

UNIVERSITY OF THE PHILIPPINES MANILA  
COLLEGE OF ARTS AND SCIENCES  
DEPARTMENT OF PHYSICAL SCIENCES AND MATHEMATICS

ONLINE CHD RISK ASSESSMENT CALCULATOR BASED  
ON PHILIPPINE HEART ASSOCIATION GUIDELINES AND  
DATASET

A special problem in partial fulfillment  
of the requirements for the degree of  
**Bachelor of Science in Computer Science**

Submitted by:

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May 2016

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## ACCEPTANCE SHEET

The Special Problem entitled “Online CHD Risk Assessment Calculator based on Philippine Heart Association Guidelines and Dataset” prepared and submitted by Evangeline Louise F. Carandang in partial fulfillment of the requirements for the degree of Bachelor of Science in Computer Science has been examined and is recommended for acceptance.

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## **Abstract**

Existing coronary heart disease risk calculators use different risk assessment models and equations derived from foreign datasets that when compared to each other may have different interpretations and results. The calculators for the risk of CHD are also accessed separately, with their own implementation of code for calculations, from the calculators that predict the death from the disease. Users also cannot determine which calculator is optimal to use since results varies and the different models validate the accuracy by testing it also with other models.

Using the same point system for each model but a dataset from Philippine Heart Association CAD registry, new estimations for the equations are derived and used to compute for the probability of death or myocardial infarction from the disease. The results from the indicated models by PHA are displayed with their own interpretations as well as the result from the model derived from the Philippine dataset. The clinician could also enter some note to the patient that can be saved as a PDF file together with the patient information and risk assessment. The entered values in the calculator could also be used to generate statistical reports.

*Keywords:* coronary heart disease, regression analysis, risk calculator, risk score models

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# I. Introduction

## A. Background of the Study

Based on a study by the Department of Health in 2009 using the data from previous years, 170,000 Filipinos or approximately 19 Filipinos each hour die from cardiovascular disease and it has been one of the top two causes of death in the Philippines since 1993. Since then until as recent as December 2014, Cardiovascular disease, particularly Coronary Heart Disease (CHD), is the leading cause of death in the Philippines [1].

It is also one of the top ten causes of mortality in the world with an approximation of 17.5 million deaths in 2012 which makes 31% of the global death. Three-fourths of the CDV deaths were commonly from the low and middle-income countries as classified by the World Health Organization. Since Philippines is classified as a lower-middle-income country, a higher mortality rate of CVD patients is more probable [2] [3].

This news alarmed the Philippine Heart Association (PHA) which is why they released an updated guideline on treating and managing heart disease in the book, "2014 Philippine Clinical Practice Guidelines for the Management of Coronary Heart Disease," with the aim to improve the care of patients with CHD. It has more entries and statements also introduced in foreign guidelines regarding CHD [1]. It is currently under the process of developing local practice guidelines and recommendations in the management of angina and myocardial infarction.

Cardiovascular disease is a group of disorders which includes:

- Coronary heart disease is the disorder in the blood vessels that supplies the heart muscle
- Cerebrovascular disease is the disorder in the blood vessels that supplies the brain

- Peripheral arterial disease is the disorder in the blood vessels that supplies the arms and legs
- Rheumatic heart disease is the heart muscle and valves damages from rheumatic fever
- Congenital heart disease is the heart structure malformations
- Deep vein thrombosis and pulmonary embolism are the blood clots in the leg veins [2]

The focus of this study is the coronary heart disease. CHD is the result of a plaque build-up in the coronary arteries which serves as the major supply of oxygen-rich blood to the heart. Having the supply cut off result to a heart attack that if not restored would cause the heart muscles to die. The deterioration of the muscles leads to various critical conditions [4]. From the global deaths caused by CVD, an estimation of 7.4 million deaths were caused by CHD [2].

CHD is only fully diagnosed after series of tests such as electrocardiogram, stress testing, echocardiography, chest x-ray, blood tests, and coronary angiography and cardiac catheterization. However, the doctor could give an initial diagnosis based on the patient's medical history, family medical history and a physical exam [4]. There are existing calculators that predicts risk of heart attacks and death from CHD. Examples of calculators that predict risk of heart attacks would be the Risk Assessment Tool by NHLBI [5], Mayo Clinic Heart Disease Risk Calculator [6], and the Framingham score. Examples of calculators that predict mortality are the Thrombolysis in Myocardial Infarction (TIMI) [7], Global Registry of Acute Coronary Events (GRACE) calculators [8], and the HEART score. The ones recommended by PHA is the Framingham, TIMI, GRACE, and HEART score. The Framingham predicts the risk of coronary heart disease of a patient based on certain predictors. The TIMI, GRACE, and HEART scores provides probabilities on the risk of death or myocardial infarc-

tion within a certain span of time. Each of them has different predictors to assess the risk. It will be further discussed in Chapter 3.

## **B. Statement of the Problem**

Calculators for predicting heart attacks and death from CHD already exist. However, these calculators use different risk assessment models that when compared to each other may have different interpretations and results. The calculators asks for values in different set of fields which has their own estimates based on the analysis done by statisticians for each risk score model. Despite these, these calculators are still under the same category of assessing the risk of death and myocardial infarction for UA/NSTEMI patients which is recommended by PHA. Furthermore, the calculators for the risk of CHD are also separated from the calculators that predict the death from the disease. Users also cannot determine which calculator is optimal to use since results varies and the different models validate the accuracy by testing it also with other models.

The bases of the equations that the calculators use are also datasets from foreign countries, not the Philippines. Therefore, the estimations needed to predict the probabilities would differ from the Philippine CHD cases when regression analysis is applied.

## **C. Objectives of the Study**

This study aims to provide a one-access online calculator of possible case of CHD and survival measurement for a CHD patient. The system would accept input based on the parameters necessary to diagnose the disease and output the calculated data. The system uses a series of models in the guidelines published by the Philippine Heart Association [9] to predict heart attacks even at an early stage based on the patient's medical information that the user will provide. The result could serve as a guide

for both patients and health professionals to plan for medications, treatments, or healthcare.

The entered data in the calculator is saved in the database. The system would generate statistical reports based on CHD patients' data from the information in the database. The reports may be used for other research purposes, both clinical and academic.

The online application has functionalities that would allow the doctor to:

1. Determine if the patient have heart problems and calculate the possibility that it will lead to coronary heart disease using the Framingham Risk Score
2. Calculate the survival rate of a person over a span of time depending on the model based on currently entered data using:
  - (a) TIMI Risk Score
  - (b) GRACE Risk Score
  - (c) Heart Score
3. Include notes on steps to take to lower the risk of the disease or the risk of death
4. View statistical information about coronary heart disease based on the data of all patients entered in the calculator and saved in the database by choosing a category and generating:
  - (a) Bar graphs
  - (b) Pie charts
  - (c) Text summarization
5. View background regarding coronary heart disease which includes causes, signs and symptoms, treatment, and prevention guidelines
6. Export a PDF format of the report of information or the results



## **D. Significance of the Project**

Still remaining as one of the top causes of death in the country, CHD prediction is essential in order to take certain measures or precautions to prevent high risk in the succeeding years. Early diagnosis of the disease allows time for the optimal treatment or the appropriate care needed. This is crucial since a certain length of time is allotted for various measures to be incorporated into a routine that eventually becomes the new lifestyle of the person. Having an estimated survival rate prepares the patient and the family physically, mentally, emotionally, and financially.

The risk assessment scores stated in the PHA guidelines integrated in this calculator would allow an estimate of the risk using the different score models [9] whose results are displayed in comparison with each other with their own interpretations. The probability calculated is based on the dataset of CHD cases from the Philippines.

## **E. Scope and Limitations**

1. The system does not validate the data entered by the user. It calculates the result based on the assumption that the data provided is true. The survival measurement calculator assumes that the user or the patient data provided is from a diagnosed coronary heart disease patient.
2. The data fields and results are based on Philippine Heart Association guidelines for the diagnosis of coronary heart disease.
3. The system only focuses on coronary heart disorder of the cardiovascular disease. The parameters are only related to the factors that may affect the heart of the patient based on the model used.
4. The patient data that are processed in the statistical analysis is only limited

on the dataset provided by the health offices which are assumed accurate and complete.

5. The online calculator serves only as a form of reference for the users and not as an entire alternative form of initial diagnosis. It is still recommended to visit a medical professional especially if the result is a high risk for heart disease.

## **F. Assumptions**

1. The user has valid coronary heart disease data that will be entered in the calculator.
2. The user knows the purpose of the calculator and understands the results generated.

## II. Review of Related Literature

In the guidelines released by the Philippine Heart Association, risk assessments used scores from different types of test. Those indicated are the Framingham risk score [10] to predict risk of coronary heart disease and Thrombolysis in Myocardial Infarction (TIMI) risk score, Global Registry of Acute Coronary Events (GRACE) risk model and Heart score model to predict the risk of death or myocardial infarction [9] with GRACE being the most effective and easiest tool to use for calculating the risk of death according to the analysis made by Khalill et. al. [11]. The GRACE calculator can classify the risk of death of a patient or the risk of myocardial infarction. The variables for each model will be discussed further in Chapter 3.

The variables, that were included in the calculator, to predict the risk of coronary heart disease was studied by Wilson et. al. [12]. The same variables are still used today to predict the risk using the Framingham risk score model.

Another risk score model was applied in predicting mortality in patients with acute myocardial infarction in a study by Huang et. al. [13]. This model is the Sequential Organ Failure Assessment (SOFA) score. The attributes considered in this model is the respiration, coagulation, liver bilirubin, hypotension, coma scale, and creatinine. The SOFA score was compared to TIMI and GRACE risk score. The difference was that TIMI and GRACE scores were calculated based on initial history, ECG and laboratory tests on admission while SOFA score was calculated at the time of hospitalization. The accuracy in predictability of each model was compared by getting the area under receiver operating characteristic curve where TIMI model got 0.67, GRACE model got 0.73, and SOFA model got 0.79; thus, making GRACE and SOFA significantly better for predicting mortality.

A study by Paredes et. al. [14] implemented a Matlab tool that tried to improve the risk score models by addressing the weaknesses of the stated risk score models. The study compared the results with the combination of other risk models like

GRACE, TIMI, and PURSUIT. This system calculates the risk of the patient but still being able to do configurations in adjusting the parameters from global to specific populations. Some of the variables included in determining the risk were age, sex, risk factors, aspirin intake, known history of cardiac arrests, angina, Killip class, systolic blood pressure, and creatinine. This system made use of the Bayesian approach.

Another study that also used Bayesian approach was by Sarkar and Koehler [15]. They introduced another risk score model that is dynamic in a way that it combines heart failure diagnostic information from the Bayesian belief network. The main focus of the study is to identify the risk for heart failure. Among the variables that were collected from diagnosis and combined in the network were heart rates, patient activity, and fibrillations. The network used allowed inclusion of more variables like B-type natriuretic peptide, measures of renal dysfunction, blood pressure, and respiration rate, which can also determine risk of heart failure, to the model.

Another application of Bayes theorem was presented in a study by Alizadehsani et. al. [16]. It was cross-validated with other cost-sensitive algorithms to determine which generates the highest sensitivity and accuracy in the diagnosis of coronary heart disease. The tested algorithms in the study were Naive Bayes, Sequential Minimal Optimization (SMO), K-Nearest neighbors (KNN), Support Vector Machine (SVM), and C4.5. These data mining algorithms were alternatives to angiography which was the primary mode for diagnosis but considered costly and complicated. The SMO algorithm got the highest accuracy in diagnosis compared to other algorithms with or without using the cost matrix.

Other approaches include the use of an ensemble PSO-based approach. According the Hedeshi and Abadeh [17], Particle Swarm Optimization (PSO) was successfully used in data mining field to extract a set of rules for diagnosis of coronary heart disease. The study also used the boosting algorithm by Hoffman which applies a weak learning algorithm on the data and combine separate classifiers into a single

classifier. The approach was a cooperation between fuzzy rules that generate with PSO metaheuristic. The proposed method got 92.59% accuracy compared to other classifiers using the same dataset and produces results that are interpretable. Patients were diagnosed either as health or subject to possible CHD.

Fuzzy classifier was also used in a study by Chitra and Seenivasagam [18]. A new unsupervised classification system called the Fuzzy C Means classifier is used to categorize the preprocessed patient records. The algorithm is given thirteen attributes to classify. The attributes considered are age, sex, chest pain, resting blood pressure, cholesterol, blood sugar, ECG, maximum heart rate, angina, old peak, ST segment slope, major vessels, and thalac. The C Means classifier was compared to other models like Artificial Neural Network, and K-Means Clustering. This proposed algorithm was found to be more efficient in predicting the risk of heart and is cost effective compared to other algorithms with C Means having 92% accuracy compared to 85% and 88 %. It was also implemented using a MatLab tool.

According to the study, the proposed cost-sensitive algorithms previously stated can be used in diagnosing other diseases like cancer. Risk calculators for other disease also exist that makes use of data mining algorithms. An example would be the prototype of a mortality risk calculator by Agrawal et. al. [19] for lung cancer. The developers made use of the Surveillance, Epidemiology, and End Results (SEER) Program dataset attributes and performed an analysis of the outcome. The same method was applied to a special problem by Meren in a breast cancer survival measurement calculator [20]. Both studies used the WEKA toolkit for data mining.

In a breast cancer risk assessment study by Ribeiro et. al. [21], a fuzzy set theory and logic based assessment was proposed. It accepted the minimum number of inputs of age, menopause, simplified fuzzy body mass index, and hormone replacement. The proposed decision support system served as an alternative tool for breast cancer risk assessment.

Fuzzy logic was also used in determining Parkinson's Disease risk. According to Liu et. al. [22], diagnosis of Parkinson's Disease depended on the traditional neurological exams and experience of doctors. Since video games were a possible way for Parkinson's Disease rehabilitation where physical and mental conditions improve, the fuzzy logic based predictor was implemented in a tablet game tailored for Parkinson's Disease diagnosis. The risk is calculated using the combination of three ability measurements that are analyzed based from the three tasks in the game.

A risk calculator was also called FRAX was also used in a study by Anburajan et. al. [23] for screening for osteoporotic fracture risk focusing in South Indian rural population for people under ages 50 years and above. Prevention of the first osteoporotic fracture was said to be better than cure. The device used to detect osteoporotic fracture is the central dual energy x-ray absorptiometry (DXA) bone densitometer. It was however expensive and not widely available. The calculator served as an alternative to predict osteoporotic fracture risk.

These approaches and other related systems usually used data mining techniques to preprocess the dataset and made use of different clustering algorithms to finally classify the data.

### III. Theoretical Framework

#### A. Coronary heart disease

Coronary heart disease (CHD) is caused by a blockage in the main arteries of the heart by atheromatous plaque, a congenital abnormality of the arteries, a myocardial bridging, problems in vasculitides, and an induction from radiation [9]. The disease is also known as coronary artery disease (CAD) or ischemic heart disease (IHD). Most of the times, acute coronary syndrome (ACS) is used instead of CHD, but ACS is actually just a subcategory of CHD [24] [25].

Atheromatous, atherosclerotic, or the process atherosclerosis means the build-up of fatty material inside the arteries. The formation of patches or plaque causes the blood vessel to become narrower thus reducing the blood flow. The blood clot that results from this can cause a heart attack if it developed in the coronary artery [26] [25].

Going back to the subcategories of CHD, it could either be Acute Coronary Syndrome or Stable Ischemic Heart Disease (SIHD). ACS can be further sorted under Non-ST Elevation Acute Coronary Syndrome (NSTEMI) and or ST-elevation Acute Coronary Syndrome. The former can still be distinguished as Unstable Angina (UA) or Non-ST Elevation Myocardial Infarction (NSTEMI). It is shown in the flowchart on the next page from the guidelines [9].

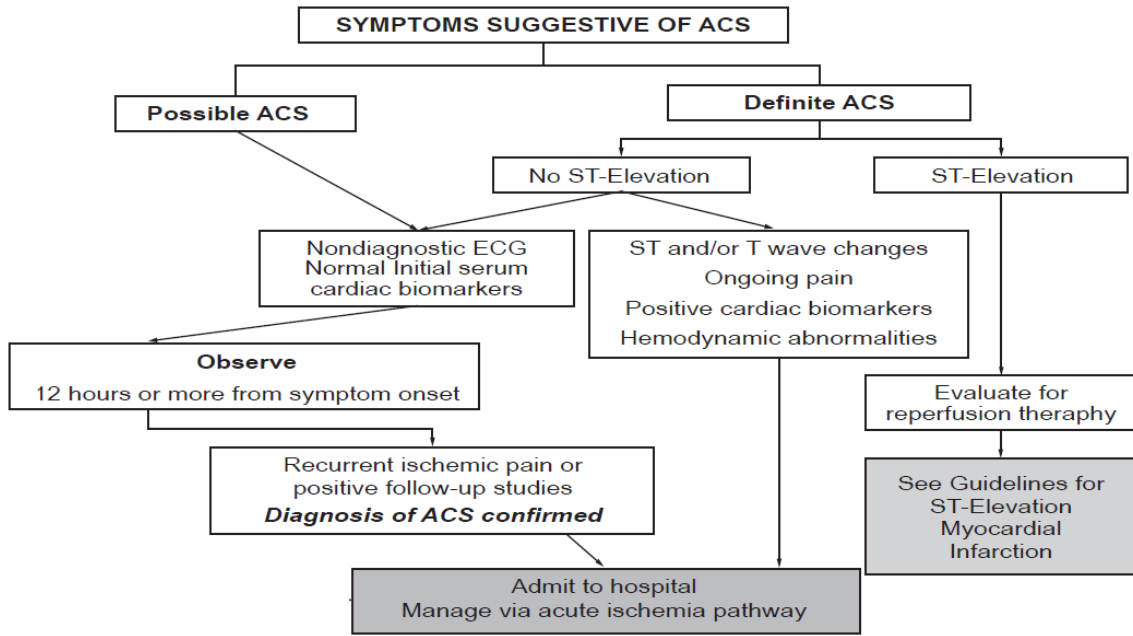


Figure 1: Algorithm for the evaluation and management of patients suspected to have ACS upon medical contact



## B. Prediction and survival

The Framingham risk model is the one indicated by the Philippines Heart Association [10] in determining the risk for coronary heart disease. Framingham risk model makes use of points by category to predict the risk. The point system and the corresponding probability are as follows.

For the risk points per predictor and the corresponding probability for each total number of points of males, see Figure 2 and Table 1 from the NLHBI website [27].

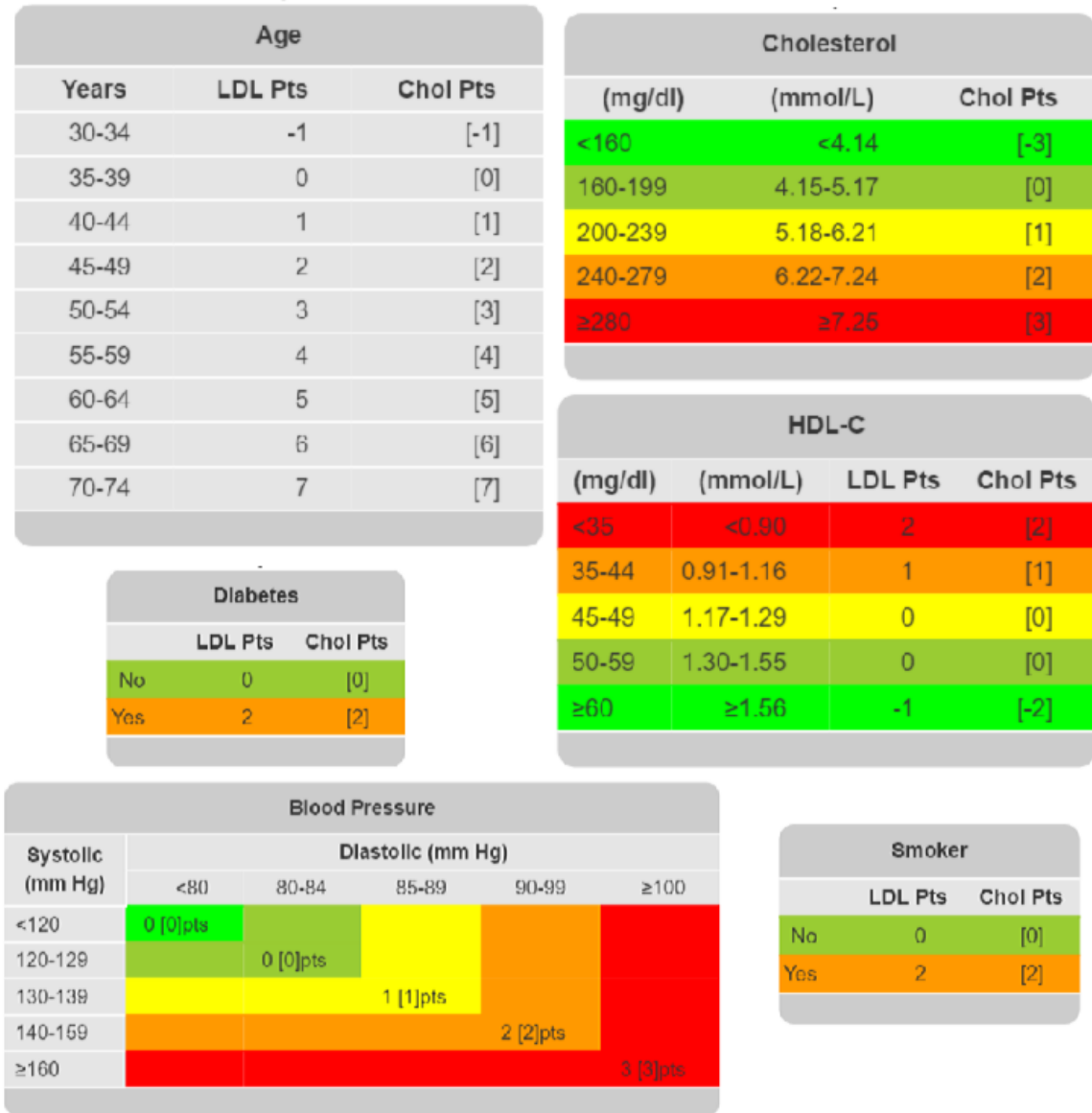


Figure 2: Risk Points for Each Predictor for Men

For the risk points per predictor and the corresponding probability for each total number of points of females, see Figures 3 and Table 1 from the NLHBI website [27].

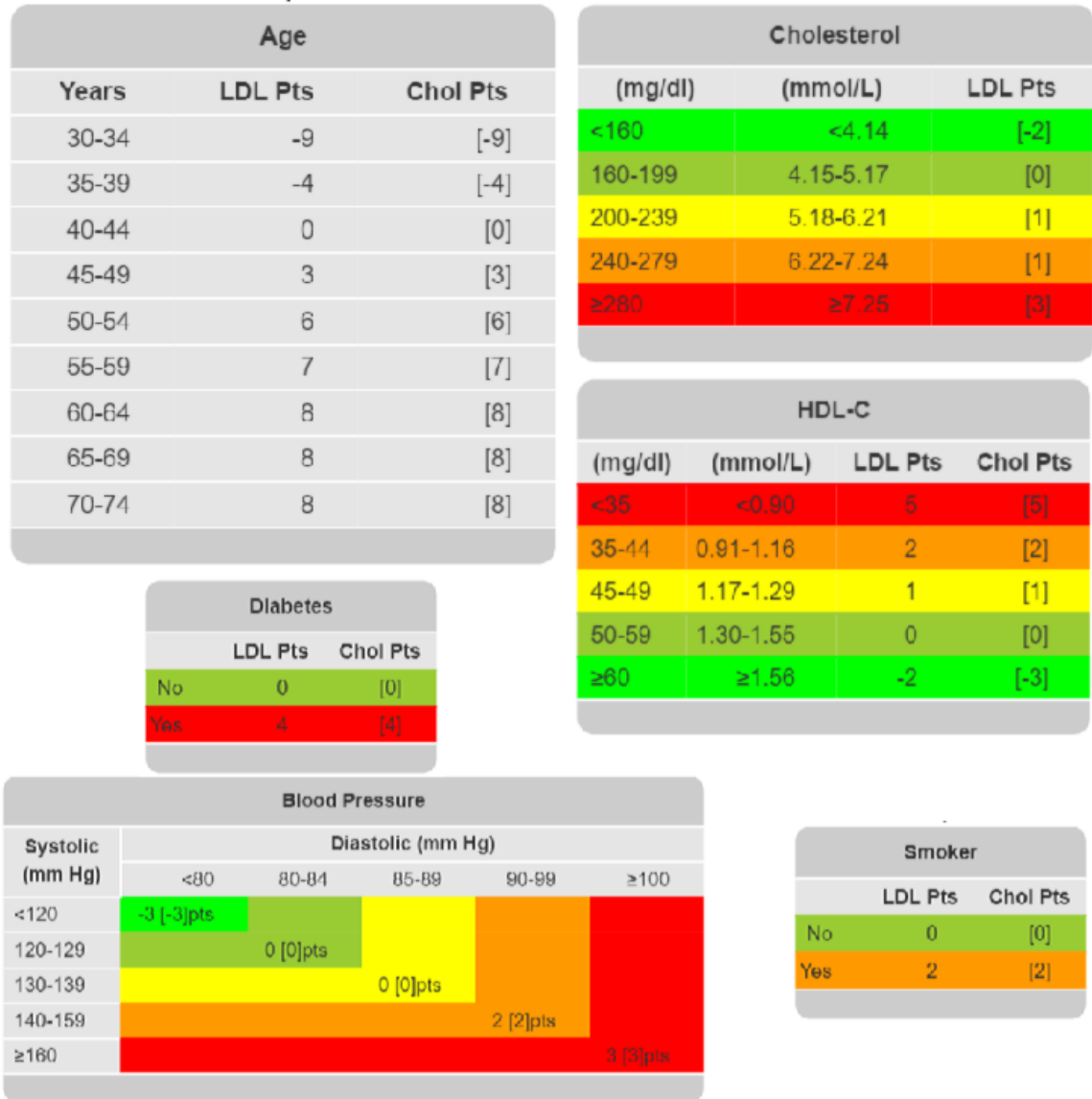


Figure 3: Risk Points for Each Predictor for Women

Table 1: 10 Yr CHD Risk for Men and Women

Points	Risk for Men	Risk for Women
<-2	2%	1%
-1	2%	2%
0	3%	2%
1	3%	2%
2	4%	3%
3	5%	3%
4	7%	4%
5	8%	4%
6	10%	5%
7	13%	6%
8	16%	7%
9	20%	8%
10	25%	10%
11	31%	11%
12	37%	13%
13	45%	15%
14	$\geq 53\%$	18%
15	$\geq 53\%$	20%
16	$\geq 53\%$	24%
$\geq 17$	$\geq 53\%$	27%

To determine the mortality of the patient over a span of time, the Philippine Heart Association [9] mentioned three prediction models namely the TIMI risk score, GRACE risk score, and Heart risk score models. Each risk model has the following variables as shown in Figure 4.

<b>TIMI risk Score (7 variables)</b>	<b>GRACE risk model (8 variables)</b>	<b>HEART score model (5 variables)</b>
Age 65 years or older	Older Age	History
At least 3 risk factors for CAD	Heart rate	ECG
Prior coronary stenosis of 50% or more	Systolic blood pressure	Age
ST-segment deviation on ECG presentation	ST segment depression	Risk factors
At least 2 anginal events in prior 24 hours	Killip classification	Troponin
Elevated serum cardiac biomarkers	Positive initial cardiac markers	
Use of aspirin in prior 7 days	Serum creatinine	
	Cardiac arrest at hospital arrival	

Figure 4: Variables used in risk models used in the assessment of risk of death and myocardial infarction in patients with NSTEMI and UA

The point system for TIMI risk score model is shown in Figure 5.

TIMI risk score	Outcome rate through 14 days after randomization (%)
0-1	4.7
2	8.3
3	13.2
4	19.9
5	25.2
6-7	40.9

Figure 5: Rate of outcome of all-cause mortality using TIMI risk score

The point system for GRACE risk score model is no longer fixed for all probability queries for a certain time. There are specific

The methods and formulas [28] that were used to calculate the corresponding probability of death for the GRACE risk score model are as follows. Univariate and multivariate logistic regression analysis was used to obtain the estimates [29].

