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APPENDIX S1.

LIST OF ABBREVIATIONS

Abbreviation	Definition
6MWT	6-Min Walk Test
AACVPR	American Association of Cardiovascular and Pulmonary Rehabilitation
ACEI	Angiotensin-converting Enzyme Inhibitors
ACS	Acute Coronary Syndrome
ARB	Angiotensin Receptor Blockers
AUC	Area Under Curve
BMI	Body Mass Index
BP	Blood Pressure
CABG	Coronary Artery Bypass Grafting
CAT	Category
CR	Cardiac Rehabilitation
CR_BP_cat	Cardiac Rehab Blood Pressure Category
CRBS	Cardiac Rehabilitation Barriers Scale
CRP	Cardiac Rehabilitation Programme
CRP 2	Cardiac Rehabilitation Programme Phase 2
CRP 3	Cardiac Rehabilitation Programme Phase 3
CV	Cardiovascular
CVA	Cerebrovascular Accident
CVD	Cardiovascular Disease
DM	Diabetes Mellitus
ED	Erectile Dysfunction
EST	Exercise Stress Test
EF	Ejection Fraction
HbA1c	Hemoglobin A1C
HDL	High-density Lipoprotein
HDL_cat	High-density Lipoprotein Category
HR	Heart Rate
HRQoL	Health-Related Quality Of Life
IIEF	International Index Of Erectile Function
LDL	Low-density Lipoprotein
MACCE	Major Adverse Cardiac And Cerebrovascular Events

METs	Peak Metabolic Equivalent Of Task
MI	Myocardial Infarction
MLR	Multiple Logistic Regression.
Past_CV	Past Cardiovascular History
PCI	Percutaneous Coronary Intervention
Prev CABG	Previous Coronary Artery Bypass Grafting
RFE	Recursive Feature Elimination
ROC	Receiver Operating Characteristic
RTD	Return To Drive
RTW	Return To Work
STEMI	ST-elevation Myocardial Infarction
SVM	Support Vector Machine
UE	Unexpected Event(s)
UM	University of Malaya
UMMC	University of Malaya Medical Centre
USA	United States
VE/VCO ₂	Ventilation and Carbon Dioxide

Appendix S2.

FULL LIST OF VARIABLES DESCRIPTION

Variables	Description
Timestamp	Date of data entry
Patient Registration Number	Numerical ID number given by hospital
Race	Categorical data of preset major racial groups
Education level	Education level of the patients
Attending Registrar	Person entering the data to indicate who they are
Referring Specialist	Specialist that refer the patients to CR program
Patient occupation	Occupation type of the patients
Admission Diagnosis and Procedures	Patient's Admission Diagnosis
Date of latest admission/ procedure	Date of patient's admission
Health funding	Patient's financial aid to CR program
Cardiac Risk Factors	Patient's cardiac risk factors
Significant Past CV History	Patient's past cardiovascular history
Comorbidities	Patient's comorbidities
CRP 2 INFORMATION: Intake	CR program enrollment date
Pre CRP 2 EST:	Date of pre CR programme stress test
Prescribed Sessions	CR Prescribed Sessions
AACVPR Risk Category	AACVPR Risk Category
CRP 2: Adherence	CR Adherence
CRP2 Discharge Date	Date of CR completion
CRP 3: Follow-up Method	Type of follow up during community based CR
CRP 3 discharge	Date of discharge from CR follow up usually after 1 year from CRP 2 completion
If patient did not enroll, select primary reason	Reasons why did not enroll into CRP, based on CRBS questionnaire

