, hence they can emphasis on advising patients about the more prevalent symptoms that lead to the complication**
- **patients can gain more awareness and come back for follow-up screenings if their symptoms worsen**



Wait No More.

**Say NO with
NoMyocardial
NOW!**