### **Granger Model for In-hospital death**

$$X\beta = -7.7035 + (0.0531)A + (0.0087)B + (0.00168)C +$$

$$(0.1823)D + (0.6931)E + (1.4586)F + (0.47)G + (0.8755)H$$

where

$X$  = individual patient's value for each factor

$\beta$  = estimates/coefficients

Intercept =  $-7.7035$

$A$  = Age(per1yr)

$B$  = Pulse(per1bpm)

$C$  = SystolicBloodPressure(per1mmHg)

$D$  = InitialSerumCreatinine, mg, dL

$E$  = KillipClass(1, 2, 3, or 4)

$F$  = CardiacArrestatPresentation

$G$  = InitialCardiacEnzymePositive

$H$  = STSegmentDeviation

The corresponding probability is:

$$P = (\exp^{X\beta}) / (1 + \exp^{X\beta})$$

### **Fox Model for death between hospital admission and 6 months later**

Figure 6 shows the corresponding probability for different ranges of scores for the patient in the span of time between hospital admission and six months later.

Score	Prob	Score	Prob	Score	Prob
6	0.2	132	12	174	40
27	0.4	134	13	183	50
39	0.6	137	14	191	60
48	0.8	139	15	200	70
55	1.0	141	16	208	80
60	1.2	143	17	219	90
65	1.4	145	18	285	99
69	1.6	147	19		
73	1.8	149	20		
76	2	150	21		
88	3	152	22		
97	4	153	23		
104	5	155	24		
110	6	156	25		
115	7	158	26		
119	8	159	27		
123	9	160	28		
126	10	162	29		
129	11	163	30		

Figure 6: Score relation to probability of death between admission and 6 months later

The following shows the estimates and equations used to compute for the probability of 1-year to 3-year death and/or myocardial infarction. Cox regression analysis was used to get the coefficients [30].

#### Model for 1-year death/MI probability calculations

$$\begin{aligned}
 X\beta = & (0.14677)A + (0.01797)B + (0.04230)C + (-0.15965)D + \\
 & 0.53625)E + (0.68594)F + (1.15850)G + (0.67071)H + \\
 & (0.22710)I + (0.32831)J
 \end{aligned}$$

The corresponding probability is:

$$P = (1 - 0.9983577131(\exp^{X\beta})) * 100$$

#### Model for 1-year death probability calculations

$$X\beta = (0.41157)A + (0.08222)B + (0.13138)C + (-0.51259)D +$$

$$(0.63827)E + (0.85325)F + (1.29372)G + (0.87185)H + \\ (0.37660)I + (0.44303)J$$

where

X = individual patient's value for each factor

$\beta$  = estimates/coefficients

A = Age(per10yrs)

B = SystolicBloodPressure(per – 20mmHg)

C = Pulse(per1bpm)

D = InitialSerumCreatinine, mg, dL

E = KillipClassII)

F = KillipClassIII

G = KillipClassIV

H = CardiacArrestatPresentation

I = InitialCardiacEnzymePositive

J = StSegmentDeviation

The corresponding probability is:

$$P = (1 - 0.9983577131(\exp^{X\beta})) * 100$$

### Model for 3-year death/MI probability calculations

$$X\beta = (0.43299)A + (0.14521)B + (0.18097)C + (0.35945)D + \\ (0.21991)E + (1.06610)F + (1.06610)G + (0.61622)H + (0.42540)I$$

The corresponding probability is:

$$P = (1 - 0.9875014749^{exp^{X\beta}}) * 100$$

### Model for 3-year death probability calculations

$$X\beta = (0.60935)A + (-0.17646)B + (-0.05444)C + (0.39403)D + \\ +(0.08466)E + (0.82842)F + (0.82842)G + (1.07623)H + (0.41228)I$$

where

$X$  = individual patient's value for each factor

$\beta$  = estimates/coefficients

$A$  = Age(per10yrs)

$B$  = SystolicBloodPressure(per - 20mmHg)

$C$  = Pulse(per1bpm)

$D$  = InitialSerumCreatinine, mg, dL

$E$  = KillipClassII)

$F$  = KillipClassIII

$G$  = KillipClassIV

$H$  = CardiacArrestatPresentation

$I$  = InitialCardiacEnzymePositive

The corresponding probability is:

$$P = (1 - 0.9998715509^{exp^{X\beta}}) * 100$$

For the Heart Score point system, it is shown in Figures 7 and 8 from PHA guidelines [9] and Heart Score website [31].



Variable		Added score
History	Highly suspicious	2
	Moderately suspicious	1
	Slightly suspicious	0
ECG	Significant ST deviation	2
	Non-specific depolarization	1
	No	0
Age	>= 65 years	2
	45 – 65 years	1
	< 45 years	0
Risk Factors	>= 3 risk factors or treated atherosclerosis	2
	1 or 2 risk factors	1
	No risk factors known	0
Troponin	> 3x normal limit	2
	1-3x normal limit	1
	</= normal limit	0

Figure 7: HEART score model

HEART Score	Risk of MACE	Proposed Policy
0 - 3	1,6%	Discharge
4 - 6	13%	X-ECG
7 - 10	50%	CAG

Figure 8: Proposed Policy

## C. Difference of coronary heart disease to other types of cardiovascular disease

Cardiovascular diseases (CVDs) focuses on the major disorders of the heart and the main circulation that supplies the heart, brain, and peripheral tissues [32]. Coronary heart disease is just one of the cardiovascular disorders. A more general grouping of the cardiovascular disorders would be the CVDs due to atherosclerosis and other CVDs.

The following are the different types of cardiovascular disease:

1. CVDs due to atherosclerosis:
  - (a) Ischemic heart disease or coronary artery disease
  - (b) Cerebrovascular disease
  - (c) Diseases of the aorta and arteries, including hypertension and peripheral vascular disease
2. Other CVDs
  - (a) Congenital heart disease
  - (b) Rheumatic heart disease
  - (c) Cardiomyopathies
  - (d) Cardiac arrhythmias [33]

The atherosclerotic plaque that causes the narrowing of the inner walls of blood vessels ends up breaking. This leads to the formation of blood clots that can develop in the artery or in the brain. Most atherosclerotic diseases are usually classified into coronary heart disease and cerebrovascular disease. The disease is categorized under coronary heart if the blood clot develops in the artery and results in heart attacks while it is categorized under cerebrovascular if the clot develops in the brain and

results in strokes. If the clot developed in blood vessels other than the heart and brain, usually the blood vessels in the legs, it is classified under peripheral vascular disease. Hypertension is the increase of blood pressure that pushes too much blood in the heart and the blood vessels that eventually causes disease [33] [34].

The other CVDs that are stated above are caused by other factors. From the name itself, Rheumatic heart disease is caused by rheumatic fever attacks that damages the heart valves and muscles. It usually follows a streptococcal pharyngitis/tonsillitis which scared the valves making them not to open and close normally. Congenital heart disease is a malformation of heart structures that are already present at birth that includes holes in the septum of the heart, abnormality in valves and heart chambers. Cardiomyopathy and cardiac arrhythmias are disorders of the heart muscles and electrical conduction system, respectively, which are less usual than heart attacks and strokes [33].

#### **D. Philippine Heart Association**

Philippine Heart Association is an organization of expert cardiologists in the Philippines. It has many departments under it and coronary heart disease, or more specifically, acute coronary syndrome is also included.

With the vision and mission of ensuring accessible, affordable and quality cardiovascular education and care for every Filipino as well as preventing and managing cardiovascular diseases [35], they created the book of guidelines for diagnosing and managing CHD [1] which was the basis of this study. They also provided the dataset which contains ACS patient information from different hospital over a span of years for this study.

## **E. CodeIgniter**

CodeIgniter [36] is an open-source PHP framework for web application development. It is small in size and is compatible with almost all hosting platforms. It also supports the use of database. It is not strict in coding but allows the use of Model-View-Controller configuration.

## IV. Design and Implementation

### A. Context Diagram

The website has one intended user, the clinicians. However, patients could still use the website if they know the necessary data needed in the forms. The clinicians would input the patient data into the form in the website and then the calculators would estimate the risk of coronary heart disease risk of an undiagnosed patient or the risk of death or myocardial infarction of a diagnosed CHD patient. The user can generate reports based on the database filled with information from the patient data in the calculator. The reports and the results from the calculator as well as the data can be saved in PDF format.

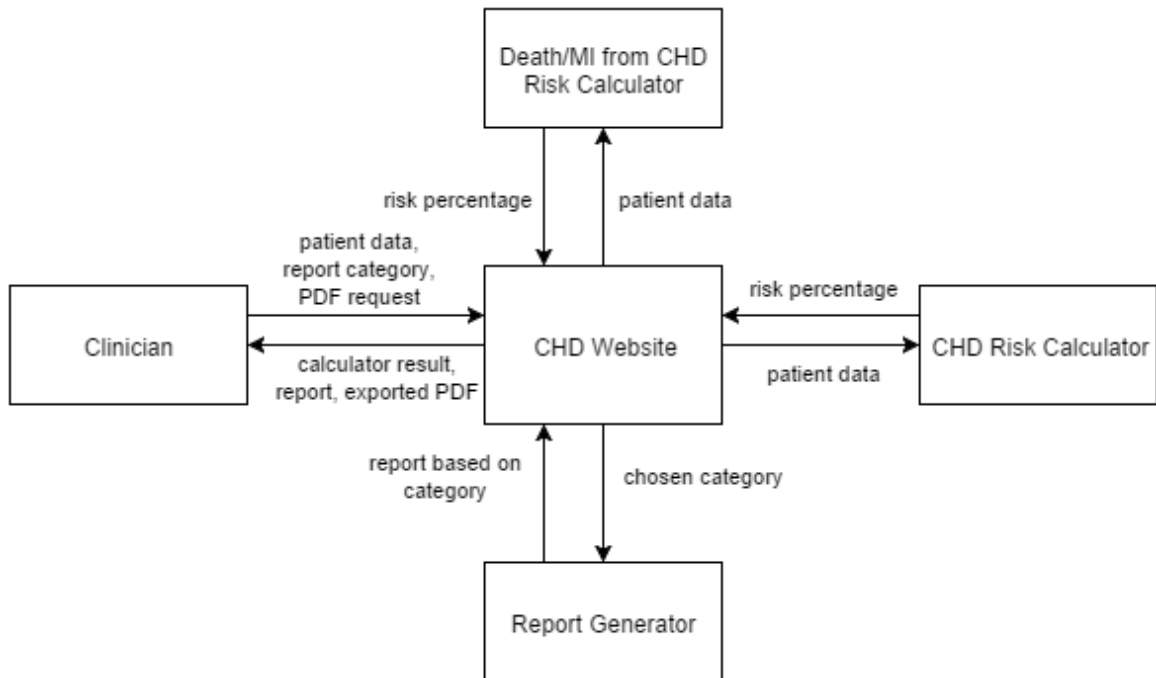


Figure 9: Context diagram

### B. Use Case Diagram

The user, which is the clinician, can use the website as calculator or report generator. The calculators use the different models as stated in Figure 10 to compute for the

estimated risk. Information entered in the calculator is saved in the database which can be used later to generate a report. These results and reports can be saved as a PDF and PNG file, respectively.

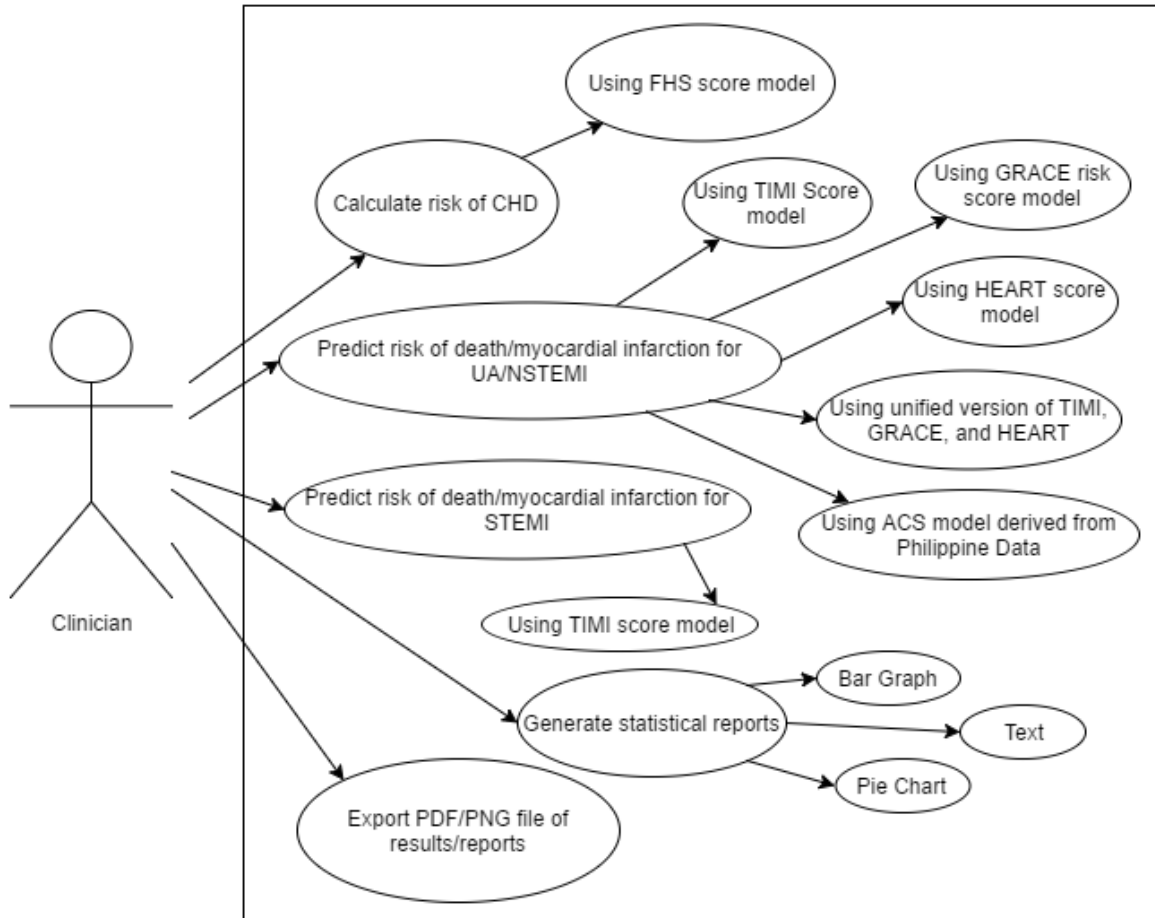


Figure 10: Use Case Diagram

### C. Entity Relationship Diagram

Since there is only one user with one patient data to be entered in the form per calculation, the tables in the database are as follows. The following variables are also the ones needed in the generation of reports. The tables and fields under them are based from the dataset groupings provided by PHA CAD registry for the regression analysis. It can be seen in Figure 47.

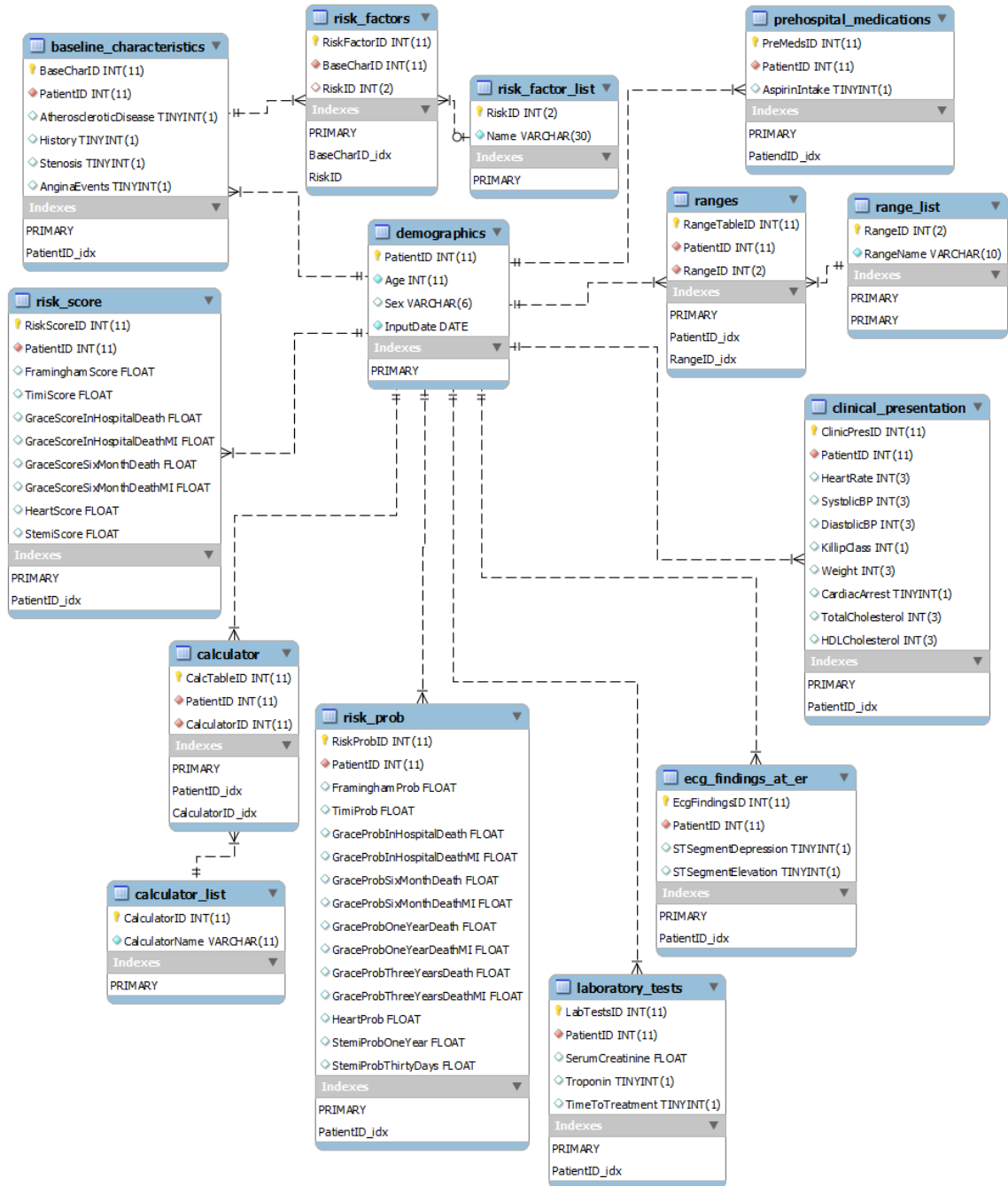


Figure 11: Entity Relationship Diagram

## D. Data Dictionary

The tables used in the database with their corresponding fields and data types as well as relationship are displayed in Figures 12, 13, 14, 15, 16, 17, 18, 19, 22, 23, 24, and

25.

Column	Type	Null	Default	Links to	Comments	MIME
BaseCharID	int(11)	No				
PatientID	int(11)	No		demographics -> PatientID		
AtheroscleroticDisease	tinyint(1)	Yes	NULL			
History	tinyint(1)	Yes	NULL			
Stenosis	tinyint(1)	Yes	NULL			
AnginaEvents	tinyint(1)	Yes	NULL			

Figure 12: Baseline Characteristics Table

Column	Type	Null	Default	Comments	MIME
CalculatorID	int(11)	No			
CalculatorName	varchar(11)	No			

Figure 13: Calculator List Table

Column	Type	Null	Default	Links to	Comments	MIME
CalcTableID	int(11)	No				
PatientID	int(11)	No		demographics -> PatientID		
CalculatorID	int(11)	No		calculator_list -> CalculatorID		

Figure 14: Calculator Table

Column	Type	Null	Default	Links to	Comments	MIME
ClinicPresID	int(11)	No				
PatientID	int(11)	No		demographics -> PatientID		
HeartRate	int(3)	Yes	NULL			
SystolicBP	int(3)	Yes	NULL			
DiastolicBP	int(3)	Yes	NULL			
KillipClass	int(1)	Yes	NULL			
Weight	int(3)	Yes	NULL			
CardiacArrest	tinyint(1)	Yes	NULL			
TotalCholesterol	int(3)	Yes	NULL			
HDLCholesterol	int(3)	Yes	NULL			

Figure 15: Clinical Presentation Table



Column	Type	Null	Default	Comments	MIME
PatientID	int(11)	No			
Age	int(11)	No			
Sex	varchar(6)	Yes	<i>NULL</i>		
InputDate	date	No			

Figure 16: Demographics Table

Column	Type	Null	Default	Links to	Comments	MIME
EcgFindingsID	int(11)	No				
PatientID	int(11)	No		demographics -> PatientID		
STSegmentDepression	tinyint(1)	Yes	<i>NULL</i>			
STSegmentElevation	tinyint(1)	Yes	<i>NULL</i>			

Figure 17: ECG Findings at ER Table

Column	Type	Null	Default	Links to	Comments	MIME
LabTestsID	int(11)	No				
PatientID	int(11)	No		demographics -> PatientID		
SerumCreatinine	float	Yes	<i>NULL</i>			
Troponin	tinyint(1)	Yes	<i>NULL</i>			
TimeToTreatment	tinyint(1)	Yes	<i>NULL</i>			

Figure 18: Laboratory Tests Table

Column	Type	Null	Default	Links to	Comments	MIME
PreMedsID	int(11)	No				
PatientID	int(11)	No		demographics -> PatientID		
AspirinIntake	tinyint(1)	Yes	<i>NULL</i>			

Figure 19: Pre-hospital Medications Table

Column	Type	Null	Default	Comments	MIME
RangeID	int(2)	No			
RangeName	varchar(10)	No			

Figure 20: Range List Table

Column	Type	Null	Default	Links to	Comments	MIME
RangeTableID	int(11)	No				
PatientID	int(11)	No		demographics -> PatientID		
RangeID	int(2)	No		range_list -> RangeID		

Figure 21: Ranges Table

Column	Type	Null	Default	Comments	MIME
RiskID	int(2)	No			
Name	varchar(30)	No			

Figure 22: Risk Factor List Table

Column	Type	Null	Default	Links to	Comments	MIME
RiskFactorID	int(11)	No				
BaseCharID	int(11)	No		baseline_characteristics -> BaseCharID		
RiskID	int(2)	Yes	<i>NULL</i>	risk_factor_list -> RiskID		

Figure 23: Risk Factors Table

Column	Type	Null	Default	Links to	Comments	MIME
RiskProbID	int(11)	No				
PatientID	int(11)	No		demographics -> PatientID		
FraminghamProb	float	Yes	NULL			
TimiProb	float	Yes	NULL			
GraceProbInHospitalDeath	float	Yes	NULL			
GraceProbInHospitalDeathMI	float	Yes	NULL			
GraceProbSixMonthDeath	float	Yes	NULL			
GraceProbSixMonthDeathMI	float	Yes	NULL			
GraceProbOneYearDeath	float	Yes	NULL			
GraceProbOneYearDeathMI	float	Yes	NULL			
GraceProbThreeYearsDeath	float	Yes	NULL			
GraceProbThreeYearsDeathMI	float	Yes	NULL			
HeartProb	float	Yes	NULL			
StemiProbOneYear	float	Yes	NULL			
StemiProbThirtyDays	float	Yes	NULL			

Figure 24: Risk Probabilities Table

Column	Type	Null	Default	Links to	Comments	MIME
RiskScoreID	int(11)	No				
PatientID	int(11)	No		demographics -> PatientID		
FraminghamScore	float	Yes	NULL			
TimiScore	float	Yes	NULL			
GraceScoreInHospitalDeath	float	Yes	NULL			
GraceScoreInHospitalDeathMI	float	Yes	NULL			
GraceScoreSixMonthDeath	float	Yes	NULL			
GraceScoreSixMonthDeathMI	float	Yes	NULL			
HeartScore	float	Yes	NULL			
StemiScore	float	Yes	NULL			

Figure 25: Risk Scores Table

## E. Technical Architecture

The website is accessible in any browser and in any device with internet connection.

The framework used is CodeIgniter and is programmed in PHP. The database used

is MySQL.

## F. Algorithm for processing the calculator inputs

The following are the final models used for TIMI and GRACE risk score probability derived from the ACS patient dataset from PHA after the multivariate logistic regression analysis is applied.

**Final model based on GRACE risk score predictors for In-hospital death derived from Philippine Dataset**

$$X\beta = -7.0278038 + (0.0465080)A + (0.0110288)B + (-0.0077314)C + (-0.0003771)D + (0.7680730)E + (-0.2271102)F + (0.3134368)G + (0.1640661)H$$

where

$X$  = individual patient's value for each factor

$\beta$  = estimates/coefficients

*Intercept* = -7.7035

$A$  = *Age(per1yr)*

$B$  = *Pulse(per1bpm)*

$C$  = *SystolicBloodPressure(per1mmHg)*

$D$  = *InitialSerumCreatinine, mg, dL*

$E$  = *KillipClass(1, 2, 3, or4)*

$F$  = *CardiacArrestatPresentation*

$G$  = *InitialCardiacEnzymePositive*

$H$  = *StSegmentDeviation*

The corresponding probability is:

$$P = (\exp^{X\beta}) / (1 + \exp^{X\beta})$$

**Final model based on TIMI risk score predictors derived from Philippine Dataset**

$$X\beta = -1.54579 + (1.13892)A + (-2.02774)B + (0.37284)C + \\ (0.30248)D + (0.01915)E + (0.41757)F + (-0.07290)G$$

where

$X$  = individual patient's value for each factor

$\beta$  = estimates/coefficients

Intercept = -7.7035

$A$  = Age(per1yr)

$B$  = Risk

$C$  = Stenosis

$D$  = StSegmentDeviation

$E$  = Angina

$F$  = InitialCardiacMarkers

$G$  = AspirinIntake

The corresponding probability is:

$$P = (\exp^{X\beta}) / (1 + \exp^{X\beta})$$

## V. Results

### A. Regression Analysis

The participants included in the analysis were the the ACS patients diagnosed with UA/NSTEMI with at least an ST-segment deviation on the qualifying ECG, a history of CHD, or elevated serum cardiac markers for TIMI [37] and GRACE [30] risk score models.

The exclusion criteria were planned revascularization in less than 24 hours, a correctable cause of angina, and contraindications to anticoagulation and patients with ST-elevation on admission ECG or new left bundle branch block [37] [30].

Lastly for the HEART score, according to an email with Dr. Johannes Kelder and Dr. Barbara Backus [38], the HEART score was designed entirely a priori; therefore, the coefficients used for the 5 predictors of the HEART score “were all pre-specified quite uniquely”. The study they did was just to calculate how well the HEART score is in predicting an event for patients with chest pain [39].

The following images show the logistic regression analysis done with the dataset provided by PHA in RStudio version 3.2.1.

Following the same steps of analysis [37] just to initially compare the significance of each predictor, whether they should be included in the final model or not, univariate logistic regression analysis was applied.