If did not complete, select reason(s)	Reasons for not completing CR based on CRBS questionnaire
Lipid Profile	Date of lipid profile blood test done
Total Cholesterol	Value of lipid profile blood reading
Triglyceride	Value of Triglyceride reading
HDL	Value of HDL reading
LDL	Value of LDL reading
Glycemic Profile	Date of blood sugar test
HbA1c	Value of glycylated red blood cells
BP CRP2 enrolment	Blood pressure at the start of CRP2
BP	BP during CRP 2
BP CRP3 enrolment	BP at the end of CRP 2
Tobacco Use Status	Smoking status at start of CRP2
Tobacco Persistence Status	Smoking status at the end of CRP 2
Quit date	Date of stopping smoking
Tobacco Relapse Status	Smoking status in CRP 3
Medication Prescription	Medication class taken by patient at CRP 2 enrolment
Medication Modification	Medication class taken by patient during CRP 2
Medication Compliance	Medication class taken by patient at the end of CRP 2
Medication Compliance	Medication class takes by patient during CRP 3
Waist Circumference	Measurement of waist circumference at CRP 2 enrolment
Weight	Body weight on CRP 2 enrolment
Weight on CRP2 discharge	Body weight on CRP 2 completion
Weight on CRP3 follow up	Body weight on CRP 3 follow up
Height	Height on CRP 2 enrolment
Exercise Stress Test	Type of exercise stress test for pre CRP 2
Peak Heart Rate	Peak heartrate achieved during pre CRP 2 stress test
Heart Rate Recovery	Rate of heart rate recovery after achieving peak HR during pre CRP 2 stress test

Peak METs	Peak metabolic equivalent of task (MET) achieved during pre CRP 2 stress test
Exercise Stress Test	Type of exercise stress test for post CRP 2
Peak Heart Rate	Peak heartrate achieved during post CRP 2 stress test
Heart Rate Recovery	Rate of heart rate recovery after achieving peak HR during post CRP 2 stress test
Peak METs	Peak metabolic equivalent of task (MET) achieved during post CRP 2 stress test
Exercise frequency	Exercise duration in minutes/ week
Exercise frequency	Exercise session/ week
Exercise intensity	Exercise rate of perceived exertion
Anxiety Scores	From the anxiety component of the Hospital Anxiety and Depression Scale
Depression Scores	From the depression component of the Hospital Anxiety and Depression Scale
Return to work	RTW status at enrolment into CRP 2
Return to work AFTER CRP2	RTW status after completing CRP 2
Return to drive	RTD status at enrolment into CRP 2
Return to drive AFTER CRP2	RTD status after completing CRP 2
Does the client experience erectile dysfunction?	ED status at enrolment into CRP 2
Does the client experience erectile dysfunction after CRP2?	ED status after completing CRP 2
How often were you able to get an erection during sexual activity?	Scoring components from the IIEF questionnaire, this questionnaire is only done if patient reports of ED
When you had erections with sexual stimulation, how often were your erections hard enough for penetration?	Scoring components from the IIEF questionnaire, this questionnaire is only done if patient reports of ED

When you attempted intercourse, how often were you able to penetrate (enter) your partner?	Scoring components from the IIEF questionnaire, this questionnaire is only done if patient reports of ED
During sexual intercourse, how often were you able to maintain your erection after you had penetrated (entered) your partner?	Scoring components from the IIEF questionnaire, this questionnaire is only done if patient reports of ED
During sexual intercourse, how difficult was it to maintain your erection to completion of intercourse?	Scoring components from the IIEF questionnaire, this questionnaire is only done if patient reports of ED
IIEF-5 score?	Scoring components from the IIEF questionnaire, this questionnaire is only done if patient reports of ED
When you had erections with sexual stimulation, how often were your erections hard enough for penetration?	Scoring components from the IIEF questionnaire, this questionnaire is only done if patient reports of ED
When you attempted intercourse, how often were you able to penetrate (enter) your partner?	Scoring components from the IIEF questionnaire, this questionnaire is only done if patient reports of ED
During sexual intercourse, how often were you able to maintain your erection after you had penetrated (entered) your partner?	Scoring components from the IIEF questionnaire, this questionnaire is only done if patient reports of ED
During sexual intercourse, how difficult was it to maintain your erection to completion of intercourse?	Scoring components from the IIEF questionnaire, this questionnaire is only done if patient reports of ED
How difficult is it for you to delay ejaculation?	Scoring components from the IIEF questionnaire, this questionnaire is only done if patient reports of ED
Do you ejaculate before you want to?	Scoring components from the IIEF questionnaire, this questionnaire is only done if patient reports of ED
Do you ejaculate with very little stimulation?	Scoring components from the IIEF questionnaire, this questionnaire is only done if patient reports of ED

Major Adverse Cardiac/CVA Event(s)	Did the MACCE occur in 6 months since MI
Major Adverse Cardiac/CVA Event(s)	Date of MACCE
Unexpected Event(s)	Did UE occur during CRP 2
Unexpected Event(s)	Date of UE
Hospital Readmission(s)	Did the patient got admitted during CRP 2
Hospital Readmission	Date of admission
A and E Visit(s)	Any emergency unit visit during CRP 2
Email Address	Email address of the person filling in the form
Residential Postcode	Patient's residential postcode
Age	Age
Gender	Gender
Left Ventricle EF @ pre-CRP 2	Left ventricle EF reading
Please indicate client current level of CRP participation	Level of CRP participation

Appendix S3.

VARIABLES SELECTED DURING DATA EXTRACTION

Variables	New Naming
Patient Registration Number	Patient_Registration_Number
Race	Race
Education level	Education_level
Patient occupation	Patient_occupation
Admission Diagnosis & Procedures	Admission_Diagnosis_&_Procedures
Date of latest admission/ procedure	Date_of_latest_admission/_procedure
Health funding	Health_funding
Cardiac Risk Factors	Cardiac_Risk_Factors
Significant Past CV History	Significant_Past_CV_History
CRP 2 INFORMATION: Intake	CR_Intake

CRP 2 INFORMATION: Intake	CR_Intake_Date
Prescribed Sessions	Prescribed_Sessions
AACVPR Risk Category	AACVPR_Risk_Category
CRP 2: Adherence	CR_Adherence
CRP2 Discharge Date	CR_Discharge_Date
Triglyceride	Triglyceride
HDL	HDL
LDL	LDL
HbA1c	HbA1c
BP CRP2 enrolment	Pre_BP
BP	CR_BP
Tobacco Use Status	Pre_Tobacco
Tobacco Persistence Status	Post_Tobacco
Medication Prescription	Pre_Medication
Medication Modification	CR_Medication
Medication Compliance	Post_Medication
Weight	Pre_Weight
Weight on CRP2 discharge	Post_Weight
Height	Height
Exercise Stress Test	Pre_Exercise_Stress_Test
Peak Heart Rate	Pre_Peak_Heart_Rate
Peak METs	Pre_METs
Exercise Stress Test	Post_Exercise_Stress_Test
Peak Heart Rate	Post_Peak_Heart_Rate
Peak METs	Post_Peak_METs
Exercise frequency	Exercise_frequency_mins_week
Exercise frequency	Exercise_frequency_sessions_week
Exercise intensity	Exercise_intensity

Anxiety Scores	Anxiety_Scores
Depression Scores	Depression_Scores
Return to work	Pre_RTW
Return to work AFTER CRP2	Post_RTW
Return to drive	Pre_Return_to_drive
Return to drive AFTER CRP2	Post_Return_to_drive
Does the client experience erectile dysfunction ?	Pre_erectile_dysfunction
Does the client experience erectile dysfunction after CRP2?	Post_erectile_dysfunction
Major Adverse Cardiac/CVA Event(s)	MACCE
Unexpected Event(s)	Unexpected_Events
Residential Postcode	Residential_Postcode
Age	Age
Gender	Gender
Left Ventricle EF @ pre-CRP 2	Pre_Left_Ventricle_EF

APPENDIX S4.