The variables chosen in the Philippine dataset are based on the already selected predictors in each risk score model. The goal in this analysis is to compare if the same variables are significant in predicting the risk. Even if the variables are not significant enough in the first step, it will still be included in the final model to compare how much change in the probability there will be when integrated in the system. The dataset was split into training set and test set randomly. The field values of Yes or No where normalized into 1s and 0s.

```

[[1]]
Call:
glm(formula = formula, family = binomial(link = "logit"), data = trainingSet)

Deviance Residuals:
    Min       1Q   Median       3Q      Max
-0.8316 -0.4158 -0.3254 -0.2469  2.7495

Coefficients:
            Estimate Std. Error z value Pr(>|z|)
(Intercept) -6.347758  0.645027  -9.841 < 2e-16 ***
age          0.056327  0.009138   6.164 7.1e-10 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

(Dispersion parameter for binomial family taken to be 1)

    Null deviance: 722.98  on 1452  degrees of freedom
Residual deviance: 681.55  on 1451  degrees of freedom
AIC: 685.55

Number of Fisher Scoring iterations: 6

```

```

[[2]]
Call:
glm(formula = formula, family = binomial(link = "logit"), data = trainingSet)

Deviance Residuals:
    Min       1Q   Median       3Q      Max
-1.1910 -0.3836 -0.3534 -0.3255  2.8262

Coefficients:
            Estimate Std. Error z value Pr(>|z|)
(Intercept) -3.975043  0.353496 -11.245 < 2e-16 ***
heart_rate   0.015412  0.003659   4.212 2.53e-05 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

(Dispersion parameter for binomial family taken to be 1)

    Null deviance: 722.98  on 1452  degrees of freedom
Residual deviance: 707.05  on 1451  degrees of freedom
AIC: 711.05

Number of Fisher Scoring iterations: 5

```

```

[[3]]
Call:
glm(formula = formula, family = binomial(link = "logit"), data = trainingSet)

Deviance Residuals:
    Min       1Q   Median       3Q      Max
-0.6608 -0.3916 -0.3744 -0.3269  2.6087

Coefficients:
            Estimate Std. Error z value Pr(>|z|)
(Intercept) -1.410525  0.395837  -3.563 0.000366 ***

```

Figure 26: Univariate Analysis following GRACE risk score predictors Pt. 1

```

systolic_bp -0.009325  0.003054  -3.053 0.002263 **
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

(Dispersion parameter for binomial family taken to be 1)

    Null deviance: 722.98  on 1452  degrees of freedom
Residual deviance: 714.08  on 1451  degrees of freedom
AIC: 718.08

Number of Fisher Scoring iterations: 5

[[4]]

Call:
glm(formula = formula, family = binomial(link = "logit"), data = trainingSet)

Deviance Residuals:
    Min       1Q   Median       3Q      Max
-0.4182 -0.4182 -0.3558 -0.3558  2.3629

Coefficients:
            Estimate Std. Error z value Pr(>|z|)
(Intercept)   -2.7283    0.1311 -20.813  <2e-16 ***
st_seg_depression  0.3353    0.2161  1.552   0.121
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

(Dispersion parameter for binomial family taken to be 1)

    Null deviance: 722.98  on 1452  degrees of freedom
Residual deviance: 720.63  on 1451  degrees of freedom
AIC: 724.63

Number of Fisher Scoring iterations: 5

[[5]]

Call:
glm(formula = formula, family = binomial(link = "logit"), data = trainingSet)

Deviance Residuals:
    Min       1Q   Median       3Q      Max
-0.9850 -0.2921 -0.2921 -0.2921  2.5203

Coefficients:
            Estimate Std. Error z value Pr(>|z|)
(Intercept)   -4.0207    0.2177 -18.467  <2e-16 ***
killip_class    0.8874    0.1014  8.747   <2e-16 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

(Dispersion parameter for binomial family taken to be 1)

    Null deviance: 722.98  on 1452  degrees of freedom
Residual deviance: 655.49  on 1451  degrees of freedom
AIC: 659.49

Number of Fisher Scoring iterations: 5

[[6]]

```

Figure 27: Univariate Analysis following GRACE risk score predictors Pt. 2



```

Call:
glm(formula = formula, family = binomial(link = "logit"), data = trainingSet)

Deviance Residuals:
    Min       1Q   Median       3Q      Max
-0.4110 -0.4110 -0.3421 -0.3421  2.3947

Coefficients:
            Estimate Std. Error z value Pr(>|z|)
(Intercept)  -2.8089     0.1552 -18.095  <2e-16 ***
enzymes       0.3800     0.2095  1.814   0.0696 .
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

(Dispersion parameter for binomial family taken to be 1)

    Null deviance: 722.98  on 1452  degrees of freedom
Residual deviance: 719.66  on 1451  degrees of freedom
AIC: 723.66

Number of Fisher Scoring iterations: 5

```

[[7]]

```

Call:
glm(formula = formula, family = binomial(link = "logit"), data = trainingSet)

Deviance Residuals:
    Min       1Q   Median       3Q      Max
-0.3819 -0.3814 -0.3778 -0.3694  2.3550

Coefficients:
            Estimate Std. Error z value Pr(>|z|)
(Intercept) -2.5812754  0.1398970 -18.451  <2e-16 ***
serumCreat  -0.0001853  0.0005121  -0.362   0.718
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

(Dispersion parameter for binomial family taken to be 1)

    Null deviance: 722.98  on 1452  degrees of freedom
Residual deviance: 722.84  on 1451  degrees of freedom
AIC: 726.84

Number of Fisher Scoring iterations: 5

```

[[8]]

```

Call:
glm(formula = formula, family = binomial(link = "logit"), data = trainingSet)

Deviance Residuals:
    Min       1Q   Median       3Q      Max
-0.6039 -0.3745 -0.3745 -0.3745  2.3205

Coefficients:
            Estimate Std. Error z value Pr(>|z|)
(Intercept)  -2.6222     0.1046 -25.06  <2e-16 ***
cardiac_arrest_at_hospital_arrival  1.0127     1.1004  0.92   0.357
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

```

Figure 28: Univariate Analysis following GRACE risk score predictors Pt. 3

(Dispersion parameter for binomial family taken to be 1)

Null deviance: 722.98 on 1452 degrees of freedom  
Residual deviance: 722.30 on 1451 degrees of freedom  
AIC: 726.3

Number of Fisher Scoring iterations: 5

Figure 29: Univariate Analysis following GRACE risk score predictors Pt. 4

```

[[1]]
Call:
glm(formula = formula, family = binomial(link = "logit"), data = trainingSet)

Deviance Residuals:
    Min       1Q   Median       3Q      Max
-0.4769 -0.4769 -0.2746 -0.2746  2.5679

Coefficients:
              Estimate Std. Error z value Pr(>|z|)
(Intercept)  -3.2594     0.1860 -17.519 < 2e-16 ***
ageForTimi    1.1426     0.2255  5.067 4.04e-07 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

(Dispersion parameter for binomial family taken to be 1)

    Null deviance: 722.98  on 1452  degrees of freedom
Residual deviance: 694.81  on 1451  degrees of freedom
AIC: 698.81

Number of Fisher Scoring iterations: 6

```

```

[[2]]
Call:
glm(formula = formula, family = binomial(link = "logit"), data = trainingSet)

Deviance Residuals:
    Min       1Q   Median       3Q      Max
-0.9005 -0.3741 -0.3741 -0.3741  2.3214

Coefficients:
              Estimate Std. Error z value Pr(>|z|)
(Intercept)  -0.6931     1.2247  -0.566  0.571
riskFactors  -1.9312     1.2292  -1.571  0.116

(Dispersion parameter for binomial family taken to be 1)

    Null deviance: 722.98  on 1452  degrees of freedom
Residual deviance: 721.13  on 1451  degrees of freedom
AIC: 725.13

Number of Fisher Scoring iterations: 5

```

```

[[3]]
Call:
glm(formula = formula, family = binomial(link = "logit"), data = trainingSet)

Deviance Residuals:
    Min       1Q   Median       3Q      Max
-0.4652 -0.3732 -0.3732 -0.3732  2.3233

Coefficients:
              Estimate Std. Error z value Pr(>|z|)
(Intercept)  -2.6292     0.1062 -24.750 <2e-16 ***
prior_catherization  0.4602     0.5384  0.855  0.393

```

Figure 30: Univariate Analysis following TIMI risk score predictors Pt. 1

```

---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

(Dispersion parameter for binomial family taken to be 1)

    Null deviance: 722.69  on 1450  degrees of freedom
Residual deviance: 722.04  on 1449  degrees of freedom
(2 observations deleted due to missingness)
AIC: 726.04

Number of Fisher Scoring iterations: 5

[[4]]
Call:
glm(formula = formula, family = binomial(link = "logit"), data = trainingSet)

Deviance Residuals:
    Min       1Q   Median       3Q      Max
-0.4182 -0.4182 -0.3558 -0.3558  2.3629

Coefficients:
            Estimate Std. Error z value Pr(>|z|)
(Intercept)   -2.7283    0.1311 -20.813  <2e-16 ***
st_seg_depression  0.3353    0.2161  1.552   0.121
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

(Dispersion parameter for binomial family taken to be 1)

    Null deviance: 722.98  on 1452  degrees of freedom
Residual deviance: 720.63  on 1451  degrees of freedom
AIC: 724.63

Number of Fisher Scoring iterations: 5

[[5]]
Call:
glm(formula = formula, family = binomial(link = "logit"), data = trainingSet)

Deviance Residuals:
    Min       1Q   Median       3Q      Max
-0.3780 -0.3780 -0.3749 -0.3749  2.3196

Coefficients:
            Estimate Std. Error z value Pr(>|z|)
(Intercept)  -2.61997    0.12560 -20.859  <2e-16 ***
prior_angina  0.01728    0.22711  0.076   0.939
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

(Dispersion parameter for binomial family taken to be 1)

    Null deviance: 715.49  on 1436  degrees of freedom
Residual deviance: 715.48  on 1435  degrees of freedom
(16 observations deleted due to missingness)
AIC: 719.48

Number of Fisher Scoring iterations: 5

```

Figure 31: Univariate Analysis following TIMI risk score predictors Pt. 2

In the analysis following the GRACE predictors, the only variables not passing

the value to be included in the next step are the serum creatinine and cardiac arrest at hospital arrival. The other variables display a high-very high significance level.

It can be seen that in the analysis following TIMI predictors, only the age (whether greater than or equal to 65 years old or not) and the cardiac biomarkers are the significant variables.

After checking the significance of each predictor in the univariate analysis, all predictors were still used for the final model. It can be seen bellow which predictors are significant and which are not.

```

Call:
glm(formula = patient_state ~ age + heart_rate + systolic_bp +
     st_seg_depression + killip_class + enzymes + serumCreat +
     cardiac_arrest_at_hospital_arrival, family = binomial(link = "logit"),
     data = trainingSet)

Deviance Residuals:
    Min       1Q   Median       3Q      Max
-1.4642  -0.3585  -0.2651  -0.1969   2.8458

Coefficients:
                Estimate Std. Error z value Pr(>|z|)
(Intercept)    -7.0278038  0.8723402  -8.056 7.87e-16 ***
age              0.0465080  0.0096741   4.807 1.53e-06 ***
heart_rate      0.0110288  0.0037953   2.906 0.00366 **
systolic_bp    -0.0077314  0.0032185  -2.402 0.01630 *
st_seg_depression 0.1640661  0.2323910   0.706 0.48019
killip_class    0.7680730  0.1075450   7.142 9.21e-13 ***
enzymes         0.3134368  0.2262985   1.385 0.16603
serumCreat     -0.0003771  0.0005766  -0.654 0.51310
cardiac_arrest_at_hospital_arrival -0.2271102  1.1932021  -0.190 0.84905
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

(Dispersion parameter for binomial family taken to be 1)

    Null deviance: 722.98  on 1452  degrees of freedom
Residual deviance: 610.40  on 1444  degrees of freedom
AIC: 628.4

Number of Fisher Scoring iterations: 6

```

Figure 32: Multivariate Analysis following GRACE risk score predictors

```

Call:
glm(formula = patient_state ~ ageForTimi + riskFactors + prior_catherization +
     st_seg_depression + prior_angina + enzymes + aspirin.x, family = binomial(link
 = "logit"),
     data = trainingSet)

Deviance Residuals:
    Min       1Q   Median       3Q      Max
-0.7551 -0.4573 -0.2916 -0.2375  2.7100

Coefficients:
              Estimate Std. Error z value Pr(>|z|)
(Intercept)   -1.54579    1.30040   -1.189   0.2346
ageForTimi     1.13892    0.22811    4.993 5.95e-07 ***
riskFactors   -2.02774    1.28495   -1.578   0.1145
prior_catherization 0.37284    0.55416    0.673   0.5011
st_seg_depression 0.30248    0.22169    1.364   0.1724
prior_angina   0.01915    0.23515    0.081   0.9351
enzymes        0.41757    0.21694    1.925   0.0543 .
aspirin.x     -0.07290    0.24822   -0.294   0.7690
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

(Dispersion parameter for binomial family taken to be 1)

Null deviance: 715.20  on 1434  degrees of freedom
Residual deviance: 679.53  on 1427  degrees of freedom
(18 observations deleted due to missingness)
AIC: 695.53

Number of Fisher Scoring iterations: 6

```

Figure 33: Multivariate Analysis following TIMI risk score predictors

## B. Online CHD Calculator

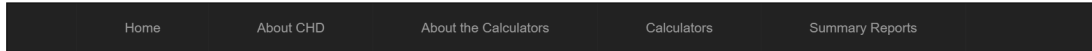
The following are the pages accessible to the user in the website:

1. Home Page



# Coronary Heart Disease Calculator

As suggested in Philippine Heart Association Guidelines



## Welcome to the Online Coronary Heart Disease Calculator!

This website contains information about CHD. The models used in the calculators are based on the suggestions in the 2014 PHA Clinical Practice Guidelines For The Diagnosis and Management of Patients with Coronary Artery Disease. The results from the risk assessment are entirely for medical guidance only and are not intended to replace actual diagnosis of the physician.

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### Related Links:

- [Philippine Heart Association](#)
- [Framingham Risk Score](#)
- [TIMI Risk Score](#)
- [GRACE Risk Model](#)
- [HEART Score](#)

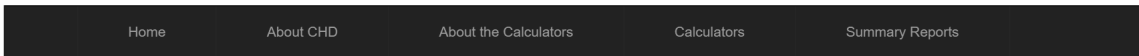
Figure 34: Home page

## 2. About CHD Page



# Coronary Heart Disease Calculator

As suggested in Philippine Heart Association Guidelines



<b>Definition</b>
Cause
Signs & Symptoms
Prevention
Treatment

## Coronary Heart Disease

### Definition

Coronary heart disease (CHD) is a disease in which a waxy substance called plaque builds up inside the coronary arteries.

CHD is commonly due to obstruction of the coronary arteries, usually the epicardial arteries, by atheromatous plaque. Obstructive CAD also has many nonatherosclerotic causes, including congenital abnormalities of the coronary arteries; myocardial bridging; coronary arteritis in association with the systemic vasculitides; and radiation-induced coronary disease. Myocardial ischemia may also occur in the absence of obstructive CAD, as in the case of aortic valve disease, hypertrophic cardiomyopathy, and idiopathic dilated cardiomyopathy (PHA, 2014).

### Other Names:

- Coronary Artery Disease (CAD)
- Atherosclerosis
- Atherothrombosis
- Heart Disease
- Ischemic Heart Disease

Coronary artery supplies blood or oxygen to the heart.

Figure 35: About Coronary Heart Disease page

## 3. About the Calculators Page



# Coronary Heart Disease Calculator

As suggested in Philippine Heart Association Guidelines

[Home](#)

[About CHD](#)

[About the Calculators](#)

[Calculators](#)

[Summary Reports](#)

## Framingham Risk Score

[TIMI Risk Score](#)

[GRACE Risk Model](#)

[Heart Score](#)

## Framingham Risk Score

The Framingham Risk Score aims to accurately predict if an individual, preferably 30-74 years old and without overt Coronary Heart Disease (CHD) at the baseline examination, has the possibility of having CHD. Prediction of risk ranges up to 10-12 years.

The Framingham Heart Study produced sex-specific CHD prediction functions for assessing risk of developing incident CHD in a white middle-class population. Concern exists regarding whether these functions can be generalized to other populations.

Using a series of regression analysis on the baseline characteristics, the analysis determined the predictors of CHD:

- Age
- Diabetes
- Smoking
- Blood pressure categories
  - Systolic Blood Pressure
  - Diastolic Blood Pressure
- Total Cholesterol
- HDL-Cholesterol

Figure 36: About the Calculators Page

## 4. Calculators Page and Results





# Coronary Heart Disease Calculator

As suggested in Philippine Heart Association Guidelines

**CHD Risk Calculator**

**Framingham Risk Score**

**ACS Survival Measurement**

TIMI Risk Score  
GRACE Risk Model  
HEART Score

**Based on diagnosis**

UA/NSTEMI  
STEMI (TIMI Risk Score)

**Derived from Philippine Data**

ACS Risk Calculator

## Framingham Risk Score

Age:  years

Sex:  Male  Female

Total Cholesterol:  mg/dL

HDL-Cholesterol:  mg/dL

Systolic Blood Pressure:  mmHg

Diastolic Blood Pressure:  mmHg

Diabetic:  Yes  No

Smoker:  Yes  No

Save Patient Info to Database

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- Related Links:
- [Philippine Heart Association](#)
  - [Framingham Risk Score](#)
  - [TIMI Risk Score](#)
  - [GRACE Risk Model](#)
  - [HEART Score](#)

Figure 37: Calculators Page



# Coronary Heart Disease Calculator

As suggested in Philippine Heart Association Guidelines

[Home](#)

[About CHD](#)

[About the Calculators](#)

[Calculators](#)

[Summary Reports](#)

## Risk Calculator Result Report

Entered Data:	
History	Highly Suspicious
ECG	Significant ST depression
Age	67 y.o.
(3) Risk Factors:	Hypercholesterolemia Hypertension Diabetes Mellitus
History of Atherosclerotic Disease	Yes
Troponin	≥ 3x normal limit

Prediction Results:			
Model used	Points	Probability	Time Period
HEART Score	10	50%	NA

### Interpretation of Risk Probability:

Patient must receive early aggressive treatments including invasive strategies without preceding non-invasive testing.

### Physician's Notes:

[Download report as PDF file](#)

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Related Links:

- [Philippine Heart Association](#)
- [Framingham Risk Score](#)
- [TIMI Risk Score](#)
- [GRACE Risk Model](#)
- [HEART Score](#)

Figure 38: Calculator Results Page



## Coronary Heart Disease Calculator

As suggested in Philippine Heart Association Guidelines

Generated on 13th of May 2016 04:30:12 AM

---

### RISK CALCULATOR RESULT REPORT

The following are the values of the coronary heart disease patient that you have entered in the calculator.

Entered Data:	
History	Highly Suspicious
ECG	Significant ST-depression
Age	67 y.o.
(1) Risk Factors:	Hypercholesterolemia, Hypertension, Diabetes Mellitus
History of Atherosclerotic Disease	Yes
Troponin	≥ 3x normal limit

Figure 39: PDF Report Page 1

The table below shows the predicted survival score and rates determined by the corresponding models used.

<b>Prediction Results:</b>			
<b>Model used</b>	<b>Points</b>	<b>Probability</b>	<b>Time Period</b>
HEART Score	10	50%	NA

<b>Interpretation of Risk Probability:</b>
Patient must receive early aggressive treatments including invasive strategies without preceding non-invasive testing.

<b>Physician's Notes:</b>
Notes. Suggestions. Eat well.

Figure 40: PDF Report Page 2

5. Summary Reports Page



# Coronary Heart Disease Calculator

As suggested in Philippine Heart Association Guidelines

Home

About CHD

About the Calculators

Calculators

Summary Reports

**Category:**  
CHD Risk

**Predictors:**

Age

Sex

Total Cholesterol

HDL-Cholesterol

Systolic Blood Pressure

Diastolic Blood Pressure

Diabetic

Smoker

**Output Type:**  
Text

**From:**

**To:**

**Submit**

## Summary Reports of Calculator Inputs

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Related Links:

- [Philippine Heart Association](#)
- [Framingham Risk Score](#)
- [TIMI Risk Score](#)
- [GRACE Risk Model](#)
- [HEART Score](#)

Figure 41: Summary Reports Page



# Coronary Heart Disease Calculator

As suggested in Philippine Heart Association Guidelines

[Home](#)

[About CHD](#)

[About the Calculators](#)

[Calculators](#)

[Summary Reports](#)

**Category:**  
CHD Risk

**Predictors:**

Age  
 Sex  
 Total Cholesterol  
 HDL-Cholesterol  
 Systolic Blood Pressure  
 Diastolic Blood Pressure  
 Diabetic  
 Smoker

**Output Type:**  
Text

**From:**

**To:**

**Submit**

## Summary Reports of Calculator Inputs

Number of patients: 47	
<b>Age</b>	N = 47 Mean: 61.55 Median: 67
<b>Sex</b>	N = 47 Male = 17 (36.17%) Female = 30 (63.83%)

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Related Links:

- [Philippine Heart Association](#)
- [Framingham Risk Score](#)
- [TIMI Risk Score](#)
- [GRACE Risk Model](#)
- [HEART Score](#)

Figure 42: Text Summary



# Coronary Heart Disease Calculator

As suggested in Philippine Heart Association Guidelines

Home

About CHD

About the Calculators

Calculators

Summary Reports

Category:  
CHD Risk

Predictors:

- Age
- Sex
- Total Cholesterol
- HDL-Cholesterol
- Systolic Blood Pressure
- Diastolic Blood Pressure
- Diabetic
- Smoker

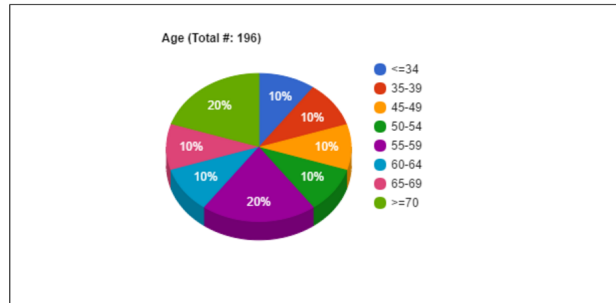
Output Type:  
Text

From:

To:

Submit

## Summary Reports of Calculator Inputs



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Related Links:

- [Philippine Heart Association](#)
- [Framingham Risk Score](#)
- [TIMI Risk Score](#)
- [GRACE Risk Model](#)
- [HEART Score](#)

Figure 43: Pie Chart



# Coronary Heart Disease Calculator

As suggested in Philippine Heart Association Guidelines

Home

About CHD

About the Calculators

Calculators

Summary Reports

Category:  
CHD Risk

Predictors:

- Age
- Sex
- Total Cholesterol
- HDL-Cholesterol
- Systolic Blood Pressure
- Diastolic Blood Pressure
- Diabetic
- Smoker

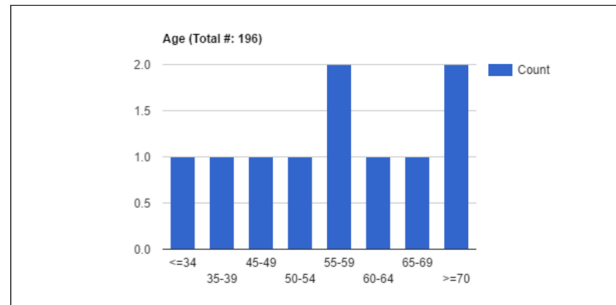
Output Type:  
Text

From:

To:

Submit

## Summary Reports of Calculator Inputs



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Related Links:

- [Philippine Heart Association](#)
- [Framingham Risk Score](#)
- [TIMI Risk Score](#)
- [GRACE Risk Model](#)
- [HEART Score](#)

Figure 44: Bar Graph



## VI. Discussions

Coronary heart disease was chosen as the focus of this study because of it was found to be one of the top causes of deaths in the Philippines [1].

The website is intentionally for cardiologists and otehr clinicians. It can be used to explain the coronary heart disease to a patient as well as compute the patient's risk on the spot. Furthermore, there is also a functionality where the clinician can add some notes and suggestions on what to do to lower or maintain the risk probability of a patient. The infomarion and result are displayed in a tabular manner with their proper labels and units. The results and page can be saved as PDF file and printed for the use and reminder of the patient.

Depending on the type of risk calculator used, the chosen model will generate scores and probabilities on a span of time. Different predictors are used in each type of calculator as seen in 4. However, an option can be chosen to see a unified version of the calculators where in one click, all the scores and probabilities for each risk score model will be displayed.

For informational purposes, the webiste also has a functionality where it generates summary reports of the information entered in the calculator within a specified range.

Compared to the impelementation used by the programmers in coding of GRACE risk calculator [40], the final models generated from their analysis was the ont used in the system's code instead of a one-by-one multiplaction of each value of the field to the corresponding coefficient code in Javascript. The computation part for each model was done in the controller part of the framework.

Regarding the regression analysis, the data used was from the CAD registry of PHA. This data is from the information gathered from different hospitals over a span of years where the patients included are still followed-up. The data is continually updated after each follow-up.

The dataset fields and values were discussed by the encoders, statisticians, and

doctors of PHA. They agreed on what universal unit of measurement would be used for specific fields. The encoding of data underwent a strict and careful process of validation from the encoder to the doctor.

## VII. Conclusions

The study allowed the creation of the website that contains the recommended calculators, Framingham, TIMI, GRACE, and HEART, by the Philippine Heart Association. Furthermore, a single simplified form was created for just a one-submit calculation for all the risk scores. This was possible because each risk score model still shared some predictors.

This study mainly involved the implementation stage for the system and the regression analysis used to create a new model derived from the Philippine dataset. The regression analysis part took longer than expected since the dataset had many fields. It was needed to be normalized and fixed. They were initially missing fields until the data was updated again from approximately 250 to 3604 patients. The data of non-UA/NSTEMI patients was needed to be excluded as well as those having the other criteria.

Regarding the implementation of the original risk scores, the computation part was done in the controller part of the framework and not in the Javascript. The models derived from the Philippine dataset using the same predictors were included in the system and also displayed in the results.

As what has been stated in the previous chapters, it can be seen in the analysis done that there are some of the key predictors that are not significant in the Philippine dataset. The results page of the system shows both the probabilities from the original model and the derived model.

## VIII. Recommendations

PHA suggested on having a functionality where a legitimate record of ACS patients may be imported in the system and it will compute the corresponding probability for each patient in the dataset depending on the model chosen. The results may then be exported as a csv file so that they can see the results per patient.

A new calculator derived from the Philippine dataset was also suggested to be done. However, the variables included in the initial analysis must be validated first by a doctor until the last state of the analysis.

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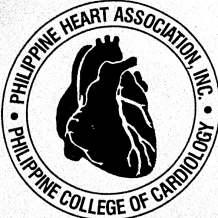


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# X. Appendix

## A. Forms



**PHILIPPINE HEART ASSOCIATION, INC.**  
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*a sub-specialty society of the  
Philippine College of Physicians,  
under the  
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*and a member society of the:  
World Heart Federation  
Asian Pacific Society of Cardiology  
ASEAN Federation of Cardiology*

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*The PHA is an organization of cardiovascular specialists and lay members that ensure accessible, affordable, and quality cardiovascular education and care for everyone.*

**Vision**

*The PHA shall be a leading organization in the prevention and management of heart and blood vessel diseases.*

**CONFIDENTIALITY STATEMENT**

I understand that as member of the steering committee/PHA secretariat/research assistant/cardiovascular fellow/consultant investigator (circle one) for the Acute Coronary Syndrome Registry of the Philippine Heart Association, I am privy to confidential information. I agree and promise to keep all data collected during this study confidential and will not reveal it to anyone outside the research team.

Name: Evangelina Louise F. Carandang

Signature: Evangelina Louise F. Carandang

Date: March 21, 2016

Witness Signature: [Signature]

*The heart is our concern, education and research, our commitment.*

Figure 45: Confidentiality Statement

December 19, 2015

**Imelda Caole-Ang, MD**  
CAD Registry  
Philippine Heart Association  
Pasig City, Philippines

Dear Dr. Caole-Ang,

Good day!

I am Evangeline Louise F. Carandang, a fourth year BS Computer Science student from University of the Philippines Manila. I am currently doing my Special Problem (SP)/thesis regarding Coronary Heart Disease.

My research topic is "Online CHD Risk Assessment Calculator based on Philippine Heart Association Guidelines and Dataset." I wish to incorporate the indicated calculators stated in PHA guidelines, namely the TIMI, GRACE, and Heart risk score model, into one website. Together with that, I wanted to create a calculator for risk of CHD using the Framingham risk score indicated in Assessment and Management of Cardiovascular Risks in Women. I also plan to generate reports (pie charts, bar graphs, etc.) based on the statistics analyzed from CHD cases.

Aside from interviews with medical professionals for information on CHD and interpretation of results, the main focus of my thesis is the risk calculator which I intend to test in the Philippine setting. The regression analysis used in the risk score models will also be used in any available dataset for or in relation with the CHD cases in the Philippines to get new estimates and attempt to derive a new equation to get the corresponding percentage of the score. Any available dataset that could be used in relation to CHD, any information, would be very helpful and would be used entirely for thesis purposes only.

Hoping for your kind consideration. Thank you!

Sincerely,

*Evangeline Louise F. Carandang*

EVANGELINE LOUISE F. CARANDANG  
University of the Philippines Manila  
BS Computer Science

Noted by:

*SM*  
MA. SHEILA A. MAGBOO  
University of the Philippines Manila  
Associate Professor 3  
SP Adviser

Figure 46: Letter To Dr. Imelda Caole-Ang

January 12, 2016

**CHARLIES L. ESTABAN, MD, FPCP**  
Internal Medicine, Cardiologist  
Daniel Mercado Medical Center  
Tanauan City, Batangas

Dear **Dr. Estaban**,

Greetings!

I am Evangeline Louise F. Carandang, a fourth year student from University of the Philippine Manila, who is taking BS Computer Science. Currently, I am doing my Special Problem/Undergraduate Thesis which is about Coronary Heart Disease.

As a noted cardiologist, I would like to request your permission to allow me to conduct a part of my research by doing an interview with you regarding coronary heart disease, such as the signs and symptoms, people with potential risk, factors for diagnosis, and treatment, that would allow better understanding of the disease. This research will be of great value in accomplishing my thesis which is a major requirement for my degree program.

Thank you and I am looking forward to meeting you.

Sincerely,

*Evangeline Louise F. Carandang*  
EVANGELINE LOUISE F. CARANDANG  
BS Computer Science Student  
University of the Philippines Manila

Noted by:

*SM*  
MA. SHEILA A. MAGBOO  
Associate Professor 3  
SP Adviser  
University of the Philippines Manila

*Estaban*  
ESTEBAN  
1/16/16

Figure 47: Letter to Dr. Charlies Esteban

## B. Source Codes

Listing 1: About.php

```
<?php
class about extends CI_Controller {

    public function __construct() {
        parent::__construct();
    }

    public function index()
    {
        $this->load->view('templates/header');
        $this->load->view('pages/aboutView');
        $this->load->view('templates/footer');
    }
}
```

Listing 2: Calculator.php

```
<?php
class calculator extends CI_Controller {

    public function __construct() {
        parent::__construct();
    }

    public function index()
    {
        $this->load->view('templates/header');
        $this->load->view('pages/calculatorView');
        $this->load->view('templates/footer');
    }

    public function about()
    {
        $this->load->view('templates/header');
        $this->load->view('pages/aboutCalculatorView');
        $this->load->view('templates/footer');
    }

    public function result(){
        $this->load->model('CalculatorModel');

        $calculator = $this->input->post('calculator');
        $date = date("Y-m-d");
        $db = $this->input->post('db');

        if($calculator == "Framingham"){
            $data = array(
                'calculator' => $calculator,
                'f_age' => $this->input->post('f_age'),
                'f_sex' => $this->input->post('f_sex'),
                'f_totalChol' => $this->input->post('f_totalChol'),
                'f_highDenLip' => $this->input->post('f_highDenLip'),
                'f_sysBloodPress' => $this->input->post('f_sysBloodPress'),
                'f_diaBloodPress' => $this->input->post('f_diaBloodPress'),
                'f_diabetic' => $this->input->post('f_diabetic'),
                'f_smoker' => $this->input->post('f_smoker')
            );

            $framPts = $this->compFram($data);
            $framProb = $this->pointToProbFram($framPts, $data['f_sex']);

            $data['framPts'] = $framPts;
            $data['framProb'] = $framProb;

            if(isset($db) && $db == "Save"){
                $demographics = array(
                    'Age' => $data['f_age'],
                    'Sex' => $data['f_sex'],
                    'InputDate' => $date
                );

                $PatientID = $this->CalculatorModel->insertDemographics($demographics);
```

```
$id['PatientID'] = $PatientID;
$id['RangeID'] = $this->_rangeAge($data['f_age']);
$this->CalculatorModel->insertRanges($id);
$id['RangeID'] = $this->_rangeChol($data['f_totalChol']);
$this->CalculatorModel->insertRanges($id);
$id['RangeID'] = $this->_rangeHdl($data['f_highDenLip']);
$this->CalculatorModel->insertRanges($id);
$id['RangeID'] = $this->_rangeSys($data['f_sysBloodPress']);
$this->CalculatorModel->insertRanges($id);
$id['RangeID'] = $this->_rangeDia($data['f_diaBloodPress']);
$this->CalculatorModel->insertRanges($id);

$baseChar['PatientID'] = $PatientID;

$BaseCharID = $this->CalculatorModel->insertBaselineCharacteristics($baseChar);

$RiskFactors['BaseCharID'] = $BaseCharID;

if($data['f_diabetic'] == "Yes"){
    $RiskFactors['RiskID'] = $this->_getRiskID("Diabetes_Mellitus");
    $this->CalculatorModel->insertRiskFactors($RiskFactors);
}
if($data['f_smoker'] == "Yes"){
    $RiskFactors['RiskID'] = $this->_getRiskID("Cigarette_smoking");
    $this->CalculatorModel->insertRiskFactors($RiskFactors);
}

$clinicalPres = array(
    'PatientID' => $PatientID,
    'SystolicBP' => $data['f_sysBloodPress'],
    'DiastolicBP' => $data['f_diaBloodPress'],
    'TotalCholesterol' => $data['f_totalChol'],
    'HDLCholesterol' => $data['f_highDenLip']
);

$this->CalculatorModel->insertClinicalPresentation($clinicalPres);

$calcUsed = array(
    'PatientID' => $PatientID,
    'CalculatorID' => 1
);

$this->CalculatorModel->insertCalculatorUsed($calcUsed);

$RiskScores = array(
    'PatientID' => $PatientID,
    'FraminghamScore' => $data['framPts']
);

$this->CalculatorModel->insertRiskScore($RiskScores);

$RiskProb = array(
    'PatientID' => $PatientID,
    'FraminghamProb' => $data['framProb']
);

$this->CalculatorModel->insertRiskProb($RiskProb);
}
}
else if($calculator == "TIMI"){
    $data = array(
        'calculator' => $calculator,
        't_age' => $this->input->post('t_age'),
        't_risk' => $this->input->post('t_risk'),
        't_historyOfStenosis' => $this->input->post('t_historyOfStenosis'),
        't_stSegmentDev' => $this->input->post('t_stSegmentDev'),
        't_anginaEvents' => $this->input->post('t_anginaEvents'),
```



```

else if($data['g_age'] >= 45 && $data['g_age'] < 50)
    $data['g_age'] = 47;
else if($data['g_age'] >= 90 && $data['g_age'] < 95)
    $data['g_age'] = 92;
else if($data['g_age'] >= 95)
    $data['g_age'] = 95;

if($data['g_heartRate'] < 50)
    $data['g_heartRate'] = 49;
else if($data['g_heartRate'] >= 50 && $data['g_heartRate'] < 70)
    $data['g_heartRate'] = 59.5;
else if($data['g_heartRate'] >= 70 && $data['g_heartRate'] < 80)
    $data['g_heartRate'] = 74.5;
else if($data['g_heartRate'] >= 80 && $data['g_heartRate'] < 90)
    $data['g_heartRate'] = 84.5;
else if($data['g_heartRate'] >= 90 && $data['g_heartRate'] < 100)
    $data['g_heartRate'] = 94.5;
else if($data['g_heartRate'] >= 100 && $data['g_heartRate'] < 110)
    $data['g_heartRate'] = 104.5;
else if($data['g_heartRate'] >= 110 && $data['g_heartRate'] < 130)
    $data['g_heartRate'] = 119.5;
else if($data['g_heartRate'] >= 130 && $data['g_heartRate'] < 150)
    $data['g_heartRate'] = 139.5;
else if($data['g_heartRate'] >= 150 && $data['g_heartRate'] < 200)
    $data['g_heartRate'] = 174.5;
else if($data['g_heartRate'] >= 200)
    $data['g_heartRate'] = 200;

if($data['g_sysBloodPress'] < 80)
    $data['g_sysBloodPress'] = 79;
else if($data['g_sysBloodPress'] >= 80 && $data['g_sysBloodPress'] < 100)
    $data['g_sysBloodPress'] = 89.5;
else if($data['g_sysBloodPress'] >= 100 && $data['g_sysBloodPress'] < 110)
    $data['g_sysBloodPress'] = 104.5;
else if($data['g_sysBloodPress'] >= 110 && $data['g_sysBloodPress'] < 120)
    $data['g_sysBloodPress'] = 114.5;
else if($data['g_sysBloodPress'] >= 120 && $data['g_sysBloodPress'] < 130)
    $data['g_sysBloodPress'] = 124.5;
else if($data['g_sysBloodPress'] >= 130 && $data['g_sysBloodPress'] < 140)
    $data['g_sysBloodPress'] = 134.5;
else if($data['g_sysBloodPress'] >= 140 && $data['g_sysBloodPress'] < 160)
    $data['g_sysBloodPress'] = 149.5;
else if($data['g_sysBloodPress'] >= 160 && $data['g_sysBloodPress'] < 180)
    $data['g_sysBloodPress'] = 169.5;
else if($data['g_sysBloodPress'] >= 180)
    $data['g_sysBloodPress'] = 180;

switch($data['g_serumCreatinine']){
case "0_-0.39_mg/dL": $serumCreat = 0.195;
break;
case "0.4_-0.79_mg/dL": $serumCreat = 0.595;
break;
case "0.8_-1.19_mg/dL": $serumCreat = 0.995;
break;
case "1.2_-1.59_mg/dL": $serumCreat = 1.395;
break;
case "1.6_-1.99_mg/dL": $serumCreat = 1.795;
break;
case "2.0_-3.99_mg/dL": $serumCreat = 2.995;
break;
case "4.0_mg/dL_or_greater": $serumCreat = 4;
break;
case "Not_available":
$serumCreat = 0;
if(isset($renal))
    $data['g_renalFailure'] = "Yes";
else
    $data['g_renalFailure'] = "No";
break;
default: break;
}

switch($data['g_killipClass']){
case "Killip_Class_I": $killipNum = 1; break;
case "Killip_Class_II": $killipNum = 2; break;

```

```

case "Killip_Class_III": $killipNum = 3; break;
case "Killip_Class_IV": $killipNum = 4; break;
case "Not_available":
$killipNum = 0;
if(isset($diuretic))
    $data['g_diureticUsage'] = "Yes";
else
    $data['g_diureticUsage'] = "No";
break;
default: break;
}

if($data['g_cardiacArrest'] == "Yes")
    $cardiacArrest = 1;
if($data['g_cardiacMarker'] == "Yes")
    $cardiacMarker = 1;
if($data['g_stSegmentDev'] == "Yes")
    $stSegmentDev = 1;

if($serumCreat == 0 || $killipNum == 0){
$graceProbPhil = 0;
$graceProbOneYearDeath = $this->
    _pointToProbGraceOneYearDeathSub($data,
        $serumCreat, $killipNum, $cardiacArrest,
        $cardiacMarker, $stSegmentDev);
$graceProbOneYearDeathMI = 0;
$graceProbThreeYearDeath = 0;
$graceProbThreeYearDeathMI = 0;
}
else{
$graceProbPhil = $this->
    _pointToProbGraceInHospitalDeathPhil($data,
        $serumCreat, $killipNum, $cardiacArrest,
        $cardiacMarker, $stSegmentDev);
$graceProbOneYearDeath = $this->
    _pointToProbGraceOneYearDeath($data,
        $serumCreat, $killipNum, $cardiacArrest,
        $cardiacMarker, $stSegmentDev);
$graceProbOneYearDeathMI = $this->
    _pointToProbGraceOneYearDeathMI($data,
        $serumCreat, $killipNum, $cardiacArrest,
        $cardiacMarker, $stSegmentDev);
$graceProbThreeYearDeath = $this->
    _pointToProbGraceThreeYearDeath($data,
        $serumCreat, $killipNum, $cardiacArrest,
        $cardiacMarker, $stSegmentDev);
$graceProbThreeYearDeathMI = $this->
    _pointToProbGraceThreeYearDeathMI($data,
        $serumCreat, $killipNum, $cardiacArrest,
        $cardiacMarker, $stSegmentDev);
}

$gracePtsInHospitalDeath = $this->
    _compGraceInHospitalDeath($data,
        $serumCreat, $killipNum, $cardiacArrest,
        $cardiacMarker, $stSegmentDev);
$gracePtsInHospitalDeathMI = $this->
    _compGraceInHospitalDeathMI($data,
        $serumCreat, $killipNum, $cardiacArrest,
        $cardiacMarker, $stSegmentDev);

$gracePtsSixMonthDeath = $this->
    _compGraceSixMonthDeath($data, $serumCreat,
        $killipNum, $cardiacArrest, $cardiacMarker,
        $stSegmentDev);
$gracePtsSixMonthDeathMI = $this->
    _compGraceSixMonthDeathMI($data,
        $serumCreat, $killipNum, $cardiacArrest,
        $cardiacMarker, $stSegmentDev);

$graceProbInHospitalDeath = $this->
    _pointToProbGraceInHospitalDeath($data,
        $serumCreat, $killipNum, $cardiacArrest,
        $cardiacMarker, $stSegmentDev);
$graceProbInHospitalDeathMI = $this->
    _pointToProbGraceInHospitalDeathMI(
        $gracePtsInHospitalDeathMI);

$graceProbSixMonthDeath = $this->
    _pointToProbGraceSixMonthDeath(
        $gracePtsSixMonthDeath);
$graceProbSixMonthDeathMI = $this->
    _pointToProbGraceSixMonthDeathMI(
        $gracePtsSixMonthDeathMI);

$data['gracePtsInHospitalDeath'] =
    $gracePtsInHospitalDeath;
$data['gracePtsInHospitalDeathMI'] =
    $gracePtsInHospitalDeathMI;
$data['gracePtsSixMonthDeath'] =
    $gracePtsSixMonthDeath;

```



```

    $data['gracePtsSixMonthDeathMI'] =
        $gracePtsSixMonthDeathMI;
    $data['graceProbInHospitalDeath'] =
        $graceProbInHospitalDeath;
    $data['graceProbInHospitalDeathMI'] =
        $graceProbInHospitalDeathMI;
    $data['graceProbSixMonthDeath'] =
        $graceProbSixMonthDeath;
    $data['graceProbSixMonthDeathMI'] =
        $graceProbSixMonthDeathMI;
    $data['graceProbOneYearDeath'] =
        $graceProbOneYearDeath;
    $data['graceProbOneYearDeathMI'] =
        $graceProbOneYearDeathMI;
    $data['graceProbThreeYearDeath'] =
        $graceProbThreeYearDeath;
    $data['graceProbThreeYearDeathMI'] =
        $graceProbThreeYearDeathMI;
    $data['graceProbInHospitalDeathPhil'] =
        $graceProbPhil;

    if (isset($db) && $db == "Save"){
        $demographics = array(
            'Age' => $data['g_ageInit'],
            'InputDate' => $date
        );

        $PatientID = $this->CalculatorModel->
            insertDemographics($demographics);

        $id['PatientID'] = $PatientID;
        $id['RangeID'] = $this->_rangeAge($data['
            g_ageInit']);
        $this->CalculatorModel->insertRanges($id);
        $id['RangeID'] = $this->_rangeSerum($data['
            g_serumCreatinine']);
        $this->CalculatorModel->insertRanges($id);
        $id['RangeID'] = $this->_rangeSys($data['
            g_sysBloodPressInit']);
        $this->CalculatorModel->insertRanges($id);
        $id['RangeID'] = $this->_rangeHeart($data['
            g_heartRateInit']);
        $this->CalculatorModel->insertRanges($id);

        $clinicalPres = array(
            'PatientID' => $PatientID,
            'HeartRate' => $data['g_heartRateInit'],
            'SystolicBP' => $data['g_sysBloodPressInit'],
            'KillipClass' => $killipNum,
            'CardiacArrest' => $this->_strToBin($data['
                g_cardiacArrest'])
        );

        $this->CalculatorModel->
            insertClinicalPresentation($clinicalPres);

        $ecgFindings = array(
            'PatientID' => $PatientID,
            'STSegmentDepression' => $this->_strToBin($data['
                g_stSegmentDev'])
        );

        $this->CalculatorModel->insertEcgFindings(
            $ecgFindings);

        $labTests = array(
            'PatientID' => $PatientID,
            'serumCreatinine' => $serumCreat,
            'Troponin' => $this->_strToBin($data['
                g_cardiacMarker'])
        );

        $this->CalculatorModel->insertLabTests($labTests
        );

        $calcUsed = array(
            'PatientID' => $PatientID,
            'CalculatorID' => 3
        );

        $this->CalculatorModel->insertCalculatorUsed(
            $calcUsed);

        $riskScores = array(
            'PatientID' => $PatientID,
            'GraceScoreInHospitalDeath' => $data['
                gracePtsInHospitalDeath'],
            'GraceScoreInHospitalDeathMI' => $data['
                gracePtsInHospitalDeathMI'],
            'GraceScoreSixMonthDeath' => $data['
                gracePtsSixMonthDeath'],
            'GraceScoreSixMonthDeathMI' => $data['
                gracePtsSixMonthDeathMI']
        );

        $this->CalculatorModel->insertRiskScore(
            $riskScores);

        $riskProb = array(
            'PatientID' => $PatientID,
            'GraceProbInHospitalDeath' => $data['
                graceProbInHospitalDeath'],
            'GraceProbInHospitalDeathMI' => $data['
                graceProbInHospitalDeathMI'],
            'GraceProbSixMonthDeath' => $data['
                graceProbSixMonthDeath'],
            'GraceProbSixMonthDeathMI' => $data['
                graceProbSixMonthDeathMI'],
            'GraceProbOneYearDeath' => $data['
                graceProbOneYearDeath'],
            'GraceProbOneYearDeathMI' => $data['
                graceProbOneYearDeathMI'],
            'GraceProbThreeYearsDeath' => $data['
                graceProbThreeYearDeath'],
            'GraceProbThreeYearDeathMI' => $data['
                graceProbThreeYearDeathMI']
        );

        $this->CalculatorModel->insertRiskProb($riskProb
        );

    }
    else if ($calculator == "HEART"){
        $data = array(
            'calculator' => $calculator,
            'h_history' => $this->input->post('h_history'),
            'h_stSegmentDev' => $this->input->post('
                h_stSegmentDev'),
            'h_age' => $this->input->post('h_age'),
            'h_risk' => $this->input->post('h_risk'),
            'h_atheros' => $this->input->post('h_atheros'),
            'h_troponin' => $this->input->post('h_troponin')
        );

        $heartPts = $this->_compHeart($data);
        $heartProb = $this->_pointToProbHeart($heartPts)
        ;

        $data['heartPts'] = $heartPts;
        $data['heartProb'] = $heartProb;

        if (isset($db) && $db == "Save"){
            $demographics = array(
                'Age' => $data['h_age'],
                'InputDate' => $date
            );

            $PatientID = $this->CalculatorModel->
                insertDemographics($demographics);

            $id['PatientID'] = $PatientID;
            $id['RangeID'] = $this->_rangeAge($data['h_age']
            );
            $this->CalculatorModel->insertRanges($id);

            $baseChar = array(
                'PatientID' => $PatientID,
                'AtheroscleroticDisease' => $this->_strToBin(
                    $data['h_atheros']),
                'History' => $this->_phraseToBin($data['
                    h_history'])
            );

            $BaseCharID = $this->CalculatorModel->
                insertBaselineCharacteristics($baseChar);

            $riskFactors['BaseCharID'] = $BaseCharID;

            if (count($data['h_risk']) != 0){
                foreach ($data['h_risk'] as $hrisk){
                    switch ($hrisk){
                        case "Hypercholesterolemia":
                            $riskFactors['RiskID'] = $this->_getRiskID("
                                Hypercholesterolemia");
                            $this->CalculatorModel->insertRiskFactors(
                                $riskFactors);
                            break;
                        case "Hypertension":
                            $riskFactors['RiskID'] = $this->_getRiskID("
                                Hypertension");
                            $this->CalculatorModel->insertRiskFactors(
                                $riskFactors);
                            break;
                        case "Diabetes_Mellitus":