SUMMARY OF GENERATED FEATURES

Generated Features	Derived From
BMI (kg/m ²)	Weight, Height
Duration_Between_Ward_Enrollement (days)	CR_Intake_Date, Date_of_latest_admission/_procedure
Duration_CR (days)	CR_Discharge_Date, CR_Intake_Date
Total_Risk_Factors	Total number of cardiac risk factors
CR_Completion (Yes,No)	If patients complete the CR based on CR_Discharge_Date and CR_Intake

APPENDIX S5.**FEATURES SELECTED IN TOP MODELS**

Classifiers	AdaBoost	SVM	CatBoost	Random Forest	XGBoost	Logistic Regression	Complement Naive Bayes	Decision Tree
No of Features	20	20	30	40	30	11	11	11
Demographical								
Age	√		√	√	√	√	√	√
Race_Chinese				√	√			
Race_Malay		√	√	√	√	√	√	√
Patient_occupation_Government servant						√	√	√
Health_funding_Fully Funded			√	√				
Health_funding_Self funded	√	√	√	√	√	√	√	√
Medical History								
Admission_Diagnosis_CABG			√	√	√			
Admission_Diagnosis_Heart Failure		√						
Admission_Diagnosis_PCI				√				
Admission_Diagnosis_STEMI	√							
Risk_Factors_DM Type 2				√				
Risk_Factors_High Lipid Profile					√			
Risk_Factors_Hypertension		√	√	√	√	√	√	√

Risk_Factors_Unknown		√						
Total_Risk_Factors	√		√	√	√			
Past_CV_Prev CABG	√	√	√	√	√	√	√	√
Past_CV_Unknown				√	√			
Triglyceride_cat_High	√	√		√	√			
Triglyceride_cat_Normal		√						
HDL_cat_High Risk	√							
Anxiety_Scores			√	√	√			
Depression_Scores	√		√	√	√			
CR Status								
Duration_Between_Ward_Enrollment	√		√	√	√			
Duration_CR	√		√	√	√			
Prescribed_Sessions_> 8 weeks				√				
Exercise_frequency_mins_week			√	√				
Exercise_frequency_sessions_week			√	√				
Exercise_intensity	√		√	√				
AACVPR_Risk_Category_High				√	√			
AACVPR_Risk_Category_Low		√	√	√	√	√	√	√
Pre CR								
Pre_BMI_range_Obesity		√	√	√	√			

Pre_BMI_range_Overweight			√		√			
Pre_BP_cat_Isolated Systolic Hypertension				√				
Pre_BP_cat_Normal		√						
Pre_BP_cat_Optimal			√		√			
Pre_erectile_dysfunction					√			
Pre_Exercise_Stress_Test_Treadmill					√			
Pre_METs_range_Light Intensity				√				
Pre_METs_range_Vigorous Intensity			√	√	√			
Pre_Peak_Heart_Rate_range_Light			√	√	√			
Pre_Peak_Heart_Rate_range_Moderate		√						
Pre_Peak_Heart_Rate_range_Very Light	√	√	√			√	√	√
Pre_Return_to_drive	√	√	√	√	√			
Pre_Tobacco_Former smoker	√							
During CR								
CR_BP_cat_Isolated Systolic Hypertension	√			√				
CR_BP_cat_Optimal	√		√	√				
CR_Medication_Aspirin				√				
Post CR								
Post_BMI_range_Normal				√				
Post_BMI_range_Obesity		√	√	√				

Post_Exercise_Stress_Test_6MWT only		√		√	√	√	√	√
Post_Exercise_Stress_Test_Treadmill	√				√			
Post_Medication_ACEI/ARB			√					
Post_Medication_Beta-antagonist				√				
Post_Medication_Statin*		√						
Post_Peak_Heart_Rate_range_Light	√		√	√	√	√	√	√
Post_Peak_Heart_Rate_range_Moderate		√	√	√				
Post_Return_to_drive	√	√	√	√	√	√	√	√
Unexpected_Events	√	√	√	√	√			