```

```

$riskFactors['RiskID'] = $this->_getRiskID("
    Diabetes_Mellitus");
$this->CalculatorModel->insertRiskFactors(
    $riskFactors);
break;
case "Cigarette_smoking":
$riskFactors['RiskID'] = $this->_getRiskID("
    Cigarette_smoking");
$this->CalculatorModel->insertRiskFactors(
    $riskFactors);
break;
case "Positive_family_history":
$riskFactors['RiskID'] = $this->_getRiskID("
    Positive_family_history");
$this->CalculatorModel->insertRiskFactors(
    $riskFactors);
break;
case "Obesity":
$riskFactors['RiskID'] = $this->_getRiskID("
    Obesity");
$this->CalculatorModel->insertRiskFactors(
    $riskFactors);
break;
}
}
}

$ecgFindings = array(
    'PatientID' => $PatientID,
    'STSegmentDepression' => $this->_phraseToBin(
        $data['h_stSegmentDev'])
);

$this->CalculatorModel->insertEcgFindings(
    $ecgFindings);

$labTests = array(
    'PatientID' => $PatientID,
    'Troponin' => $this->_phraseToBin($data['
        h_troponin'])
);

$this->CalculatorModel->insertLabTests($labTests
);

$calcUsed = array(
    'PatientID' => $PatientID,
    'CalculatorID' => 4
);

$this->CalculatorModel->insertCalculatorUsed(
    $calcUsed);

$riskScores = array(
    'PatientID' => $PatientID,
    'HeartScore' => $data['heartPts']
);

$this->CalculatorModel->insertRiskScore(
    $riskScores);

$riskProb = array(
    'PatientID' => $PatientID,
    'HeartProb' => $data['heartProb']
);

$this->CalculatorModel->insertRiskProb($riskProb
);
}
}
else if($calculator == "UANSTEMI"){
    $stSegDev1 = $this->input->post('u_stSegmentDev'
);
    $stSegDev2 = "No";

    if($stSegDev1 == "Significant_ST-depression")
        $stSegDev2 = "Yes";
    else if($stSegDev1 == "Non-specific_
        repolarisation_disturbance" || $stSegDev1
        == "Normal")
        $stSegDev2 = "No";

    $cardiacMarker1 = $this->input->post('u_troponin
');
    $cardiacMarker2 = "No";

    if($cardiacMarker1 == "
        _normal_limit")
        $cardiacMarker2 = "No";
    else if($cardiacMarker1 == "1_
        _3x_normal_
        limit" || $cardiacMarker1 == "
        _3x_normal_
        _limit")
        $cardiacMarker2 = "Yes";

    $data = array(
        'calculator' => $calculator,
        't_age' => $this->input->post('u_age'),
        't_risk' => $this->input->post('u_risk'),
        't_historyOfStenosis' => $this->input->post('
            u_historyOfStenosis'),
        't_stSegmentDev' => $stSegDev2,
        't_anginaEvents' => $this->input->post('
            u_anginaEvents'),
        't_cardiacMarker' => $cardiacMarker2,
        't_aspirinIntake' => $this->input->post('
            u_aspirinIntake'),

        'g_age' => $this->input->post('u_age'),
        'g_heartRate' => $this->input->post('u_heartRate
            '),
        'g_sysBloodPress' => $this->input->post('
            u_sysBloodPress'),
        'g_ageInit' => $this->input->post('u_age'),
        'g_heartRateInit' => $this->input->post('
            u_heartRate'),
        'g_sysBloodPressInit' => $this->input->post('
            u_sysBloodPress'),
        'g_killipClass' => $this->input->post('
            u_killipClass'),
        'g_diureticUsage' => $this->input->post('
            u_diureticUsage'),
        'g_serumCreatinine' => $this->input->post('
            u_serumCreatinine'),
        'g_renalFailure' => $this->input->post('
            u_renalFailure'),
        'g_stSegmentDev' => $stSegDev2,
        'g_cardiacMarker' => $cardiacMarker2,
        'g_cardiacArrest' => $this->input->post('
            u_cardiacArrest'),

        'h_history' => $this->input->post('u_history'),
        'h_stSegmentDev' => $this->input->post('
            u_stSegmentDev'),
        'h_age' => $this->input->post('u_age'),
        'h_risk' => $this->input->post('u_risk'),
        'h_atheros' => $this->input->post('u_atheros'),
        'h_troponin' => $this->input->post('u_troponin')
);

//TIMI

$timiPts = $this->_compTimi($data);
$timiProb = $this->_pointToProbTimi($timiPts);
$timiProbPhil = $this->_pointToProbTimiPhil(
    $data);

$ata['timiPts'] = $timiPts;
$ata['timiProb'] = $timiProb;
$ata['timiProbPhil'] = $timiProbPhil;

//GRACE

$diuretic = $this->input->post('g_diureticUsage'
);
$renal = $this->input->post('g_renalFailure');

$serumCreat = 0;
$killipNum = 0;
$cardiacArrest = 0;
$cardiacMarker = 0;
$stSegmentDev = 0;

if($ata['g_age'] < 30)
    $ata['g_age'] = 29;
else if($ata['g_age'] >= 30 && $ata['g_age'] <
    40)
    $ata['g_age'] = 34;
else if($ata['g_age'] >= 40 && $ata['g_age'] <
    45)
    $ata['g_age'] = 42;
else if($ata['g_age'] >= 45 && $ata['g_age'] <
    50)
    $ata['g_age'] = 47;
else if($ata['g_age'] >= 90 && $ata['g_age'] <
    95)
    $ata['g_age'] = 92;
else if($ata['g_age'] >= 95)
    $ata['g_age'] = 95;

if($ata['g_heartRate'] < 50)
    $ata['g_heartRate'] = 49;
else if($ata['g_heartRate'] >= 50 && $ata['
    g_heartRate'] < 70)
    $ata['g_heartRate'] = 59.5;
else if($ata['g_heartRate'] >= 70 && $ata['

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    g_heartRate' ] < 80)
$adata ['g_heartRate' ] = 74.5;
else if ($data ['g_heartRate' ] >= 80 && $data ['
    g_heartRate' ] < 90)
$adata ['g_heartRate' ] = 84.5;
else if ($data ['g_heartRate' ] >= 90 && $data ['
    g_heartRate' ] < 100)
$adata ['g_heartRate' ] = 94.5;
else if ($data ['g_heartRate' ] >= 100 && $data ['
    g_heartRate' ] < 110)
$adata ['g_heartRate' ] = 104.5;
else if ($data ['g_heartRate' ] >= 110 && $data ['
    g_heartRate' ] < 130)
$adata ['g_heartRate' ] = 119.5;
else if ($data ['g_heartRate' ] >= 130 && $data ['
    g_heartRate' ] < 150)
$adata ['g_heartRate' ] = 139.5;
else if ($data ['g_heartRate' ] >= 150 && $data ['
    g_heartRate' ] < 200)
$adata ['g_heartRate' ] = 174.5;
else if ($data ['g_heartRate' ] >= 200)
$adata ['g_heartRate' ] = 200;

if ($data ['g_sysBloodPress' ] < 80)
$adata ['g_sysBloodPress' ] = 79;
else if ($data ['g_sysBloodPress' ] >= 80 && $data ['
    'g_sysBloodPress' ] < 100)
$adata ['g_sysBloodPress' ] = 89.5;
else if ($data ['g_sysBloodPress' ] >= 100 && $data ['
    'g_sysBloodPress' ] < 110)
$adata ['g_sysBloodPress' ] = 104.5;
else if ($data ['g_sysBloodPress' ] >= 110 && $data ['
    'g_sysBloodPress' ] < 120)
$adata ['g_sysBloodPress' ] = 114.5;
else if ($data ['g_sysBloodPress' ] >= 120 && $data ['
    'g_sysBloodPress' ] < 130)
$adata ['g_sysBloodPress' ] = 124.5;
else if ($data ['g_sysBloodPress' ] >= 130 && $data ['
    'g_sysBloodPress' ] < 140)
$adata ['g_sysBloodPress' ] = 134.5;
else if ($data ['g_sysBloodPress' ] >= 140 && $data ['
    'g_sysBloodPress' ] < 160)
$adata ['g_sysBloodPress' ] = 149.5;
else if ($data ['g_sysBloodPress' ] >= 160 && $data ['
    'g_sysBloodPress' ] < 180)
$adata ['g_sysBloodPress' ] = 169.5;
else if ($data ['g_sysBloodPress' ] >= 180)
$adata ['g_sysBloodPress' ] = 180;

switch ($data ['g_serumCreatinine' ]) {
case "0_-0.39_mg/dL": $serumCreat = 0.195;
break;
case "0.4_-0.79_mg/dL": $serumCreat = 0.595;
break;
case "0.8_-1.19_mg/dL": $serumCreat = 0.995;
break;
case "1.2_-1.59_mg/dL": $serumCreat = 1.395;
break;
case "1.6_-1.99_mg/dL": $serumCreat = 1.795;
break;
case "2.0_-3.99_mg/dL": $serumCreat = 2.995;
break;
case "4.0_mg/dL_or_greater": $serumCreat = 4;
break;
case "Not_available":
$serumCreat = 0;
if (isset ($renal))
$adata ['g_renalFailure' ] = "Yes";
else
$adata ['g_renalFailure' ] = "No";
break;
default: break;
}

switch ($data ['g_killipClass' ]) {
case "Killip_Class_I": $killipNum = 1; break;
case "Killip_Class_II": $killipNum = 2; break;
case "Killip_Class_III": $killipNum = 3; break;
case "Killip_Class_IV": $killipNum = 4; break;
case "Not_available":
$killipNum = 0;
if (isset ($diuretic))
$adata ['g_diureticUsage' ] = "Yes";
else
$adata ['g_diureticUsage' ] = "No";
break;
default: break;
}

if ($data ['g_cardiacArrest' ] == "Yes")
$cardiacArrest = 1;
if ($data ['g_cardiacMarker' ] == "Yes")
$cardiacMarker = 1;
if ($data ['g_stSegmentDev' ] == "Yes")
$stSegmentDev = 1;

if ($serumCreat == 0 || $killipNum == 0) {
$graceProbPhil = 0;
$graceProbOneYearDeath = $this->
    _pointToProbGraceOneYearDeathSub ($data ,
        $serumCreat , $killipNum , $cardiacArrest ,
        $cardiacMarker , $stSegmentDev);
$graceProbOneYearDeathMI = 0;
$graceProbThreeYearDeath = 0;
$graceProbThreeYearDeathMI = 0;
}
else {
$graceProbPhil = $this->
    _pointToProbGraceInHospitalDeathPhil ($data ,
        $serumCreat , $killipNum , $cardiacArrest ,
        $cardiacMarker , $stSegmentDev);
$graceProbOneYearDeath = $this->
    _pointToProbGraceOneYearDeath ($data ,
        $serumCreat , $killipNum , $cardiacArrest ,
        $cardiacMarker , $stSegmentDev);
$graceProbOneYearDeathMI = $this->
    _pointToProbGraceOneYearDeathMI ($data ,
        $serumCreat , $killipNum , $cardiacArrest ,
        $cardiacMarker , $stSegmentDev);
$graceProbThreeYearDeath = $this->
    _pointToProbGraceThreeYearDeath ($data ,
        $serumCreat , $killipNum , $cardiacArrest ,
        $cardiacMarker , $stSegmentDev);
$graceProbThreeYearDeathMI = $this->
    _pointToProbGraceThreeYearDeathMI ($data ,
        $serumCreat , $killipNum , $cardiacArrest ,
        $cardiacMarker , $stSegmentDev);
}

$gracePtsInHospitalDeath = $this->
    _compGraceInHospitalDeath ($data ,
        $serumCreat , $killipNum , $cardiacArrest ,
        $cardiacMarker , $stSegmentDev);
$gracePtsInHospitalDeathMI = $this->
    _compGraceInHospitalDeathMI ($data ,
        $serumCreat , $killipNum , $cardiacArrest ,
        $cardiacMarker , $stSegmentDev);

$gracePtsSixMonthDeath = $this->
    _compGraceSixMonthDeath ($data , $serumCreat ,
        $killipNum , $cardiacArrest , $cardiacMarker ,
        $stSegmentDev);
$gracePtsSixMonthDeathMI = $this->
    _compGraceSixMonthDeathMI ($data ,
        $serumCreat , $killipNum , $cardiacArrest ,
        $cardiacMarker , $stSegmentDev);

$graceProbInHospitalDeath = $this->
    _pointToProbGraceInHospitalDeath ($data ,
        $serumCreat , $killipNum , $cardiacArrest ,
        $cardiacMarker , $stSegmentDev);
$graceProbInHospitalDeathMI = $this->
    _pointToProbGraceInHospitalDeathMI (
        $gracePtsInHospitalDeathMI);

$graceProbSixMonthDeath = $this->
    _pointToProbGraceSixMonthDeath (
        $gracePtsSixMonthDeath);
$graceProbSixMonthDeathMI = $this->
    _pointToProbGraceSixMonthDeathMI (
        $gracePtsSixMonthDeathMI);

$adata ['gracePtsInHospitalDeath' ] =
    $gracePtsInHospitalDeath;
$adata ['gracePtsInHospitalDeathMI' ] =
    $gracePtsInHospitalDeathMI;
$adata ['gracePtsSixMonthDeath' ] =
    $gracePtsSixMonthDeath;
$adata ['gracePtsSixMonthDeathMI' ] =
    $gracePtsSixMonthDeathMI;
$adata ['graceProbInHospitalDeath' ] =
    $graceProbInHospitalDeath;
$adata ['graceProbInHospitalDeathMI' ] =
    $graceProbInHospitalDeathMI;
$adata ['graceProbSixMonthDeath' ] =
    $graceProbSixMonthDeath;
$adata ['graceProbSixMonthDeathMI' ] =
    $graceProbSixMonthDeathMI;
$adata ['graceProbOneYearDeath' ] =
    $graceProbOneYearDeath;
$adata ['graceProbOneYearDeathMI' ] =
    $graceProbOneYearDeathMI;
$adata ['graceProbThreeYearDeath' ] =
    $graceProbThreeYearDeath;

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$data[ 'graceProbThreeYearDeathMI' ] =
    $graceProbThreeYearDeathMI;
$data[ 'graceProbInHospitalDeathPhil' ] =
    $graceProbPhil;

//HEART

$heartPts = $this->_compHeart($data);
$heartProb = $this->_pointToProbHeart($heartPts)
    ;

$data[ 'heartPts' ] = $heartPts;
$data[ 'heartProb' ] = $heartProb;

if (isset($db) && $db == "Save"){
    $demographics = array(
        'Age' => $data[ 't_age' ],
        'InputDate' => $date
    );

    $PatientID = $this->CalculatorModel->
        insertDemographics($demographics);

    $id[ 'PatientID' ] = $PatientID;
    $id[ 'RangeID' ] = $this->_rangeAge($data[ '
        g_ageInit' ]);
    $this->CalculatorModel->insertRanges($id);
    $id[ 'RangeID' ] = $this->_rangeSerum($data[ '
        g_serumCreatinine' ]);
    $this->CalculatorModel->insertRanges($id);
    $id[ 'RangeID' ] = $this->_rangeSys($data[ '
        g_sysBloodPressInit' ]);
    $this->CalculatorModel->insertRanges($id);
    $id[ 'RangeID' ] = $this->_rangeHeart($data[ '
        g_heartRateInit' ]);
    $this->CalculatorModel->insertRanges($id);

    $baseChar = array(
        'PatientID' => $PatientID,
        'AtheroscleroticDisease' => $this->_strToBin(
            $data[ 'h_atheros' ]),
        'History' => $this->_phraseToBin($data[ '
            h_history' ]),
        'Stenosis' => $this->_strToBin($data[ '
            t_historyOfStenosis' ]),
        'AnginaEvents' => $this->_strToBin($data[ '
            t_anginaEvents' ])
    );

    $BaseCharID = $this->CalculatorModel->
        insertBaselineCharacteristics($baseChar);

    $riskFactors[ 'BaseCharID' ] = $BaseCharID;

    if (count($data[ 't_risk' ]) != 0){
        foreach($data[ 't_risk' ] as $risk){
            switch($risk){
                case "Hypercholesterolemia":
                    $riskFactors[ 'RiskID' ] = $this->_getRiskID("
                        Hypercholesterolemia");
                    $this->CalculatorModel->insertRiskFactors(
                        $riskFactors);
                    break;
                case "Hypertension":
                    $riskFactors[ 'RiskID' ] = $this->_getRiskID("
                        Hypertension");
                    $this->CalculatorModel->insertRiskFactors(
                        $riskFactors);
                    break;
                case "Diabetes_Mellitus":
                    $riskFactors[ 'RiskID' ] = $this->_getRiskID("
                        Diabetes_Mellitus");
                    $this->CalculatorModel->insertRiskFactors(
                        $riskFactors);
                    break;
                case "Cigarette_smoking":
                    $riskFactors[ 'RiskID' ] = $this->_getRiskID("
                        Cigarette_smoking");
                    $this->CalculatorModel->insertRiskFactors(
                        $riskFactors);
                    break;
                case "Positive_family_history":
                    $riskFactors[ 'RiskID' ] = $this->_getRiskID("
                        Positive_family_history");
                    $this->CalculatorModel->insertRiskFactors(
                        $riskFactors);
                    break;
                case "Obesity":
                    $riskFactors[ 'RiskID' ] = $this->_getRiskID("
                        Obesity");
                    $this->CalculatorModel->insertRiskFactors(
                        $riskFactors);
                    break;
            }
        }
    }

    $clinicalPres = array(
        'PatientID' => $PatientID,
        'HeartRate' => $data[ 'g_heartRateInit' ],
        'SystolicBP' => $data[ 'g_sysBloodPressInit' ],
        'KillipClass' => $killipNum,
        'CardiacArrest' => $this->_strToBin($data[ '
            g_cardiacArrest' ])
    );

    $this->CalculatorModel->
        insertClinicalPresentation($clinicalPres);

    $segFindings = array(
        'PatientID' => $PatientID,
        'STSegmentDepression' => $this->_strToBin(
            $stSegDev2)
    );

    $this->CalculatorModel->insertEcgFindings(
        $segFindings);

    $labTests = array(
        'PatientID' => $PatientID,
        'serumCreatinine' => $serumCreat,
        'Troponin' => $this->_strToBin($cardiacMarker2)
    );

    $this->CalculatorModel->insertLabTests($labTests
    );

    $medications = array(
        'PatientID' => $PatientID,
        'AspirinIntake' => $this->_strToBin($data[ '
            t_aspirinIntake' ])
    );

    $this->CalculatorModel->
        insertPrehospitalMedications($medications);

    $calcUsed = array(
        'PatientID' => $PatientID,
        'CalculatorID' => 6
    );

    $this->CalculatorModel->insertCalculatorUsed(
        $calcUsed);

    $riskScores = array(
        'PatientID' => $PatientID,
        'TimiScore' => $data[ 'timiPts' ],
        'GraceScoreInHospitalDeath' => $data[ '
            gracePtsInHospitalDeath' ],
        'GraceScoreInHospitalDeathMI' => $data[ '
            gracePtsInHospitalDeathMI' ],
        'GraceScoreSixMonthDeath' => $data[ '
            gracePtsSixMonthDeath' ],
        'GraceScoreSixMonthDeathMI' => $data[ '
            gracePtsSixMonthDeathMI' ],
        'HeartScore' => $data[ 'heartPts' ]
    );

    $this->CalculatorModel->insertRiskScore(
        $riskScores);

    $riskProb = array(
        'PatientID' => $PatientID,
        'TimiProb' => $data[ 'timiProb' ],
        'GraceProbInHospitalDeath' => $data[ '
            graceProbInHospitalDeath' ],
        'GraceProbInHospitalDeathMI' => $data[ '
            graceProbInHospitalDeathMI' ],
        'GraceProbSixMonthDeath' => $data[ '
            graceProbSixMonthDeath' ],
        'GraceProbSixMonthDeathMI' => $data[ '
            graceProbSixMonthDeathMI' ],
        'GraceProbOneYearDeath' => $data[ '
            graceProbOneYearDeath' ],
        'GraceProbOneYearDeathMI' => $data[ '
            graceProbOneYearDeathMI' ],
        'GraceProbThreeYearsDeath' => $data[ '
            graceProbThreeYearDeath' ],
        'GraceProbThreeYearsDeathMI' => $data[ '
            graceProbThreeYearDeathMI' ],
        'HeartProb' => $data[ 'heartProb' ]
    );

    $this->CalculatorModel->insertRiskProb($riskProb)
}

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    );
}
}
else if($calculator == "STEMI"){
$killipNum = 0;

$data = array(
'calculator' => $calculator,
's_age' => $this->input->post('s_age'),
's_anginaEvents' => $this->input->post('
s_anginaEvents'),
's_sysBloodPress' => $this->input->post('
s_sysBloodPress'),
's_heartRate' => $this->input->post('s_heartRate
'),
's_killipClass' => $this->input->post('
s_killipClass'),
's_weight' => $this->input->post('s_weight'),
's_stSegmentElev' => $this->input->post('
s_stSegmentElev'),
's_timeToTreat' => $this->input->post('
s_timeToTreat')
);

$stemiPts = $this->_compStemi($data);
$stemiProbThirtyDays = $this->
_pointToProbStemiThirtyDays($stemiPts);
$stemiProbOneYear = $this->
_pointToProbStemiOneYear($stemiPts);

$data['stemiPts'] = $stemiPts;
$data['stemiProbThirtyDays'] =
$stemiProbThirtyDays;
$data['stemiProbOneYear'] = $stemiProbOneYear;

if(isset($db) && $db == "Save"){
$demographics = array(
'Age' => $data['s_age'],
'InputDate' => $date
);

$PatientID = $this->CalculatorModel->
insertDemographics($demographics);

$baseChar = array(
'PatientID' => $PatientID,
'AnginaEvents' => $this->_strToBin($data['
s_anginaEvents'])
);

$BaseCharID = $this->CalculatorModel->
insertBaselineCharacteristics($baseChar);

$RiskFactors['BaseCharID'] = $BaseCharID;

if($data['s_anginaEvents'] == "Yes"){
$RiskFactors['RiskID'] = $this->_getRiskID("
Diabetes_Mellitus");
$this->CalculatorModel->insertRiskFactors(
$RiskFactors);
}

switch($data['s_killipClass']){
case "Killip_Class_I": $killipNum = 1; break;
case "Killip_Class_II": $killipNum = 2; break;
case "Killip_Class_III": $killipNum = 3; break;
case "Killip_Class_IV": $killipNum = 4; break;
default: break;
}

$clinicalPres = array(
'PatientID' => $PatientID,
'HeartRate' => $data['s_heartRate'],
'SystolicBP' => $data['s_sysBloodPress'],
'KillipClass' => $killipNum,
'Weight' => $data['s_weight']
);

$this->CalculatorModel->
insertClinicalPresentation($clinicalPres);

$ecgFindings = array(
'PatientID' => $PatientID,
'STSegmentElevation' => $this->_strToBin($data['
s_stSegmentElev'])
);

$this->CalculatorModel->insertEcgFindings(
$ecgFindings);

$labTests = array(
'PatientID' => $PatientID,
'TimeToTreatment' => $this->_strToBin($data['
s_timeToTreat'])
);

$this->CalculatorModel->insertLabTests($labTests
);

$calcUsed = array(
'PatientID' => $PatientID,
'CalculatorID' => 5
);

$this->CalculatorModel->insertCalculatorUsed(
$calcUsed);

$riskScores = array(
'PatientID' => $PatientID,
'StemiScore' => $data['stemiPts']
);

$this->CalculatorModel->insertRiskScore(
$riskScores);

$riskProb = array(
'PatientID' => $PatientID,
'StemiProbOneYear' => $data['stemiProbOneYear'],
'StemiProbThirtyDays' => $data['
stemiProbThirtyDays'],
);

$this->CalculatorModel->insertRiskProb($riskProb
);
}
}

$this->load->view('templates/header');

if(!is_array($_POST) || !isset($data))
$this->load->view('errors/cli/error_noInput');
else
$this->load->view('pages/resultView', $data);

$this->load->view('templates/footer');
}

private function _strToBin($str){
if($str == "Yes"){
return 1;
}
else{
return 0;
}
}

private function _phraseToBin($phrase){
if($phrase == "Highly_Suspicious" || $phrase ==
"Significant_ST-depression" || $phrase ==
"3x_normal_limit" || $phrase == "1_
3x_normal_limit")
return 1;
else
return 0;
}

private function _getRiskID($name) {
$this->load->model('CalculatorModel');

$risk = $this->CalculatorModel->getRiskID($name)
;
$rid = $risk[0]->RiskID;

return $rid;
}

private function _compFram($data){
$framPts = 0;
$f_ageP = 0;
$f_cholP = 0;
$f_hdlP = 0;
$f_bpP = 0;
$f_diabeticP = 0;
$f_smokerP = 0;

if($data['f_sex'] == "Male"){
$f_ageP = $this->_agePointMFram($data['f_age']);
$f_cholP = $this->_cholPointMFram($data['
f_totalChol']);
$f_hdlP = $this->_hdlPointMFram($data['
f_highDenLip']);
$f_bpP = $this->_bloodPressMFram($data['
f_sysBloodPress'], $data['f_diaBloodPress'
]);
}
}

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}
else{
$f_ageP = $this->_agePointFFram($data['f_age'])
;
$f_choleP = $this->_cholPointFFram($data['
f_totalChol']);
$f_hdlP = $this->_hdlPointFFram($data['
f_highDenLip']);
$f_bpP = $this->_bloodPressFFram($data['
f_sysBloodPress'], $data['f_diaBloodPress'
]);
}

$f_diabeticP = $this->_diabeticPointFram($data[
'f_diabetic'], $data['f_sex']);

if($data['f_smoker'] == "Yes")
$f_smokerP = 2;

$framPts = $f_ageP + $f_choleP + $f_hdlP + $f_bpP
+ $f_diabeticP + $f_smokerP;

return $framPts;
}

private function _agePointMFrame($age){
$agePt = 0;

if($age <= 34)
$agePt = -1;
else if($age >= 35 && $age <= 39)
$agePt = 0;
else if($age >= 40 && $age <= 44)
$agePt = 1;
else if($age >= 45 && $age <= 49)
$agePt = 2;
else if($age >= 50 && $age <= 54)
$agePt = 3;
else if($age >= 55 && $age <= 59)
$agePt = 4;
else if($age >= 60 && $age <= 64)
$agePt = 5;
else if($age >= 65 && $age <= 69)
$agePt = 6;
else if($age >= 70)
$agePt = 7;

return $agePt;
}

private function _cholPointMFrame($chol){
$cholPt = 0;

if($chol < 160)
$cholPt = -3;
else if($chol >= 160 && $chol <= 199)
$cholPt = 0;
else if($chol >= 200 && $chol <= 239)
$cholPt = 1;
else if($chol >= 240 && $chol <= 279)
$cholPt = 2;
else if($chol >= 280)
$cholPt = 3;

return $cholPt;
}

private function _hdlPointMFrame($hdl){
$hdlPt = 0;

if($hdl < 35)
$hdlPt = 2;
else if($hdl >= 35 && $hdl <= 44)
$hdlPt = 1;
else if($hdl >= 45 && $hdl <= 59)
$hdlPt = 0;
else if($hdl >= 60)
$hdlPt = -2;

return $hdlPt;
}

private function _bloodPressMFrame($sysBP, $diaBP
){
$bpPt = 0;

if($sysBP <= 129 && $diaBP <= 84)
$bpPt = 0;
else if(($sysBP >= 130 && $sysBP <= 139 &&
$diaBP <= 89) || ($sysBP <= 139 && $diaBP
>= 85 && $diaBP <= 89))
$bpPt = 1;
else if(($sysBP >= 140 && $sysBP <= 159 &&
$diaBP <= 99) || ($sysBP <= 159 && $diaBP
>= 90 && $diaBP <= 99))
$bpPt = 2;
else if(($sysBP >= 160 && $diaBP <= 99) || (
$sysBP <= 160 && $diaBP >= 100) || ($sysBP
>= 160 && $diaBP >= 100))
$bpPt = 3;

return $bpPt;
}

private function _diabeticPointFram($diabetic ,
$sex){
$diabeticPt = 0;

if($diabetic == "Yes" && $sex == "Male")

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$diabeticPt = 2;
else if($diabetic == "Yes" && $sex == "Female")
$diabeticPt = 4;
else if($diabetic == "No")
$diabeticPt = 0;

return $diabeticPt;
}

private function _pointToProbFram($framPts, $sex)
{
$prob = 0;

if($sex == "Male"){
switch($framPts){
case 0: $prob = 3; break;
case 1: $prob = 3; break;
case 2: $prob = 4; break;
case 3: $prob = 5; break;
case 4: $prob = 7; break;
case 5: $prob = 8; break;
case 6: $prob = 10; break;
case 7: $prob = 13; break;
case 8: $prob = 16; break;
case 9: $prob = 20; break;
case 10: $prob = 25; break;
case 11: $prob = 31; break;
case 12: $prob = 37; break;
case 13: $prob = 45; break;
default:
if($framPts >= 14)
$prob = 53;
else if($framPts <= -1)
$prob = 2;
break;
}
}
else{
switch($framPts){
case -1: $prob = 2; break;
case 0: $prob = 2; break;
case 1: $prob = 2; break;
case 2: $prob = 3; break;
case 3: $prob = 3; break;
case 4: $prob = 4; break;
case 5: $prob = 4; break;
case 6: $prob = 5; break;
case 7: $prob = 6; break;
case 8: $prob = 7; break;
case 9: $prob = 8; break;
case 10: $prob = 10; break;
case 11: $prob = 11; break;
case 12: $prob = 13; break;
case 13: $prob = 15; break;
case 14: $prob = 18; break;
case 15: $prob = 20; break;
case 16: $prob = 24; break;
default:
if($framPts >= 17)
$prob = 27;
else if($framPts <= -2)
$prob = 1;
break;
}
}
return $prob;
}

private function _compTimi($data){
$timiPts = 0;

if($data['t_age'] >= 65)
$timiPts++;
if(count($data['t_risk']) >= 3)
$timiPts++;
if($data['t_historyOfStenosis'] == "Yes")
$timiPts++;
if($data['t_stSegmentDev'] == "Yes")
$timiPts++;
if($data['t_anginaEvents'] == "Yes")
$timiPts++;
if($data['t_cardiacMarker'] == "Yes")
$timiPts++;
if($data['t_aspirinIntake'] == "Yes")
$timiPts++;

return $timiPts;
}

private function _pointToProbTimi($timiPts){
$prob = 0;

if($timiPts <= 1)
$prob = 4.7;
else if($timiPts == 2)
$prob = 8.3;
else if($timiPts == 3)
$prob = 13.2;
else if($timiPts == 4)
$prob = 19.9;
else if($timiPts == 5)
$prob = 25.2;
else if($timiPts >= 6)
$prob = 40.9;

return $prob;
}

private function _pointToProbTimiPhil($data){
$prob = 0;
$xBhat = 0;
$age = 0;
$risk = 0;
$stenosis = 0;
$st = 0;
$angina = 0;
$enzyme = 0;
$aspirin = 0;

if($data['t_age'] >= 65)
$age = 1;
if(count($data['t_risk']) >= 3)
$risk = 1;
if($data['t_historyOfStenosis'] == "Yes")
$stenosis = 1;
if($data['t_stSegmentDev'] == "Yes")
$st = 1;
if($data['t_anginaEvents'] == "Yes")
$angina = 1;
if($data['t_cardiacMarker'] == "Yes")
$enzyme = 1;
if($data['t_aspirinIntake'] == "Yes")
$aspirin = 1;

$xBhat = ($age * 1.13892) + ($risk * (-2.02774))
+ ($stenosis * 0.37284) + ($st * 0.30248)
+ ($angina * 0.01915) + ($enzyme * 0.41757)
+ ($aspirin * (-0.07290)) - 1.54579;

$prob = (exp($xBhat) / (1 + exp($xBhat))) * 100;

return round($prob, 2);
}

private function _compGraceInHospitalDeath($data
, $serumCreat, $killipNum, $cardiacArrest,
$cardiacMarker, $stSegmentDev){
$spts = 0;

//age
if($data['g_age'] < 30)
$spts += 0;
else if($data['g_age'] >= 30 && $data['g_age'] <
40)
$spts += ($data['g_age'] - 30) * (17/10);
else if($data['g_age'] >= 40 && $data['g_age'] <
50)
$spts += 17 + (($data['g_age'] - 40) * (16/10));
else if($data['g_age'] >= 50 && $data['g_age'] <
60)
$spts += 33 + (($data['g_age'] - 50) * (17/10));
else if($data['g_age'] >= 60 && $data['g_age'] <
70)
$spts += 50 + (($data['g_age'] - 60) * (17/10));
else if($data['g_age'] >= 70 && $data['g_age'] <
80)
$spts += 67 + (($data['g_age'] - 70) * (16/10));
else if($data['g_age'] >= 80 && $data['g_age'] <
90)
$spts += 83 + (($data['g_age'] - 80) * (17/10));
else if($data['g_age'] >= 90)
$spts += 100;

//heartRate
if($data['g_heartRate'] < 50)
$spts += 0;
else if($data['g_heartRate'] >= 50 && $data['g_heartRate'] < 60)
$spts += ($data['g_heartRate'] - 50) * (3/10);
else if($data['g_heartRate'] >= 60 && $data['g_heartRate'] < 70)
$spts += 3 + (($data['g_heartRate'] - 60) *
(3/10));
else if($data['g_heartRate'] >= 70 && $data['

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    g_heartRate'] < 80)
Spts += 6 + (($data['g_heartRate'] - 70) *
(3/10));
else if($data['g_heartRate'] >= 80 && $data['
g_heartRate'] < 90)
Spts += 9 + (($data['g_heartRate'] - 80) *
(3/10));
else if($data['g_heartRate'] >= 90 && $data['
g_heartRate'] < 100)
Spts += 12 + (($data['g_heartRate'] - 90) *
(3/10));
else if($data['g_heartRate'] >= 100 && $data['
g_heartRate'] < 110)
Spts += 15 + (($data['g_heartRate'] - 100) *
(3/10));
else if($data['g_heartRate'] >= 110 && $data['
g_heartRate'] < 150)
Spts += 18 + (($data['g_heartRate'] - 110) *
(12/40));
else if($data['g_heartRate'] >= 150 && $data['
g_heartRate'] < 200)
Spts += 30 + (($data['g_heartRate'] - 150) *
(16/50));
else if($data['g_heartRate'] >= 200)
Spts += 46;

//sysBloodPress
if($data['g_sysBloodPress'] < 80)
Spts += 58;
else if($data['g_sysBloodPress'] >= 80 && $data['
g_sysBloodPress'] < 100)
Spts += 58 - (($data['g_sysBloodPress'] - 80) *
(10/20));
else if($data['g_sysBloodPress'] >= 100 && $data['
g_sysBloodPress'] < 110)
Spts += 48 - (($data['g_sysBloodPress'] - 100) *
(5/10));
else if($data['g_sysBloodPress'] >= 110 && $data['
g_sysBloodPress'] < 120)
Spts += 43 - (($data['g_sysBloodPress'] - 110) *
(4/10));
else if($data['g_sysBloodPress'] >= 120 && $data['
g_sysBloodPress'] < 130)
Spts += 39 - (($data['g_sysBloodPress'] - 120) *
(5/10));
else if($data['g_sysBloodPress'] >= 130 && $data['
g_sysBloodPress'] < 140)
Spts += 34 - (($data['g_sysBloodPress'] - 130) *
(5/10));
else if($data['g_sysBloodPress'] >= 140 && $data['
g_sysBloodPress'] < 150)
Spts += 29 - (($data['g_sysBloodPress'] - 140) *
(5/10));
else if($data['g_sysBloodPress'] >= 150 && $data['
g_sysBloodPress'] < 160)
Spts += 24 - (($data['g_sysBloodPress'] - 150) *
(5/10));
else if($data['g_sysBloodPress'] >= 160 && $data['
g_sysBloodPress'] < 180)
Spts += 19 - (($data['g_sysBloodPress'] - 160) *
(9/20));
else if($data['g_sysBloodPress'] >= 180 && $data['
g_sysBloodPress'] < 200)
Spts += 10 - (($data['g_sysBloodPress'] - 180) *
(10/20));

//serumCreatinine
if($serumCreat < 0.2)
Spts += ($serumCreat * (1/(0.2)));
else if($serumCreat >= 0.2 && $serumCreat < 0.4)
Spts += 1 + (($serumCreat - 0.2) * (2/(0.2)));
else if($serumCreat >= 0.4 && $serumCreat < 0.6)
Spts += 3 + (($serumCreat - 0.4) * (1/(0.2)));
else if($serumCreat >= 0.6 && $serumCreat < 0.8)
Spts += 4 + (($serumCreat - 0.6) * (2/(0.2)));
else if($serumCreat >= 0.8 && $serumCreat < 1.0)
Spts += 6 + (($serumCreat - 0.8) * (1/(0.2)));
else if($serumCreat >= 1.0 && $serumCreat < 1.2)
Spts += 7 + (($serumCreat - 1.0) * (1/(0.2)));
else if($serumCreat >= 1.2 && $serumCreat < 1.4)
Spts += 8 + (($serumCreat - 1.2) * (2/(0.2)));
else if($serumCreat >= 1.4 && $serumCreat < 1.6)
Spts += 10 + (($serumCreat - 1.4) * (1/(0.2)));
else if($serumCreat >= 1.6 && $serumCreat < 1.8)
Spts += 11 + (($serumCreat - 1.6) * (2/(0.2)));
else if($serumCreat >= 1.8 && $serumCreat < 2.0)
Spts += 13 + (($serumCreat - 1.8) * (1/(0.2)));
else if($serumCreat >= 2.0 && $serumCreat < 3.0)
Spts += 14 + (($serumCreat - 2.0) * 7);
else if($serumCreat >= 3.0 && $serumCreat < 4.0)
Spts += 21 + (($serumCreat - 3.0) * 7);
else if($serumCreat >= 4.0)

Spts += 28;

//killipClass
switch($killipNum){
case 1: $spts += 0; break;
case 2: $spts += 20; break;
case 3: $spts += 39; break;
case 4: $spts += 59; break;
}

Spts += ($cardiacArrest * 39) + ($cardiacMarker
* 14) + ($stSegmentDev * 28);

return round($spts);
}

private function
_pointToProbGraceInHospitalDeath($data,
$serumCreat, $killipNum, $cardiacArrest,
$cardiacMarker, $stSegmentDev){
$prob = 0;
$xBhat = 0;
$diureticProb = 0;
$renalProb = 0;

if($killipNum == 0){
if($data['g_diureticUsage'] == "Yes")
$diureticProb = 1.73275;
else
$diureticProb = 0.6931;
}

if($serumCreat == 0){
if($data['g_renalFailure'] == "Yes")
$renalProb = 0.3646;
else
$renalProb = 0.09115;
}

$xBhat = ($data['g_age'] * 0.0531) + ($data['
g_heartRate'] * 0.0087) + ($data['
g_sysBloodPress'] * (-0.0168)) + (
$serumCreat * 0.1823) + ($killipNum *
0.6931) + ($cardiacArrest * 1.4586) + (
$cardiacMarker * 0.4700) + ($stSegmentDev *
0.8755) - 7.7035 + $diureticProb +
$renalProb;

$prob = (exp($xBhat) / (1 + exp($xBhat))) * 100;

return round($prob, 2);
}

private function
_pointToProbGraceInHospitalDeathPhil($data,
$serumCreat, $killipNum, $cardiacArrest,
$cardiacMarker, $stSegmentDev){
$prob = 0;
$xBhat = 0;

$xBhat = ($data['g_age'] * 0.0465080) + ($data['
g_heartRate'] * 0.0110288) + ($data['
g_sysBloodPress'] * (-0.0077314)) + (
$serumCreat * (-0.0003771)) + ($killipNum *
0.7680730) + ($cardiacArrest *
(-0.2271102)) + ($cardiacMarker *
0.3134368) + ($stSegmentDev * 0.1640661) -
7.0278038;

$prob = (exp($xBhat) / (1 + exp($xBhat))) * 100;

return round($prob, 2);
}

private function _compGraceInHospitalDeathMI(
$data, $serumCreat, $killipNum,
$cardiacArrest, $cardiacMarker,
$stSegmentDev){
Spts = 0;

//age
if($data['g_age'] < 30)
Spts += 0;
else if($data['g_age'] >= 30 && $data['g_age'] <
40)
Spts += ($data['g_age'] - 30) * 1.3;
else if($data['g_age'] >= 40 && $data['g_age'] <
50)
Spts += 13 + (($data['g_age'] - 40) * 1.4);
else if($data['g_age'] >= 50 && $data['g_age'] <
60)
Spts += 27 + (($data['g_age'] - 50) * 1.3);

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else if($data['g_age'] >= 60 && $data['g_age'] < 70)
$pts += 40 + (($data['g_age'] - 60) * 1.4);
else if($data['g_age'] >= 70 && $data['g_age'] < 80)
$pts += 54 + (($data['g_age'] - 70) * 1.3);
else if($data['g_age'] >= 80 && $data['g_age'] < 90)
$pts += 67 + (($data['g_age'] - 80) * 1.3);
else if($data['g_age'] >= 90)
$pts += 80;

//heartRate
if($data['g_heartRate'] < 50)
$pts += 0;
else if($data['g_heartRate'] >= 50 && $data['g_heartRate'] < 60)
$pts += ($data['g_heartRate'] - 50) * 0.3;
else if($data['g_heartRate'] >= 60 && $data['g_heartRate'] < 70)
$pts += 3 + (($data['g_heartRate'] - 60) * 0.2);
else if($data['g_heartRate'] >= 70 && $data['g_heartRate'] < 80)
$pts += 5 + (($data['g_heartRate'] - 70) * 0.3);
else if($data['g_heartRate'] >= 80 && $data['g_heartRate'] < 90)
$pts += 8 + (($data['g_heartRate'] - 80) * 0.3);
else if($data['g_heartRate'] >= 90 && $data['g_heartRate'] < 100)
$pts += 11 + (($data['g_heartRate'] - 90) * 0.3);
else if($data['g_heartRate'] >= 100 && $data['g_heartRate'] < 110)
$pts += 14 + (($data['g_heartRate'] - 100) * 0.2);
else if($data['g_heartRate'] >= 110 && $data['g_heartRate'] < 150)
$pts += 16 + (($data['g_heartRate'] - 110) * 0.3);
else if($data['g_heartRate'] >= 150 && $data['g_heartRate'] < 200)
$pts += 28 + (($data['g_heartRate'] - 150) * 0.26);
else if($data['g_heartRate'] >= 200)
$pts += 41;

//sysBloodPress
if($data['g_sysBloodPress'] < 80)
$pts += 53;
else if($data['g_sysBloodPress'] >= 80 && $data['g_sysBloodPress'] < 100)
$pts += 53 - (($data['g_sysBloodPress'] - 80) * 0.4);
else if($data['g_sysBloodPress'] >= 100 && $data['g_sysBloodPress'] < 110)
$pts += 45 - (($data['g_sysBloodPress'] - 100) * 0.5);
else if($data['g_sysBloodPress'] >= 110 && $data['g_sysBloodPress'] < 120)
$pts += 40 - (($data['g_sysBloodPress'] - 110) * 0.5);
else if($data['g_sysBloodPress'] >= 120 && $data['g_sysBloodPress'] < 130)
$pts += 35 - (($data['g_sysBloodPress'] - 120) * 0.4);
else if($data['g_sysBloodPress'] >= 130 && $data['g_sysBloodPress'] < 140)
$pts += 31 - (($data['g_sysBloodPress'] - 130) * 0.5);
else if($data['g_sysBloodPress'] >= 140 && $data['g_sysBloodPress'] < 150)
$pts += 26 - (($data['g_sysBloodPress'] - 140) * 0.4);
else if($data['g_sysBloodPress'] >= 150 && $data['g_sysBloodPress'] < 160)
$pts += 22 - (($data['g_sysBloodPress'] - 150) * 0.5);
else if($data['g_sysBloodPress'] >= 160 && $data['g_sysBloodPress'] < 180)
$pts += 17 - (($data['g_sysBloodPress'] - 160) * 0.4);
else if($data['g_sysBloodPress'] >= 180 && $data['g_sysBloodPress'] < 200)
$pts += 9 - (($data['g_sysBloodPress'] - 180) * 0.45);

//serumCreatinine
if($serumCreat == 0){
if($data['g_renalFailure'] == "Yes")
$pts += 14;
else
$pts += 3.5;
}
else if($serumCreat > 0 && $serumCreat < 0.2)
$pts += ($serumCreat * (1/(0.2)));
else if($serumCreat >= 0.2 && $serumCreat < 0.4)
$pts += 1 + (($serumCreat - 0.2) * (2/(0.2)));
else if($serumCreat >= 0.4 && $serumCreat < 0.6)
$pts += 3 + (($serumCreat - 0.4) * (1/(0.2)));
else if($serumCreat >= 0.6 && $serumCreat < 0.8)
$pts += 4 + (($serumCreat - 0.6) * (2/(0.2)));
else if($serumCreat >= 0.8 && $serumCreat < 1.0)
$pts += 6 + (($serumCreat - 0.8) * (1/(0.2)));
else if($serumCreat >= 1.0 && $serumCreat < 1.2)
$pts += 7 + (($serumCreat - 1.0) * (1/(0.2)));
else if($serumCreat >= 1.2 && $serumCreat < 1.4)
$pts += 8 + (($serumCreat - 1.2) * (2/(0.2)));
else if($serumCreat >= 1.4 && $serumCreat < 1.6)
$pts += 10 + (($serumCreat - 1.4) * (1/(0.2)));
else if($serumCreat >= 1.6 && $serumCreat < 1.8)
$pts += 11 + (($serumCreat - 1.6) * (2/(0.2)));
else if($serumCreat >= 1.8 && $serumCreat < 2.0)
$pts += 13 + (($serumCreat - 1.8) * (1/(0.2)));
else if($serumCreat >= 2.0 && $serumCreat < 3.0)
$pts += 14 + (($serumCreat - 2.0) * 7);
else if($serumCreat >= 3.0 && $serumCreat < 4.0)
$pts += 21 + (($serumCreat - 3.0) * 7);
else if($serumCreat >= 4.0)
$pts += 28;

//killipClass
switch($killipNum){
case 0:
if($data['g_diureticUsage'] == "Yes")
$pts += 50;
else
$pts += 0;
break;
case 1: $pts += 0; break;
case 2: $pts += 33; break;
case 3: $pts += 67; break;
case 4: $pts += 100; break;
}

$pts += ($cardiacArrest * 98) + ($cardiacMarker * 54) + ($stSegmentDev * 67);

return round($pts);
}

private function
_pointToProbGraceInHospitalDeathMI($score){
$prob = 0;

if($score < 30)
$prob = 2;
else if($score >= 30 && $score < 57)
$prob = 3;
else if($score >= 57 && $score < 79)
$prob = 4;
else if($score >= 79 && $score < 96)
$prob = 5;
else if($score >= 96 && $score < 111)
$prob = 6;
else if($score >= 111 && $score < 124)
$prob = 7;
else if($score >= 124 && $score < 136)
$prob = 8;
else if($score >= 136 && $score < 146)
$prob = 9;
else if($score >= 146 && $score < 156)
$prob = 10;
else if($score >= 156 && $score < 165)
$prob = 11;
else if($score >= 165 && $score < 173)
$prob = 12;
else if($score >= 173 && $score < 181)
$prob = 13;
else if($score >= 181 && $score < 188)
$prob = 14;
else if($score >= 188 && $score < 195)
$prob = 15;
else if($score >= 195 && $score < 202)
$prob = 16;
else if($score >= 202 && $score < 208)
$prob = 17;
else if($score >= 208 && $score < 214)
$prob = 18;
else if($score >= 214 && $score < 220)
$prob = 19;
else if($score >= 220 && $score < 225)
$prob = 20;
else if($score >= 225 && $score < 231)
$prob = 21;
}

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else if($score >= 231 && $score < 236)
$prob = 22;
else if($score >= 236 && $score < 241)
$prob = 23;
else if($score >= 241 && $score < 246)
$prob = 24;
else if($score >= 246 && $score < 251)
$prob = 25;
else if($score >= 251 && $score < 255)
$prob = 26;
else if($score >= 255 && $score < 260)
$prob = 27;
else if($score >= 260 && $score < 264)
$prob = 28;
else if($score >= 264 && $score < 269)
$prob = 29;
else if($score >= 269 && $score < 309)
$prob = 30;
else if($score >= 309 && $score < 345)
$prob = 40;
else if($score >= 345 && $score < 382)
$prob = 50;
else if($score >= 382 && $score < 422)
$prob = 60;
else if($score >= 422 && $score < 471)
$prob = 70;
else if($score >= 471)
$prob = 80;

return round($prob, 2);
}

private function _compGraceSixMonthDeath($data,
    $serumCreat, $killipNum, $cardiacArrest,
    $cardiacMarker, $stSegmentDev){
    $pts = 0;

    //age
    if($data['g-age'] < 35)
    $pts += 0;
    else if($data['g-age'] >= 35 && $data['g-age'] <
    45)
    $pts += ($data['g-age'] - 35) * 1.8;
    else if($data['g-age'] >= 45 && $data['g-age'] <
    55)
    $pts += 18 + (($data['g-age'] - 45) * 1.8);
    else if($data['g-age'] >= 55 && $data['g-age'] <
    65)
    $pts += 36 + (($data['g-age'] - 55) * 1.8);
    else if($data['g-age'] >= 65 && $data['g-age'] <
    75)
    $pts += 54 + (($data['g-age'] - 65) * 1.8);
    else if($data['g-age'] >= 75 && $data['g-age'] <
    85)
    $pts += 73 + (($data['g-age'] - 75) * 1.8);
    else if($data['g-age'] >= 85 && $data['g-age'] <
    90)
    $pts += 91 + (($data['g-age'] - 85) * 1.8);
    else if($data['g-age'] >= 90)
    $pts += 100;

    //heartRate
    if($data['g_heartRate'] < 70)
    $pts += 0;
    else if($data['g_heartRate'] >= 70 && $data['
    g_heartRate'] < 80)
    $pts += ($data['g_heartRate'] - 70) * 0.3;
    else if($data['g_heartRate'] >= 80 && $data['
    g_heartRate'] < 90)
    $pts += 3 + (($data['g_heartRate'] - 80) * 0.2);
    else if($data['g_heartRate'] >= 90 && $data['
    g_heartRate'] < 100)
    $pts += 5 + (($data['g_heartRate'] - 90) * 0.3);
    else if($data['g_heartRate'] >= 100 && $data['
    g_heartRate'] < 110)
    $pts += 8 + (($data['g_heartRate'] - 100) * 0.2);
    else if($data['g_heartRate'] >= 110 && $data['
    g_heartRate'] < 150)
    $pts += 10 + (($data['g_heartRate'] - 110) *
    0.3);
    else if($data['g_heartRate'] >= 150 && $data['
    g_heartRate'] < 200)
    $pts += 22 + (($data['g_heartRate'] - 150) *
    0.3);
    else if($data['g_heartRate'] >= 200)
    $pts += 34;

    //sysBloodPress
    if($data['g_sysBloodPress'] < 80)
    $pts += 40;
    else if($data['g_sysBloodPress'] >= 80 && $data[
    'g_sysBloodPress'] < 100)
    $pts += 40 - (($data['g_sysBloodPress'] - 80) *
    0.3);
    else if($data['g_sysBloodPress'] >= 100 && $data
    ['g_sysBloodPress'] < 110)
    $pts += 34 - (($data['g_sysBloodPress'] - 100) *
    0.3);
    else if($data['g_sysBloodPress'] >= 110 && $data
    ['g_sysBloodPress'] < 120)
    $pts += 31 - (($data['g_sysBloodPress'] - 110) *
    0.4);
    else if($data['g_sysBloodPress'] >= 120 && $data
    ['g_sysBloodPress'] < 130)
    $pts += 27 - (($data['g_sysBloodPress'] - 120) *
    0.3);
    else if($data['g_sysBloodPress'] >= 130 && $data
    ['g_sysBloodPress'] < 140)
    $pts += 24 - (($data['g_sysBloodPress'] - 130) *
    0.3);
    else if($data['g_sysBloodPress'] >= 140 && $data
    ['g_sysBloodPress'] < 150)
    $pts += 20 - (($data['g_sysBloodPress'] - 140) *
    0.4);
    else if($data['g_sysBloodPress'] >= 150 && $data
    ['g_sysBloodPress'] < 160)
    $pts += 17 - (($data['g_sysBloodPress'] - 150) *
    0.3);
    else if($data['g_sysBloodPress'] >= 160 && $data
    ['g_sysBloodPress'] < 180)
    $pts += 14 - (($data['g_sysBloodPress'] - 160) *
    0.3);
    else if($data['g_sysBloodPress'] >= 180 && $data
    ['g_sysBloodPress'] < 200)
    $pts += 8 - (($data['g_sysBloodPress'] - 180) *
    0.4);

    //serumCreatinine
    if($serumCreat == 0){
    if($data['g_renalFailure'] == "Yes")
    $pts += 14;
    else
    $pts += 3.5;
    }
    else if($serumCreat > 0 && $serumCreat < 0.2)
    $pts += ($serumCreat * (1/(0.2)));
    else if($serumCreat >= 0.2 && $serumCreat < 0.4)
    $pts += 1 + (($serumCreat - 0.2) * (2/(0.2)));
    else if($serumCreat >= 0.4 && $serumCreat < 0.6)
    $pts += 3 + (($serumCreat - 0.4) * (1/(0.2)));
    else if($serumCreat >= 0.6 && $serumCreat < 0.8)
    $pts += 4 + (($serumCreat - 0.6) * (2/(0.2)));
    else if($serumCreat >= 0.8 && $serumCreat < 1.0)
    $pts += 6 + (($serumCreat - 0.8) * (1/(0.2)));
    else if($serumCreat >= 1.0 && $serumCreat < 1.2)
    $pts += 7 + (($serumCreat - 1.0) * (1/(0.2)));
    else if($serumCreat >= 1.2 && $serumCreat < 1.4)
    $pts += 8 + (($serumCreat - 1.2) * (2/(0.2)));
    else if($serumCreat >= 1.4 && $serumCreat < 1.6)
    $pts += 10 + (($serumCreat - 1.4) * (1/(0.2)));
    else if($serumCreat >= 1.6 && $serumCreat < 1.8)
    $pts += 11 + (($serumCreat - 1.6) * (2/(0.2)));
    else if($serumCreat >= 1.8 && $serumCreat < 2.0)
    $pts += 13 + (($serumCreat - 1.8) * (1/(0.2)));
    else if($serumCreat >= 2.0 && $serumCreat < 3.0)
    $pts += 14 + (($serumCreat - 2.0) * 7);
    else if($serumCreat >= 3.0 && $serumCreat < 4.0)
    $pts += 21 + (($serumCreat - 3.0) * 7);
    else if($serumCreat >= 4.0)
    $pts += 28;

    //killipClass
    switch($killipNum){
    case 0:
    if($data['g_diureticUsage'] == "Yes")
    $pts += 20;
    else
    $pts += 0;
    break;
    case 1: $pts += 0; break;
    case 2: $pts += 15; break;
    case 3: $pts += 29; break;
    case 4: $pts += 44; break;
    }

    $pts += ($cardiacArrest * 30) + ($cardiacMarker
    * 13) + ($stSegmentDev * 17);

    return round($pts);
}

private function _pointToProbGraceSixMonthDeath(
    $score){

```

```

$prob = 0;

if($score <= 6)
$prob = 0.2;
else if($score > 6 && $score <= 27)
$prob = 0.4;
else if($score > 27 && $score <= 39)
$prob = 0.6;
else if($score > 39 && $score <= 48)
$prob = 0.8;
else if($score > 48 && $score <= 55)
$prob = 1;
else if($score > 55 && $score <= 60)
$prob = 1.2;
else if($score > 60 && $score <= 65)
$prob = 1.4;
else if($score > 65 && $score <= 69)
$prob = 1.6;
else if($score > 69 && $score <= 73)
$prob = 1.8;
else if($score > 73 && $score <= 76)
$prob = 2;
else if($score > 76 && $score <= 88)
$prob = 3;
else if($score > 88 && $score <= 97)
$prob = 4;
else if($score > 97 && $score <= 104)
$prob = 5;
else if($score > 104 && $score <= 110)
$prob = 6;
else if($score > 110 && $score <= 115)
$prob = 7;
else if($score > 115 && $score <= 119)
$prob = 8;
else if($score > 119 && $score <= 123)
$prob = 9;
else if($score > 123 && $score <= 126)
$prob = 10;
else if($score > 126 && $score <= 129)
$prob = 11;
else if($score > 129 && $score <= 132)
$prob = 12;
else if($score > 132 && $score <= 134)
$prob = 13;
else if($score > 134 && $score <= 137)
$prob = 14;
else if($score > 137 && $score <= 139)
$prob = 15;
else if($score > 139 && $score <= 141)
$prob = 16;
else if($score > 141 && $score <= 143)
$prob = 17;
else if($score > 143 && $score <= 145)
$prob = 18;
else if($score > 145 && $score <= 147)
$prob = 19;
else if($score > 147 && $score <= 149)
$prob = 20;
else if($score > 149 && $score <= 150)
$prob = 21;
else if($score > 150 && $score <= 152)
$prob = 22;
else if($score > 152 && $score <= 153)
$prob = 23;
else if($score > 153 && $score <= 155)
$prob = 24;
else if($score > 155 && $score <= 156)
$prob = 25;
else if($score > 156 && $score <= 158)
$prob = 26;
else if($score > 158 && $score <= 159)
$prob = 27;
else if($score > 159 && $score <= 160)
$prob = 28;
else if($score > 160 && $score <= 162)
$prob = 29;
else if($score > 162 && $score <= 163)
$prob = 30;
else if($score > 163 && $score <= 174)
$prob = 40;
else if($score > 174 && $score <= 183)
$prob = 50;
else if($score > 183 && $score <= 191)
$prob = 60;
else if($score > 191 && $score <= 200)
$prob = 70;
else if($score > 200 && $score <= 208)
$prob = 80;
else if($score > 208 && $score <= 219)
$prob = 90;
else if($score > 219 && $score <= 240)
$prob = 99;

```

```

else if($score > 240)
$prob = 113;

return round($prob, 2);
}

private function _compGraceSixMonthDeathMI($data
, $serumCreat, $killipNum, $cardiacArrest,
$cardiacMarker, $stSegmentDev){
$pts = 0;

//age
if($data['g_age'] < 35)
$pts += 0;
else if($data['g_age'] >= 35 && $data['g_age'] <
45)
$pts += ($data['g_age'] - 35) * 1.8;
else if($data['g_age'] >= 45 && $data['g_age'] <
55)
$pts += 18 + (($data['g_age'] - 45) * 1.8);
else if($data['g_age'] >= 55 && $data['g_age'] <
65)
$pts += 36 + (($data['g_age'] - 55) * 1.8);
else if($data['g_age'] >= 65 && $data['g_age'] <
75)
$pts += 54 + (($data['g_age'] - 65) * 1.8);
else if($data['g_age'] >= 75 && $data['g_age'] <
85)
$pts += 73 + (($data['g_age'] - 75) * 1.8);
else if($data['g_age'] >= 85 && $data['g_age'] <
90)
$pts += 91 + (($data['g_age'] - 85) * 1.8);
else if($data['g_age'] >= 90)
$pts += 100;

//sysBloodPress
if($data['g_sysBloodPress'] < 80)
$pts += 54;
else if($data['g_sysBloodPress'] >= 80 && $data[
'g_sysBloodPress'] < 200)
$pts += 54 - (($data['g_sysBloodPress'] - 80) *
0.45);

//serumCreatinine
if($serumCreat == 0){
if($data['g_renalFailure'] == "Yes")
$pts += 19;
else
$pts += 5;
}
else if($serumCreat < 3.0)
$pts += $serumCreat * 10;
else if($serumCreat >= 3.0 && $serumCreat < 4.0)
$pts += 30 + (($serumCreat - 3.0) * 11);
else if($serumCreat >= 4.0)
$pts += 41;

//killipClass
switch($killipNum){
case 0:
if($data['g_diureticUsage'] == "Yes")
$pts += 40;
else
$pts += 0;
break;
case 1: $pts += 0; break;
case 2: $pts += 27; break;
case 3: $pts += 55; break;
case 4: $pts += 82; break;
}

$pts += ($cardiacArrest * 66) + ($cardiacMarker
* 41) + ($stSegmentDev * 39);

return round($pts);
}

private function
_pointToProbGraceSixMonthDeathMI($score){
$prob = 0;

if($score <= 2)
$prob = 4;
else if($score > 2 && $score <= 20)
$prob = 5;
else if($score > 20 && $score <= 38)
$prob = 6;
else if($score > 38 && $score <= 46)
$prob = 6;
else if($score > 46 && $score <= 50)
$prob = 7;
else if($score > 50 && $score <= 55)

```

```

$prob = 7;
else if($score > 55 && $score <= 67)
$prob = 8;
else if($score > 67 && $score <= 74)
$prob = 9;
else if($score > 74 && $score <= 77)
$prob = 10;
else if($score > 77 && $score <= 86)
$prob = 11;
else if($score > 86 && $score <= 96)
$prob = 12;
else if($score > 96 && $score <= 104)
$prob = 13;
else if($score > 104 && $score <= 105)
$prob = 14;
else if($score > 105 && $score <= 114)
$prob = 15;
else if($score > 114 && $score <= 122)
$prob = 17;
else if($score > 122 && $score <= 132)
$prob = 19;
else if($score > 132 && $score <= 141)
$prob = 21;
else if($score > 141 && $score <= 148)
$prob = 23;
else if($score > 148 && $score <= 165)
$prob = 27;
else if($score > 165 && $score <= 168)
$prob = 28;
else if($score > 168 && $score <= 187)
$prob = 34;
else if($score > 187 && $score <= 196)
$prob = 38;
else if($score > 196 && $score <= 205)
$prob = 40;
else if($score > 205 && $score <= 223)
$prob = 40;
else if($score > 223 && $score <= 232)
$prob = 50;
else if($score > 232 && $score <= 242)
$prob = 50;
else if($score > 242 && $score <= 260)
$prob = 60;
else if($score > 260 && $score <= 271)
$prob = 70;
else if($score > 271 && $score <= 287)
$prob = 70;
else if($score > 287 && $score <= 296)
$prob = 80;
else if($score > 296 && $score <= 309)
$prob = 80;
else if($score > 309 && $score <= 327)
$prob = 90;
else if($score > 327)
$prob = 91;

return round($prob, 2);
}

private function _nonlinearOneYear($data, $creat
){
$f11 = 0; $f12 = 0; $f13 = 0;
$f21 = 0; $f22 = 0; $f23 = 0;
$f31 = 0; $f32 = 0; $f33 = 0; $f34 = 0; $f35 =
0; $f36 = 0;
$f41 = 0; $f42 = 0; $f43 = 0; $f44 = 0; $f45 =
0; $f46 = 0;

//age
$age = $data['g-age'] / 10;
$a1 = 4.8165;
$b1 = 6.6571;
$c1 = 8.3095;

if($age >= $a1)
$f11 = pow(($age - $a1), 3);
if($age >= $b1)
$f12 = (pow(($age - $b1), 3)) * ($c1 - $a1) / (
$c1 - $b1);
if($age >= $c1)
$f13 = (pow(($age - $c1), 3)) * ($b1 - $a1) / (
$c1 - $b1);

//sbp
$sbp = $data['g-sysBloodPress'] / (-20);
$a2 = -9.02;
$b2 = -6.97;
$c2 = -5.32;

if($sbp >= $a2)
$f21 = pow(($sbp - $a2), 3);
if($sbp >= $b2)
$f22 = (pow(($sbp - $b2), 3)) * ($c2 - $a2) / (
$c2 - $b2);
if($sbp >= $c2)
$f23 = (pow(($sbp - $c2), 3)) * ($b2 - $a2) / (
$c2 - $b2);

//bpm
$bpm = $data['g-heartRate'] / 30;
$a3 = 1.71;
$b3 = 2.31;
$c3 = 2.77;
$d3 = 3.95;

if($bpm >= $a3)
$f31 = pow(($bpm - $a3), 3);
if($bpm >= $c3)
$f32 = (pow(($bpm - $c3), 3)) * ($d3 - $a3) / (
$d3 - $c3);
if($bpm >= $d3)
$f33 = (pow(($bpm - $d3), 3)) * ($c3 - $a3) / (
$d3 - $c3);
if($bpm >= $b3)
$f34 = pow(($bpm - $b3), 3);
if($bpm >= $c3)
$f35 = (pow(($bpm - $c3), 3)) * ($d3 - $b3) / (
$d3 - $c3);
if($bpm >= $d3)
$f36 = (pow(($bpm - $d3), 3)) * ($c3 - $b3) / (
$d3 - $c3);

//creat
$a4 = 0.685;
$b4 = 0.925;
$c4 = 1.145;
$d4 = 2.065;

if($creat != 0){
if($creat >= $a4)
$f41 = pow(($creat - $a4), 3);
if($creat >= $c4)
$f42 = (pow(($creat - $c4), 3)) * ($d4 - $a4) / (
$d4 - $c4);
if($creat >= $d4)
$f43 = (pow(($creat - $d4), 3)) * ($c4 - $a4) / (
$d4 - $c4);
if($creat >= $b4)
$f44 = pow(($creat - $b4), 3);
if($creat >= $c4)
$f45 = (pow(($creat - $c4), 3)) * ($d4 - $b4) / (
$d4 - $c4);
if($creat >= $d4)
$f46 = (pow(($creat - $d4), 3)) * ($c4 - $b4) / (
$d4 - $c4);
}

$f = array(
" f11" => $f11,
" f12" => $f12,
" f13" => $f13,
" f21" => $f21,
" f22" => $f22,
" f23" => $f23,
" f31" => $f31,
" f32" => $f32,
" f33" => $f33,
" f34" => $f34,
" f35" => $f35,
" f36" => $f36,
" f41" => $f41,
" f42" => $f42,
" f43" => $f43,
" f44" => $f44,
" f45" => $f45,
" f46" => $f46
);

return $f;
}

private function _computeProbOneYear($data,
$serumCreat, $f, $list){
$age1 = 0; $age2 = 0;
$sbp1 = 0; $sbp2 = 0;
$bpm1 = 0; $bpm2 = 0; $bpm3 = 0;
$creat1 = 0; $creat2 = 0; $creat3 = 0;
$xbage = 0; $xsbp = 0; $xbpm = 0; $xbcreat =
0;

$age1 = ($data['g-age'] / 10) * $list['ageProb1']
];
$age2 = ($f['f11'] - $f['f12'] + $f['f13']) *
$list['ageProb2'];

```

```

$xbage = $age1 + $age2;

$sbp1 = ($data['g-sysBloodPress'] / (-20)) *
    $list['sysBPProb1'];
$sbp2 = ($f['f21'] - $f['f22'] + $f['f23']) *
    $list['sysBPProb2'];
$xbpsbp = $sbp1 + $sbp2;

$bpml = ($data['g-heartRate'] / 30) * $list['
    bpmProb1'];
$bpml2 = ($f['f31'] - $f['f32'] + $f['f33']) *
    $list['bpmProb2'];
$bpml3 = ($f['f34'] - $f['f35'] + $f['f36']) *
    $list['bpmProb3'];
$xbpsbp = $bpml + $bpml2 + $bpml3;

$creat1 = $serumCreat * $list['creatProb1'];
$creat2 = ($f['f41'] - $f['f42'] + $f['f43']) *
    $list['creatProb2'];
$creat3 = ($f['f44'] - $f['f45'] + $f['f46']) *
    $list['creatProb3'];
$xbcreat = $creat1 + $creat2 + $creat3;

$xb = array(
    "age" => $xbage,
    "sbp" => $xbpsbp,
    "bpm" => $xbpsbp,
    "creat" => $xbcreat
);

return $xb;
}

private function _pointToProbGraceOneYearDeath(
    $data, $serumCreat, $killipNum,
    $cardiacArrest, $cardiacMarker,
    $stSegmentDev){
    $prob = 0;
    $xBhat = 0;
    $killipProb = 0;

    $listOfProb1 = array(
        "ageProb1" => 0.41157,
        "ageProb2" => 0.0129,
        "sysBPProb1" => 0.08222,
        "sysBPProb2" => 0.0102,
        "bpmProb1" => 0.13138,
        "bpmProb2" => 0.40176,
        "bpmProb3" => (-1.37249),
        "creatProb1" => (-0.51259),
        "creatProb2" => 7.52634,
        "creatProb3" => (-18.23023)
    );

    $f = $this->_nonlinearOneYear($data, $serumCreat
    );
    $xb = $this->_computeProbOneYear($data,
        $serumCreat, $f, $listOfProb1);

    switch($killipNum){
        case 1: $killipProb = 0; break;
        case 2: $killipProb = 0.63827; break;
        case 3: $killipProb = 0.85325; break;
        case 4: $killipProb = 1.29372; break;
    }

    $xBhat = $xb['age'] + $xb['sbp'] + $xb['bpm'] +
        $xb['creat'] + $killipProb + (
            $cardiacArrest * 0.87185) + ($cardiacMarker
            * 0.37660) + ($stSegmentDev * 0.44303);
    $prob = (1 - pow(0.9983577131, exp($xBhat))) *
        100;

    return round($prob, 2);
}

private function
    _pointToProbGraceOneYearDeathSub($data,
        $serumCreat, $killipNum, $cardiacArrest,
        $cardiacMarker, $stSegmentDev){
    $prob = 0;
    $xBhat = 0;
    $diureticProb = 0;

    $listOfProb2 = array(
        "ageProb1" => 0.4423,
        "ageProb2" => 0.01231,
        "sysBPProb1" => 0.02338,
        "sysBPProb2" => 0.01835,
        "bpmProb1" => 0.16705,
        "bpmProb2" => 0.43926,
        "bpmProb3" => (-1.48002),
        "creatProb1" => (-0.51259),
        "creatProb2" => 7.52634,
        "creatProb3" => (-18.23023)
    );

    $f = $this->_nonlinearOneYear($data, $serumCreat
    );
    $xb = $this->_computeProbOneYear($data,
        $serumCreat, $f, $listOfProb2);

    if($data['g-diureticUsage'] == "Yes")
        $diureticProb = 0.68008;
    if($data['g-renalFailure'] == "Yes")
        $xb['creat'] = 0.44469;
    else
        $xb['creat'] = 0;

    $xBhat = $xb['age'] + $xb['sbp'] + $xb['bpm'] +
        $xb['creat'] + $diureticProb + (
            $cardiacArrest * 1.18193) + ($cardiacMarker
            * 0.39944) + ($stSegmentDev * 0.46524);
    $prob = (1 - pow(0.9994190637, exp($xBhat))) *
        100;

    return round($prob, 2);
}

private function _pointToProbGraceOneYearDeathMI
    ($data, $serumCreat, $killipNum,
    $cardiacArrest, $cardiacMarker,
    $stSegmentDev){
    $prob = 0;
    $xBhat = 0;
    $killipProb = 0;

    $listOfProb3 = array(
        "ageProb1" => 0.14677,
        "ageProb2" => 0.0209,
        "sysBPProb1" => 0.01797,
        "sysBPProb2" => 0.0102,
        "bpmProb1" => 0.0423,
        "bpmProb2" => 0.37817,
        "bpmProb3" => (-1.25482),
        "creatProb1" => (-0.15965),
        "creatProb2" => 5.02142,
        "creatProb3" => (-12.33887)
    );

    $f = $this->_nonlinearOneYear($data, $serumCreat
    );
    $xb = $this->_computeProbOneYear($data,
        $serumCreat, $f, $listOfProb3);

    switch($killipNum){
        case 1: $killipProb = 0; break;
        case 2: $killipProb = 0.53625; break;
        case 3: $killipProb = 0.68594; break;
        case 4: $killipProb = 1.15850; break;
    }

    $xBhat = $xb['age'] + $xb['sbp'] + $xb['bpm'] +
        $xb['creat'] + $killipProb + (
            $cardiacArrest * 0.67071) + ($cardiacMarker
            * 0.22710) + ($stSegmentDev * 0.32831);
    $prob = (1 - pow(0.9865696068, exp($xBhat))) *
        100;

    return round($prob, 2);
}

private function _nonlinearThreeYears($data){
    $f21 = 0; $f22 = 0; $f23 = 0; $f24 = 0; $f25 =
        0; $f26 = 0;
    $f31 = 0; $f32 = 0; $f33 = 0; $f34 = 0; $f35 =
        0; $f36 = 0;

    //sbp
    $sbp = $data['g-sysBloodPress'] / (-20);
    $a2 = -9.62;
    $b2 = -7.52;
    $c2 = -6.47;
    $d2 = -4.92;

    if($sbp >= $a2)
        $f21 = pow((($sbp - $a2), 3);
    if($sbp >= $c2)
        $f22 = (pow((($sbp - $c2), 3)) * ($d2 - $a2) / (
            $d2 - $c2);
    if($sbp >= $d2)
        $f23 = (pow((($sbp - $d2), 3)) * ($c2 - $a2) / (
            $d2 - $c2);
    if($sbp >= $b2)

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```

$f24 = pow(($sbp - $b2), 3);
if ($sbp >= $c2)
$f25 = (pow(($sbp - $c2), 3)) * ($d2 - $b2) / (
    $d2 - $c2);
if ($sbp >= $d2)
$f26 = (pow(($sbp - $d2), 3)) * ($c2 - $b2) / (
    $d2 - $c2);

//bpm
$bpm = $data['g_heartRate'] / 30;
$a3 = 1.71;
$b3 = 2.31;
$c3 = 2.77;
$d3 = 3.95;

if ($bpm >= $a3)
$f31 = pow(($bpm - $a3), 3);
if ($bpm >= $c3)
$f32 = (pow(($bpm - $c3), 3)) * ($d3 - $a3) / (
    $d3 - $c3);
if ($bpm >= $d3)
$f33 = (pow(($bpm - $d3), 3)) * ($c3 - $a3) / (
    $d3 - $c3);
if ($bpm >= $b3)
$f34 = pow(($bpm - $b3), 3);
if ($bpm >= $c3)
$f35 = (pow(($bpm - $c3), 3)) * ($d3 - $b3) / (
    $d3 - $c3);
if ($bpm >= $d3)
$f36 = (pow(($bpm - $d3), 3)) * ($c3 - $b3) / (
    $d3 - $c3);

$f = array(
    "f21" => $f21,
    "f22" => $f22,
    "f23" => $f23,
    "f24" => $f24,
    "f25" => $f25,
    "f26" => $f26,
    "f31" => $f31,
    "f32" => $f32,
    "f33" => $f33,
    "f34" => $f34,
    "f35" => $f35,
    "f36" => $f36
);

return $f;
}

private function _computeProbThreeYears($data,
    $f, $list){
    $sbp1 = 0; $sbp2 = 0; $sbp3 = 0;
    $bpm1 = 0; $bpm2 = 0; $bpm3 = 0;
    $xbsbp = 0; $xbbpm = 0;

    $sbp1 = ($data['g_sysBloodPress'] / (-20)) *
        $list['sysBPPProb1'];
    $sbp2 = ($f['f21'] - $f['f22'] + $f['f23']) *
        $list['sysBPPProb2'];
    $sbp3 = ($f['f24'] - $f['f25'] + $f['f26']) *
        $list['sysBPPProb3'];
    $xbsbp = $sbp1 + $sbp2 + $sbp3;

    $bpm1 = ($data['g_heartRate'] / 30) * $list['
        bpmProb1'];
    $bpm2 = ($f['f31'] - $f['f32'] + $f['f33']) *
        $list['bpmProb2'];
    $bpm3 = ($f['f34'] - $f['f35'] + $f['f36']) *
        $list['bpmProb3'];
    $xbbpm = $bpm1 + $bpm2 + $bpm3;

    $xb = array(
        "sbp" => $xbsbp,
        "bpm" => $xbbpm
    );

    return $xb;
}

private function _pointToProbGraceThreeYearDeath(
    $data, $serumCreat, $skillipNum,
    $cardiacArrest, $cardiacMarker,
    $stSegmentDev){
    $prob = 0;
    $xBhat = 0;
    $killipProb = 0;

    $listOfProb5 = array(
        "sysBPPProb1" => (-0.17646),
        "sysBPPProb2" => 0.03852,
        "sysBPPProb3" => (-0.16024),
        "bpmProb1" => (-0.05444),
        "bpmProb2" => 0.82884,
        "bpmProb3" => (-2.65671)
    );

    $f = $this->_nonlinearThreeYears($data);
    $xb = $this->_computeProbThreeYears($data, $f,
        $listOfProb5);

    switch ($killipNum){
        case 1: $killipProb = 0; break;
        case 2: $killipProb = 0.08466; break;
        case 3:
        case 4: $killipProb = 0.82842; break;
    }

    $xBhat = (($data['g_age'] / 10) * 0.60935) + $xb[
        'sbp'] + $xb['bpm'] + ($serumCreat *
        0.39403) + $killipProb + ($cardiacArrest *
        1.07623) + ($stSegmentDev * 0.41228);
    $prob = (1 - pow(0.9998715509, exp($xBhat))) *
        100;

    return round($prob, 2);
}

private function
    _pointToProbGraceThreeYearDeathMI($data,
    $serumCreat, $skillipNum, $cardiacArrest,
    $cardiacMarker, $stSegmentDev){
    $prob = 0;
    $xBhat = 0;
    $killipProb = 0;

    switch ($killipNum){
        case 1: $killipProb = 0; break;
        case 2: $killipProb = 0.21991; break;
        case 3:
        case 4: $killipProb = 1.06610; break;
    }

    $xBhat = (($data['g_age'] / 10) * 0.43299) + ((
        $data['g_sysBloodPress'] / (-20)) *
        0.14521) + (($data['g_heartRate'] / 30) *
        0.18097) + ($serumCreat * 0.35945) +
        $killipProb + ($cardiacArrest * 0.61622) +
        ($stSegmentDev * 0.42540);
    $prob = (1 - pow(0.9875014749, exp($xBhat))) *
        100;

    return round($prob, 2);
}

private function _compHeart($data){
    $heartPts = 0;

    if ($data['h_history'] == "Highly_Suspicious")
        $heartPts += 2;
    else if ($data['h_history'] == "Moderately_
        Suspicious")
        $heartPts += 1;
    if ($data['h_stSegmentDev'] == "Significant_ST-
        depression")
        $heartPts += 2;
    else if ($data['h_stSegmentDev'] == "Non-specific
        repolarisation_disturbance")
        $heartPts += 1;
    if ($data['h_age'] >= 65)
        $heartPts += 2;
    else if ($data['h_age'] > 45 && $data['h_age'] <
        65)
        $heartPts += 1;
    if (count($data['h_risk']) >= 3 || $data['
        h_atheros'] == "Yes")
        $heartPts += 2;
    else if (count($data['h_risk']) < 3 && count(
        $data['h_risk']) > 0 && $data['h_atheros']
        == "No")
        $heartPts += 1;
    if ($data['h_troponin'] == "_3x_normal_limit")
        $heartPts += 2;
    else if ($data['h_troponin'] == "1_
        _3x_normal_
        limit")
        $heartPts += 1;

    return $heartPts;
}

private function _pointToProbHeart($heartPts){
    $prob = 0;

    if ($heartPts <= 3)

```

```

$prob = 1.6;
else if($heartPts >= 4 && $heartPts <= 6)
$prob = 13;
else if($heartPts >= 7)
$prob = 50;

return $prob;
}

private function _compStemi($data){
$stemiPts = 0;

if($data['s_age'] >= 75)
$stemiPts += 3;
else if($data['s_age'] >= 65 && $data['s_age']
<= 74)
$stemiPts += 2;

if($data['s_anginaEvents'] == "Yes")
$stemiPts += 1;

if($data['s_sysBloodPress'] < 100)
$stemiPts += 3;
if($data['s_heartRate'] > 100)
$stemiPts += 2;

if($data['s_killipClass'] != "Killip_Class_I")
$stemiPts += 2;

if($data['s_weight'] < 67)
$stemiPts += 1;

if($data['s_stSegmentElev'] == "Yes")
$stemiPts += 1;
if($data['s_timeToTreat'] == "Yes")
$stemiPts += 1;

return $stemiPts;
}

private function _pointToProbStemiThirtyDays(
    $stemiPts){
$prob = 0;

switch($stemiPts){
case 0: $prob = 0.8; break;
case 1: $prob = 1.6; break;
case 2: $prob = 2.2; break;
case 3: $prob = 4.4; break;
case 4: $prob = 7.3; break;
case 5: $prob = 12.4; break;
case 6: $prob = 16.1; break;
case 7: $prob = 23.4; break;
case 8: $prob = 26.8; break;
default:
if($stemiPts > 8)
$prob = 35.9;
break;
}

return $prob;
}

private function _pointToProbStemiOneYear(
    $stemiPts){
$prob = 0;

switch($stemiPts){
case 0: $prob = 1.0; break;
case 1: $prob = 1.0; break;
case 2: $prob = 1.8; break;
case 3: $prob = 3.0; break;
case 4: $prob = 4.2; break;
case 5: $prob = 6.7; break;
case 6: $prob = 7.7; break;
case 7: $prob = 12.1; break;
case 8: $prob = 16.3; break;
default:
if($stemiPts > 8)
$prob = 17.2;
break;
}

return $prob;
}

private function _rangeAge($age){
$ida = 0;
if($age <= 34)
$ida = 1;
else if($age >= 35 && $age <= 39)
$ida = 2;
else if($age >= 40 && $age <= 44)
$ida = 3;
else if($age >= 45 && $age <= 49)
$ida = 4;
else if($age >= 50 && $age <= 54)
$ida = 5;
else if($age >= 55 && $age <= 59)
$ida = 6;
else if($age >= 60 && $age <= 64)
$ida = 7;
else if($age >= 65 && $age <= 69)
$ida = 8;
else if($age >= 70)
$ida = 9;
return $ida;
}

private function _rangeChol($chol){
$cid = 0;
if($chol < 160)
$cid = 10;
else if($chol >= 160 && $chol <= 199)
$cid = 11;
else if($chol >= 200 && $chol <= 239)
$cid = 12;
else if($chol >= 240 && $chol <= 279)
$cid = 13;
else if($chol >= 280)
$cid = 14;
return $cid;
}

private function _rangeHdl($hdl){
$hid = 0;
if($hdl < 35)
$hid = 15;
else if($hdl >= 35 && $hdl <= 44)
$hid = 16;
else if($hdl >= 45 && $hdl <= 69)
$hid = 17;
else if($hdl >= 50 && $hdl <= 59)
$hid = 18;
else if($hdl >= 60)
$hid = 19;
return $hid;
}

private function _rangeSys($sysBP){
$ids = 0;
if($sysBP < 120)
$ids = 20;
else if($sysBP >= 120 && $sysBP <= 129)
$ids = 21;
else if($sysBP >= 130 && $sysBP <= 139)
$ids = 22;
else if($sysBP >= 140 && $sysBP <= 159)
$ids = 23;
else if($sysBP >= 160)
$ids = 24;
return $ids;
}

private function _rangeDia($diaBP){
$idd = 0;
if($diaBP < 80)
$idd = 25;
else if($diaBP >= 80 && $diaBP <= 84)
$idd = 26;
else if($diaBP >= 85 && $diaBP <= 89)
$idd = 27;
else if($diaBP >= 90 && $diaBP <= 99)
$idd = 28;
else if($diaBP >= 100)
$idd = 29;
return $idd;
}

private function _rangeSerum($serum){
$ide = 0;
switch($serum){
case "0_-0.39_mg/dL": $ide = 30; break;
case "0.4_-0.79_mg/dL": $ide = 31; break;
case "0.8_-1.19_mg/dL": $ide = 32; break;
case "1.2_-1.59_mg/dL": $ide = 33; break;
case "1.6_-1.99_mg/dL": $ide = 34; break;
case "2.0_-3.99_mg/dL": $ide = 35; break;
case "4.0_mg/dL_or_greater": $ide = 36; break;
default: break;
}
return $ide;
}

```

```

private function _rangeHeart($bpm){
    $idB = 0;
    if($bpm < 50)
    $idB = 37;
    else if($bpm >= 50 && $bpm <= 99)
    $idB = 38;
    else if($bpm >= 100 && $bpm <= 199)
    $idB = 39;
    else if($bpm >= 200)
    $idB = 40;
    return $idB;
}

```

### Listing 3: Export.php

```

<?php
class export extends CI_Controller {

    public function __construct() {
        parent::__construct();
    }

    public function result()
    {
        $calculator = $this->input->post('calculator');

        if($calculator == "Framingham"){
            $data = array(
                'calculator' => $calculator,
                'f_age' => $this->input->post('f_age'),
                'f_sex' => $this->input->post('f_sex'),
                'f_totalChol' => $this->input->post('f_totalChol'),
                'f_highDenLip' => $this->input->post('f_highDenLip'),
                'f_sysBloodPress' => $this->input->post('f_sysBloodPress'),
                'f_diaBloodPress' => $this->input->post('f_diaBloodPress'),
                'f_diabetic' => $this->input->post('f_diabetic'),
                'f_smoker' => $this->input->post('f_smoker'),
                'framPts' => $this->input->post('framPts'),
                'framProb' => $this->input->post('framProb'),
            );
        }
        else if($calculator == "TIMI"){
            $data = array(
                'calculator' => $calculator,
                't_age' => $this->input->post('t_age'),
                't_risk' => $this->input->post('t_risk'),
                't_historyOfStenosis' => $this->input->post('t_historyOfStenosis'),
                't_stSegmentDev' => $this->input->post('t_stSegmentDev'),
                't_anginaEvents' => $this->input->post('t_anginaEvents'),
                't_cardiacMarker' => $this->input->post('t_cardiacMarker'),
                't_aspirinIntake' => $this->input->post('t_aspirinIntake'),
                'timiPts' => $this->input->post('timiPts'),
                'timiProb' => $this->input->post('timiProb'),
            );
        }
        else if($calculator == "GRACE"){
            $data = array(
                'calculator' => $calculator,
                'g_ageInit' => $this->input->post('g_ageInit'),
                'g_heartRateInit' => $this->input->post('g_heartRateInit'),
                'g_sysBloodPressInit' => $this->input->post('g_sysBloodPressInit'),
                'g_killipClass' => $this->input->post('g_killipClass'),
                'g_diureticUsage' => $this->input->post('g_diureticUsage'),
                'g_serumCreatinine' => $this->input->post('g_serumCreatinine'),
                'g_renalFailure' => $this->input->post('g_renalFailure'),
                'g_stSegmentDev' => $this->input->post('g_stSegmentDev'),
                'g_cardiacMarker' => $this->input->post('g_cardiacMarker'),
                'g_cardiacArrest' => $this->input->post('g_cardiacArrest'),
                'gracePtsInHospitalDeath' => $this->input->post('gracePtsInHospitalDeath'),
            );
        }
    }
}

```

```

'gracePtsInHospitalDeathMI' => $this->input->post('gracePtsInHospitalDeathMI'),
'gracePtsSixMonthDeath' => $this->input->post('gracePtsSixMonthDeath'),
'gracePtsSixMonthDeathMI' => $this->input->post('gracePtsSixMonthDeathMI'),
'graceProbInHospitalDeath' => $this->input->post('graceProbInHospitalDeath'),
'graceProbInHospitalDeathMI' => $this->input->post('graceProbInHospitalDeathMI'),
'graceProbSixMonthDeath' => $this->input->post('graceProbSixMonthDeath'),
'graceProbSixMonthDeathMI' => $this->input->post('graceProbSixMonthDeathMI'),
'graceProbOneYearDeath' => $this->input->post('graceProbOneYearDeath'),
'graceProbOneYearDeathMI' => $this->input->post('graceProbOneYearDeathMI'),
'graceProbThreeYearDeath' => $this->input->post('graceProbThreeYearDeath'),
'graceProbThreeYearDeathMI' => $this->input->post('graceProbThreeYearDeathMI')
);
}
else if($calculator == "HEART"){
    $data = array(
        'calculator' => $calculator,
        'h_history' => $this->input->post('h_history'),
        'h_stSegmentDev' => $this->input->post('h_stSegmentDev'),
        'h_age' => $this->input->post('h_age'),
        'h_risk' => $this->input->post('h_risk'),
        'h_atheros' => $this->input->post('h_atheros'),
        'h_troponin' => $this->input->post('h_troponin'),
        'heartPts' => $this->input->post('heartPts'),
        'heartProb' => $this->input->post('heartProb'),
    );
}
else if($calculator == "UANSTEMI"){
    $data = array(
        'calculator' => $calculator,
        'g_ageInit' => $this->input->post('g_ageInit'),
        'g_heartRateInit' => $this->input->post('g_heartRateInit'),
        'g_sysBloodPressInit' => $this->input->post('g_sysBloodPressInit'),
        'h_risk' => $this->input->post('h_risk'),
        'h_atheros' => $this->input->post('h_atheros'),
        'g_killipClass' => $this->input->post('g_killipClass'),
        'h_stSegmentDev' => $this->input->post('h_stSegmentDev'),
        'g_serumCreatinine' => $this->input->post('g_serumCreatinine'),
        'h_troponin' => $this->input->post('h_troponin'),
        'h_history' => $this->input->post('h_history'),
        't_historyOfStenosis' => $this->input->post('t_historyOfStenosis'),
        't_anginaEvents' => $this->input->post('t_anginaEvents'),
        't_aspirinIntake' => $this->input->post('t_aspirinIntake'),
        'g_cardiacArrest' => $this->input->post('g_cardiacArrest'),
        'timiPts' => $this->input->post('timiPts'),
        'timiProb' => $this->input->post('timiProb'),
        'gracePtsInHospitalDeath' => $this->input->post('gracePtsInHospitalDeath'),
        'gracePtsInHospitalDeathMI' => $this->input->post('gracePtsInHospitalDeathMI'),
        'gracePtsSixMonthDeath' => $this->input->post('gracePtsSixMonthDeath'),
        'gracePtsSixMonthDeathMI' => $this->input->post('gracePtsSixMonthDeathMI'),
        'graceProbInHospitalDeath' => $this->input->post('graceProbInHospitalDeath'),
        'graceProbInHospitalDeathMI' => $this->input->post('graceProbInHospitalDeathMI'),
        'graceProbSixMonthDeath' => $this->input->post('graceProbSixMonthDeath'),
        'graceProbSixMonthDeathMI' => $this->input->post('graceProbSixMonthDeathMI'),
        'graceProbOneYearDeath' => $this->input->post('graceProbOneYearDeath'),
        'graceProbOneYearDeathMI' => $this->input->post('graceProbOneYearDeathMI'),
        'graceProbThreeYearDeath' => $this->input->post('graceProbThreeYearDeath'),
        'graceProbThreeYearDeathMI' => $this->input->post('graceProbThreeYearDeathMI'),
    );
}
}

```



```

'heartPts' => $this->input->post('heartPts'),
'heartProb' => $this->input->post('heartProb')
);
}
else if($calculator == "STEMI"){
$data = array(
'calculator' => $calculator,
's_age' => $this->input->post('s_age'),
's_anginaEvents' => $this->input->post('
s_anginaEvents'),
's_sysBloodPress' => $this->input->post('
s_sysBloodPress'),
's_heartRate' => $this->input->post('s_heartRate
'),
's_killipClass' => $this->input->post('
s_killipClass'),
's_weight' => $this->input->post('s_weight'),
's_stSegmentElev' => $this->input->post('
s_stSegmentElev'),
's_timeToTreat' => $this->input->post('
s_timeToTreat'),
'stemiPts' => $this->input->post('stemiPts'),
'stemiProbThirtyDays' => $this->input->post('
stemiProbThirtyDays'),
'stemiProbOneYear' => $this->input->post('
stemiProbOneYear')
);
}
$data['notes'] = $this->input->post('noteInput')
;
$val = $this->input->post('val');
$this->load->view('templates/header');
$this->load->library('m.pdf');
if(!is_array($_POST) || !isset($data) || !isset(
$val))
$this->load->view('errors/cli/error_noInput');
else{
$this->load->library('m.pdf');
$html = $this->load->view('pdf/output', $data,
true);
$pdfFilePath = "PatientInfo.pdf";
$this->m_pdf->pdf->WriteHTML($html);
$str = $this->m_pdf->pdf->Output($pdfFilePath, "
D");
}
$this->load->view('templates/footer');
}
}

```

#### Listing 4: Home.php

```

<?php
class home extends CI_Controller {

public function __construct() {
parent::__construct();
}

public function index()
{
$this->load->view('templates/header');
$this->load->view('pages/homeView');
$this->load->view('templates/footer');
}
}

```

#### Listing 5: My404.php

```

<?php
class my404 extends CI_Controller
{
public function __construct()
{
parent::__construct();
}

public function index()
{
$this->output->set_status_header('404');
$this->load->view('templates/header');
$this->load->view('errors/cli/error_404');
$this->load->view('templates/footer');
}
}

```

#### Listing 6: Report.php

```

<?php
class report extends CI_Controller {

public function __construct() {
parent::__construct();
}

public function index() {
$this->load->view('templates/header');
$this->load->view('pages/summaryReportView');
$this->load->view('templates/footer');
}

public function summary() {
$this->load->model('SummaryReportModel');
$category = $this->input->post('category');
$startDate = $this->input->post('date1');
$endDate = $this->input->post('date2');

$date1 = date("Y-m-d", strtotime($startDate));
$date2 = date("Y-m-d", strtotime($endDate));

if($category == "one"){
$patientQuery = $this->SummaryReportModel->
patientQuery($date1, $date2);
$ageQuery = $this->SummaryReportModel->ageQuery(
$date1, $date2);
$ageQuery3 = $this->SummaryReportModel->
ageQuery3($date1, $date2);
$sexQuery = $this->SummaryReportModel->sexQuery(
$date1, $date2);
$totalCholQuery = $this->SummaryReportModel->
totalCholQuery($date1, $date2);
$totalCholQuery2 = $this->SummaryReportModel->
totalCholQuery2($date1, $date2);
$hdlCholQuery = $this->SummaryReportModel->
hdlCholQuery($date1, $date2);
$hdlCholQuery2 = $this->SummaryReportModel->
hdlCholQuery2($date1, $date2);
$sysBPQuery = $this->SummaryReportModel->
sysBPQuery($date1, $date2);
$sysBPQuery3 = $this->SummaryReportModel->
sysBPQuery3($date1, $date2);
$diaBPQuery = $this->SummaryReportModel->
diaBPQuery($date1, $date2);
$diaBPQuery2 = $this->SummaryReportModel->
diaBPQuery2($date1, $date2);
$diabeticQuery = $this->SummaryReportModel->
diabeticQuery($date1, $date2);
$smokerQuery = $this->SummaryReportModel->
smokerQuery($date1, $date2);

$data2 = array(
'patientQuery' => $patientQuery,
'ageQuery' => $ageQuery,
'ageQuery3' => $ageQuery3,
'sexQuery' => $sexQuery,
'totalCholQuery' => $totalCholQuery,
'totalCholQuery2' => $totalCholQuery2,
'hdlCholQuery' => $hdlCholQuery,
'hdlCholQuery2' => $hdlCholQuery2,
'sysBPQuery' => $sysBPQuery,
'sysBPQuery3' => $sysBPQuery3,
'diaBPQuery' => $diaBPQuery,
'diaBPQuery2' => $diaBPQuery2,
'diabeticQuery' => $diabeticQuery,
'smokerQuery' => $smokerQuery
);
}
else {
$patientQuery2 = $this->SummaryReportModel->
patientQuery2($date1, $date2);
$ageQuery2 = $this->SummaryReportModel->
ageQuery2($date1, $date2);
$ageQuery4 = $this->SummaryReportModel->
ageQuery4($date1, $date2);
$heartRateQuery = $this->SummaryReportModel->
heartRateQuery($date1, $date2);
$heartRateQuery2 = $this->SummaryReportModel->
heartRateQuery2($date1, $date2);
$sysBPQuery2 = $this->SummaryReportModel->
sysBPQuery2($date1, $date2);
$sysBPQuery4 = $this->SummaryReportModel->
sysBPQuery4($date1, $date2);
}
}
}

```

```

$riskFactorsQuery = $this->SummaryReportModel->
    riskFactorsQuery($date1, $date2);
$killipClassQuery = $this->SummaryReportModel->
    killipClassQuery($date1, $date2);
$ecgQuery = $this->SummaryReportModel->ecgQuery(
    $date1, $date2);
$serumCreatQuery = $this->SummaryReportModel->
    serumCreatQuery($date1, $date2);
$serumCreatQuery2 = $this->SummaryReportModel->
    serumCreatQuery2($date1, $date2);
$troponinQuery = $this->SummaryReportModel->
    troponinQuery($date1, $date2);
$historyQuery = $this->SummaryReportModel->
    historyQuery($date1, $date2);
$stenosisQuery = $this->SummaryReportModel->
    stenosisQuery($date1, $date2);
$anginaQuery = $this->SummaryReportModel->
    anginaQuery($date1, $date2);
$aspirinQuery = $this->SummaryReportModel->
    aspirinQuery($date1, $date2);
$cardiacArrestQuery = $this->SummaryReportModel
    ->cardiacArrestQuery($date1, $date2);

$data = array(
    'patientQuery2' => $patientQuery2,
    'ageQuery2' => $ageQuery2,
    'ageQuery4' => $ageQuery4,
    'heartRateQuery' => $heartRateQuery,
    'heartRateQuery2' => $heartRateQuery2,
    'sysBPQuery2' => $sysBPQuery2,
    'sysBPQuery4' => $sysBPQuery4,
    'riskFactorsQuery' => $riskFactorsQuery,
    'killipClassQuery' => $killipClassQuery,
    'ecgQuery' => $ecgQuery,
    'serumCreatQuery' => $serumCreatQuery,
    'serumCreatQuery2' => $serumCreatQuery2,
    'troponinQuery' => $troponinQuery,
    'historyQuery' => $historyQuery,
    'stenosisQuery' => $stenosisQuery,
    'anginaQuery' => $anginaQuery,
    'aspirinQuery' => $aspirinQuery,
    'cardiacArrestQuery' => $cardiacArrestQuery
);

$this->load->view('templates/header');
$this->load->view('pages/summaryReportView',
    $data2);
$this->load->view('templates/footer');
}
}

```

## Listing 7: CalculatorModel.php

```

<?php

class CalculatorModel extends CI_Model {

public function __construct()
{
    $this->load->database();
}

function getRiskID($name) {
    $query = $this->db->query('SELECT_RiskID_FROM_
        risk_factor_list_WHERE_Name="' . $name . '"');
    return $query->result();
}

function insertDemographics($demographics) {
    $this->db->insert('demographics', $demographics);
    return $this->db->insert_id();
}

function insertBaselineCharacteristics($baseChar
    ) {
    $this->db->insert('baseline_characteristics',
        $baseChar);
    return $this->db->insert_id();
}

function insertRiskFactors($riskFactors) {
    $this->db->insert('risk_factors', $riskFactors);
}

function insertPrehospitalMedications(
    $medications) {
    $this->db->insert('prehospital_medications',
        $medications);
}

```

```

}

function insertClinicalPresentation(
    $clinicalPres) {
    $this->db->insert('clinical_presentation',
        $clinicalPres);
}

function insertEcgFindings($ecgFindings) {
    $this->db->insert('ecg_findings_at_er',
        $ecgFindings);
}

function insertLabTests($labTests) {
    $this->db->insert('laboratory_tests', $labTests)
    ;
}

function insertCalculatorUsed($calcUsed) {
    $this->db->insert('calculator', $calcUsed);
}

function insertRiskScore($riskScores) {
    $this->db->insert('risk_score', $riskScores);
}

function insertRiskProb($riskProb) {
    $this->db->insert('risk_prob', $riskProb);
}

function insertRanges($ranges) {
    $this->db->insert('ranges', $ranges);
}
}
?>

```

## Listing 8: SummaryReportModel.php

```

<?php

class SummaryReportModel extends CI_Model {

public function __construct() {
    $this->load->database();
}

/*-----CHD Risk
-----*/

public function patientQuery($date1, $date2) {
    $this->db->select('CalculatorID');
    $this->db->from('demographics, _calculator');
    $this->db->where("(demographics.PatientID =_
        calculator.PatientID)_AND_(calculator.
        CalculatorID =_1)_AND_(demographics.
        InputDate_BETWEEN_'". $date1 ."'_AND_'".
        $date2 ."'")");
    $query = $this->db->get();

    return $query->result();
}

public function ageQuery($date1, $date2) {
    $this->db->select('Age');
    $this->db->from('demographics, _calculator');
    $this->db->where("(demographics.PatientID =_
        calculator.PatientID)_AND_(calculator.
        CalculatorID =_1)_AND_(demographics.
        InputDate_BETWEEN_'". $date1 ."'_AND_'".
        $date2 ."'")");
    $query = $this->db->get();

    return $query->result();
}

public function ageQuery3($date1, $date2) {
    $this->db->select('RangeName');
    $this->db->from('range_list, _ranges, _
        demographics, _calculator');
    $this->db->where("(ranges.RangeID IS _NOT_NULL)_
        AND_(demographics.PatientID =_calculator.
        PatientID)_AND_(calculator.CalculatorID =_
        1)_AND_(demographics.InputDate_BETWEEN_'".
        $date1 ."'_AND_'". $date2 ."'')_AND_(
        demographics.PatientID =_ranges.PatientID)_
        AND_(ranges.RangeID =_range_list.RangeID)_
        AND_(range_list.RangeID >_0)_AND_(
        range_list.RangeID <_10)");
    $query = $this->db->get();
}

```

```

return $query->result();
}

public function sexQuery($date1, $date2) {
$this->db->select('Sex');
$this->db->from('demographics ,_calculator');
$this->db->where("(demographics.Sex_IS_NOT_NULL)
_AND_(demographics.PatientID=_calculator.
PatientID)_AND_(calculator.CalculatorID=_
1)_AND_(demographics.InputDate_BETWEEN_'
$date1.'"_AND_"$date2.'"");
$query = $this->db->get();

return $query->result();
}

public function totalCholQuery($date1, $date2) {
$this->db->select('TotalCholesterol');
$this->db->from('demographics ,_
clinical_presentation ,_calculator');
$this->db->where("(clinical_presentation.
TotalCholesterol_IS_NOT_NULL)_AND_(
demographics.PatientID=_calculator.
PatientID)_AND_(calculator.CalculatorID=_
1)_AND_(demographics.PatientID=_
clinical_presentation.PatientID)_AND_(
demographics.InputDate_BETWEEN_'$date1.'"
_AND_"$date2.'"");
$query = $this->db->get();

return $query->result();
}

public function totalCholQuery2($date1, $date2)
{
$this->db->select('RangeName');
$this->db->from('range_list ,_ranges ,_
demographics ,_calculator');
$this->db->where("(ranges.RangeID_IS_NOT_NULL)_
_AND_(demographics.PatientID=_calculator.
PatientID)_AND_(calculator.CalculatorID=_
1)_AND_(demographics.InputDate_BETWEEN_'
$date1.'"_AND_"$date2.'"')_AND_(
demographics.PatientID=_ranges.PatientID)_
_AND_(ranges.RangeID=_range_list.RangeID)_
_AND_(range_list.RangeID >= 9)_AND_(
range_list.RangeID <= 15)");
$query = $this->db->get();

return $query->result();
}

public function hdlCholQuery($date1, $date2) {
$this->db->select('HDLCholesterol');
$this->db->from('demographics ,_
clinical_presentation ,_calculator');
$this->db->where("(clinical_presentation.
HDLCholesterol_IS_NOT_NULL)_AND_(
demographics.PatientID=_calculator.
PatientID)_AND_(calculator.CalculatorID=_
1)_AND_(demographics.PatientID=_
clinical_presentation.PatientID)_AND_(
demographics.InputDate_BETWEEN_'$date1.'"
_AND_"$date2.'"");
$query = $this->db->get();

return $query->result();
}

public function hdlCholQuery2($date1, $date2) {
$this->db->select('RangeName');
$this->db->from('range_list ,_ranges ,_
demographics ,_calculator');
$this->db->where("(ranges.RangeID_IS_NOT_NULL)_
_AND_(demographics.PatientID=_calculator.
PatientID)_AND_(calculator.CalculatorID=_
1)_AND_(demographics.InputDate_BETWEEN_'
$date1.'"_AND_"$date2.'"')_AND_(
demographics.PatientID=_ranges.PatientID)_
_AND_(ranges.RangeID=_range_list.RangeID)_
_AND_(range_list.RangeID >= 14)_AND_(
range_list.RangeID <= 20)");
$query = $this->db->get();

return $query->result();
}

public function sysBPQuery($date1, $date2) {
$this->db->select('SystolicBP');
}

public function sysBPQuery3($date1, $date2) {
$this->db->select('RangeName');
$this->db->from('range_list ,_ranges ,_
demographics ,_calculator');
$this->db->where("(ranges.RangeID_IS_NOT_NULL)_
_AND_(demographics.PatientID=_calculator.
PatientID)_AND_(calculator.CalculatorID=_
1)_AND_(demographics.InputDate_BETWEEN_'
$date1.'"_AND_"$date2.'"')_AND_(
demographics.PatientID=_ranges.PatientID)_
_AND_(ranges.RangeID=_range_list.RangeID)_
_AND_(range_list.RangeID >= 19)_AND_(
range_list.RangeID <= 25)");
$query = $this->db->get();

return $query->result();
}

public function diaBPQuery($date1, $date2) {
$this->db->select('DiastolicBP');
$this->db->from('demographics ,_
clinical_presentation ,_calculator');
$this->db->where("(clinical_presentation.
DiastolicBP_IS_NOT_NULL)_AND_(demographics.
PatientID=_calculator.PatientID)_AND_(
calculator.CalculatorID=_1)_AND_(
demographics.PatientID=_
clinical_presentation.PatientID)_AND_(
demographics.InputDate_BETWEEN_'$date1.'"
_AND_"$date2.'"");
$query = $this->db->get();

return $query->result();
}

public function diaBPQuery2($date1, $date2) {
$this->db->select('RangeName');
$this->db->from('range_list ,_ranges ,_
demographics ,_calculator');
$this->db->where("(ranges.RangeID_IS_NOT_NULL)_
_AND_(demographics.PatientID=_calculator.
PatientID)_AND_(calculator.CalculatorID=_
1)_AND_(demographics.InputDate_BETWEEN_'
$date1.'"_AND_"$date2.'"')_AND_(
demographics.PatientID=_ranges.PatientID)_
_AND_(ranges.RangeID=_range_list.RangeID)_
_AND_(range_list.RangeID >= 24)_AND_(
range_list.RangeID <= 30)");
$query = $this->db->get();

return $query->result();
}

public function diabeticQuery($date1, $date2) {
$this->db->select('RiskID');
$this->db->from('baseline_characteristics ,_
risk_factors ,_demographics ,_calculator');
$this->db->where("(risk_factors.RiskID_IS_NOT_
NULL)_AND_(demographics.PatientID=_
calculator.PatientID)_AND_(calculator.
CalculatorID=_1)_AND_(demographics.
PatientID=_baseline_characteristics.
PatientID)_AND_(demographics.InputDate_
BETWEEN_'$date1.'"_AND_"$date2.'"')_AND_(
_baseline_characteristics.BaseCharID=_
risk_factors.BaseCharID)_AND_(risk_factors.
RiskID=_3)");
$query = $this->db->get();

return $query->result();
}

public function smokerQuery($date1, $date2) {
$this->db->select('RiskID');
$this->db->from('baseline_characteristics ,_
risk_factors ,_demographics ,_calculator');
}

```

```

$this->db->where(" (risk_factors.RiskID_IS_NOT_
NULL) _AND_(demographics.PatientID _=
calculator.PatientID) _AND_(calculator.
CalculatorID _=-1) _AND_(demographics.
PatientID _=-baseline_characteristics.
PatientID) _AND_(demographics.InputDate_
BETWEEN_'".$date1."' _AND_'".$date2."' ) _AND_
(-baseline_characteristics.BaseCharID _=
risk_factors.BaseCharID) _AND_(risk_factors.
RiskID _=-4)");
$query = $this->db->get();

return $query->result();
}

/*-----ACS Survival-----*/

public function patientQuery2($date1, $date2) {
$this->db->select(' CalculatorID ');
$this->db->from(' demographics, _calculator ');
$this->db->where(" (demographics.PatientID _=
calculator.PatientID) _AND_(calculator.
CalculatorID _!=-1) _AND_(calculator.
CalculatorID _!=-5) _AND_(demographics.
InputDate_BETWEEN_'".$date1."' _AND_'".$
$date2."' )");
$query = $this->db->get();

return $query->result();
}

public function ageQuery2($date1, $date2) {
$this->db->select(' Age ');
$this->db->from(' demographics, _calculator ');
$this->db->where(" (demographics.PatientID _=
calculator.PatientID) _AND_(calculator.
CalculatorID _!=-1) _AND_(calculator.
CalculatorID _!=-5) _AND_(demographics.
InputDate_BETWEEN_'".$date1."' _AND_'".$
$date2."' )");
$query = $this->db->get();

return $query->result();
}

public function ageQuery4($date1, $date2) {
$this->db->select(' RangeName ');
$this->db->from(' range_list, _ranges, _
demographics, _calculator ');
$this->db->where(" (ranges.RangeID_IS_NOT_NULL) _
AND_(demographics.PatientID _=calculator.
PatientID) _AND_(calculator.CalculatorID _!=-
1) _AND_(calculator.CalculatorID _!=-5) _AND_(
demographics.InputDate_BETWEEN_'".$date1."'
_AND_'".$date2."' ) _AND_(demographics.
PatientID _=-ranges.PatientID) _AND_(ranges.
RangeID _=-range_list.RangeID) _AND_(
range_list.RangeID _>=0) _AND_(range_list.
RangeID <=10)");
$query = $this->db->get();

return $query->result();
}

public function heartRateQuery($date1, $date2) {
$this->db->select(' HeartRate ');
$this->db->from(' demographics, _
clinical_presentation, _calculator ');
$this->db->where(" (clinical_presentation.
HeartRate_IS_NOT_NULL) _AND_(demographics.
PatientID _=calculator.PatientID) _AND_(
calculator.CalculatorID _!=-1) _AND_(
calculator.CalculatorID _!=-5) _AND_(
demographics.PatientID _=
clinical_presentation.PatientID) _AND_(
demographics.InputDate_BETWEEN_'".$date1."'
_AND_'".$date2."' )");
$query = $this->db->get();

return $query->result();
}

public function heartRateQuery2($date1, $date2) {
$this->db->select(' RangeName ');
$this->db->from(' range_list, _ranges, _
demographics, _calculator ');
$this->db->where(" (ranges.RangeID_IS_NOT_NULL) _
AND_(demographics.PatientID _=calculator.
PatientID) _AND_(calculator.CalculatorID _!=-
1) _AND_(calculator.CalculatorID _!=-5) _AND_(
demographics.InputDate_BETWEEN_'".$date1."'
_AND_'".$date2."' ) _AND_(demographics.
PatientID _=-ranges.PatientID) _AND_(ranges.
RangeID _=-range_list.RangeID) _AND_(
range_list.RangeID _>=36) _AND_(range_list.
RangeID <=41)");
$query = $this->db->get();

return $query->result();
}

public function sysBPQuery2($date1, $date2) {
$this->db->select(' SystolicBP ');
$this->db->from(' demographics, _
clinical_presentation, _calculator ');
$this->db->where(" (clinical_presentation.
SystolicBP_IS_NOT_NULL) _AND_(demographics.
PatientID _=calculator.PatientID) _AND_(
calculator.CalculatorID _!=-1) _AND_(
calculator.CalculatorID _!=-5) _AND_(
demographics.PatientID _=
clinical_presentation.PatientID) _AND_(
demographics.InputDate_BETWEEN_'".$date1."'
_AND_'".$date2."' )");
$query = $this->db->get();

return $query->result();
}

public function sysBPQuery4($date1, $date2) {
$this->db->select(' RangeName ');
$this->db->from(' range_list, _ranges, _
demographics, _calculator ');
$this->db->where(" (ranges.RangeID_IS_NOT_NULL) _
AND_(demographics.PatientID _=calculator.
PatientID) _AND_(calculator.CalculatorID _!=-
1) _AND_(calculator.CalculatorID _!=-5) _AND_(
demographics.InputDate_BETWEEN_'".$date1."'
_AND_'".$date2."' ) _AND_(demographics.
PatientID _=-ranges.PatientID) _AND_(ranges.
RangeID _=-range_list.RangeID) _AND_(
range_list.RangeID _>=19) _AND_(range_list.
RangeID <=25)");
$query = $this->db->get();

return $query->result();
}

public function riskFactorsQuery($date1, $date2) {
$this->db->select(' Name ');
$this->db->from(' risk_factor_list, _
baseline_characteristics, _risk_factors, _
demographics, _calculator ');
$this->db->where(" (risk_factors.RiskID_IS_NOT_
NULL) _AND_(demographics.PatientID _=
baseline_characteristics.PatientID) _AND_(
demographics.PatientID _=calculator.
PatientID) _AND_(calculator.CalculatorID _!=-
1) _AND_(calculator.CalculatorID _!=-5) _AND_(
demographics.InputDate_BETWEEN_'".$date1."'
_AND_'".$date2."' ) _AND_(
baseline_characteristics.BaseCharID _=
risk_factors.BaseCharID) _AND_(risk_factors.
RiskID _=-risk_factor_list.RiskID)");
$query = $this->db->get();

return $query->result();
}

public function killipClassQuery($date1, $date2) {
$this->db->select(' KillipClass ');
$this->db->from(' demographics, _
clinical_presentation, _calculator ');
$this->db->where(" (clinical_presentation.
KillipClass_IS_NOT_NULL) _AND_(demographics.
PatientID _=calculator.PatientID) _AND_(
calculator.CalculatorID _!=-1) _AND_(
calculator.CalculatorID _!=-5) _AND_(
demographics.PatientID _=
clinical_presentation.PatientID) _AND_(
demographics.InputDate_BETWEEN_'".$date1."'
_AND_'".$date2."' )");
$query = $this->db->get();

return $query->result();
}

public function ecgQuery($date1, $date2) {
$this->db->select(' STSegmentDepression ');
$this->db->from(' demographics, _

```



```

ng-click="tab.setTab(4)">Heart Score</a></li>
</ul>
</div>
<div class="col-sm-9">
<div ng-show="tab.isSet(1)">
<h2>Framingham Risk Score</h2><br>
<p>The Framingham Risk Score aims to accurately predict if an individual, preferably 30–74 years old and without overt Coronary Heart Disease (CHD) at the baseline examination, has the possibility of having CHD. Prediction of risk ranges up to 10–12 years.</p>
<p>The Framingham Heart Study produced sex-specific CHD prediction functions for assessing risk of developing incident CHD in a white middle-class population. Concern exists regarding whether these functions can be generalized to other populations.</p>
<p>Using a series of regression analysis on the baseline characteristics, the analysis determined the predictors of CHD:</p>
<ul>
<li>Age</li>
<li>Diabetes</li>
<li>Smoking</li>
<li>Blood pressure categories</li>
<ul>
<li>Systolic Blood Pressure</li>
<li>Diastolic Blood Pressure</li>
</ul>
<li>Total Cholesterol</li>
<li>HDL-Cholesterol</li>
</ul>
</div>
<div ng-show="tab.isSet(2)">
<h2>TIMI Risk Score</h2><br>
<p>The TIMI risk score is determined by the sum of the presence of seven variables upon admission, with 1 point given for each present variable: age 65 years or older; at least three risk factors for CAD; prior coronary stenosis of 50% or more; ST-segment deviation on ECG presentation; at least two anginal events in the prior 24 hours; use of aspirin in the prior 7 days; and elevated serum cardiac biomarkers</p>
<p>The TIMI risk score population included patients who are classified to have UA/NSTEMI. The risk calculator is available at www.timi.org. As the TIMI risk score increases, the composite end points of all-cause mortality, new or recurrent MI, or severe recurrent ischemia prompting revascularization within 14 days increases. An early invasive strategy may benefit a patient with a TIMI risk score of 3 and above.</p>
</div>
<div ng-show="tab.isSet(3)">
<h2>GRACE Risk Model</h2><br>
<p>The original GRACE Risk Score used eight clinical variables to calculate the risk for death and death or MI from admission to hospital to 6 months after discharge. It is this version which has been most widely applied in clinical settings for estimation of risk for patients with ACS</p>
<p>In 2012 the Centre for Cardiovascular Science, University of Edinburgh, in collaboration with the Center for Outcomes Research, University of Massachusetts further developed the original GRACE Risk Score.</p>
<p>For this new version of the GRACE Risk Score, the time of the estimation of the risk period was extended from 6 months to 1 year and 3 years. The GRACE Risk Version 2.0 Score now predicts the outcomes of death and death or MI over an extended 1-year period, and also death over a 3-year period from hospital admission.</p>
</div>
<div ng-show="tab.isSet(4)">
<h2>Heart Score</h2><br>
<p>The HEART score is a newly developed scoring model for patients presenting with chest pain (PEB) in the emergency department.</p>

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<p>These are the predictors in HEART score for UA/NSTEMI and STEMI.</p>
<p></p>
<ul>
<li>History</li>
<li>ECG</li>
<li>Age</li>
<li>Risk Factors</li>
<li>History of Atherosclerotic Disease</li>
<li>PTroponin</li>
</ul>
</div>
<br><br>
<b>References:</b>
<ul>
<li>R. D'Agostino, Sr, S. Grundy, L. Sullivan, P. Wilson and for the CHD Risk Prediction Group, "Validation of the Framingham Coronary Heart Disease Prediction Scores", JAMA, vol. 286, no. 2, p. 180, 2001.</li>
<li>A. EM, C. M. B. PM, and et al., "The timi risk score for unstable angina/non-st elevation mi: A method for prognostication and therapeutic decision making," JAMA, vol. 284, no. 7, pp. 835–842, 2000.</li>
<li>K. A. A. Fox, et al., "Should patients with acute coronary disease be stratified for management according to their risk? derivation, external validation and outcomes using the updated grace risk score," BMJ Open, vol. 4, no. 2, 2014.</li>
<li>G. CB, G. RJ, D. O, and et al., "Predictors of hospital mortality in the global registry of acute coronary events," Archives of Internal Medicine, vol. 163, no. 19, pp. 2345–353, 2003.</li>
<li>B. E. Backus, et al., "Chest pain in the emergency room: A multicenter validation of the heart score," Critical Pathways in Cardiology, vol. 9, no. 3, 2010.</li>
</ul>
</div>
</div>

```

### Listing 10: aboutView.php

```

<div class="container" ng-controller="TabController1 as tab">
<div class="row">
<div class="col-sm-3">
<br>
<ul class="nav nav-pills nav-stacked" id="navSide1">
<li ng-class="{_active: tab.isSet(1)}"><a href ng-click="tab.setTab(1)">Definition</a></li>
<li ng-class="{_active: tab.isSet(2)}"><a href ng-click="tab.setTab(2)">Cause</a></li>
<li ng-class="{_active: tab.isSet(3)}"><a href ng-click="tab.setTab(3)">Signs & Symptoms</a></li>
<li ng-class="{_active: tab.isSet(4)}"><a href ng-click="tab.setTab(4)">Prevention</a></li>
<li ng-class="{_active: tab.isSet(5)}"><a href ng-click="tab.setTab(5)">Treatment</a></li>
</ul>
</div>
<div class="col-sm-9">
<h2>Coronary Heart Disease</h2>
<br>
<div ng-show="tab.isSet(1)">
<h4 id="subheader">Definition</h4>
<p>Coronary heart disease (CHD) is a disease in which a waxy substance called plaque builds up inside the coronary arteries.</p>
<p>CHD is commonly due to obstruction of the coronary arteries, usually the epicardial arteries, by atheromatous plaque. Obstructive CAD also has many nonatherosclerotic causes, including congenital abnormalities of the coronary arteries; myocardial bridging; coronary arteritis in association with the systemic vasculitides; and radiation-induced coronary disease. Myocardial ischemia may also occur in the

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absence of obstructive CAD, as in the case of aortic valve disease, hypertrophic cardiomyopathy, and idiopathic dilated cardiomyopathy.

Other Names:

- Coronary Artery Disease (CAD)
- Atherosclerosis
- Atherothrombosis
- Heart Disease
- Ischemic Heart Disease

Coronary artery supplies blood or oxygen to the heart.

**Cause**

There are some activities that becomes certain lifestyles which lead to the damaging of the inner layers of the coronary arteries.

Among these factors **include:**

- Smoking
- High levels of fats and cholesterol in the blood
- High blood pressure
- High levels of sugar in the blood due to insulin resistance or diabetes
- Blood vessel inflammation and other structural problems of the heart

**Signs & Symptoms**

Signs

- Old age for females
- Heart Attack
- Heart With Muscle Damage and a Blocked Artery
- Heart Failure
- Arrhythmia

Symptoms

- Angina/Chest Pain
- Difficulty in breathing

**Prevention**

Coronary heart diseases is usually affected by the lifestyle of a person rather than a structural problem of the artery. These are among the usual recommendations of the doctor to have a healthy lifestyle to lower the risk:

- Heart-healthy eating
- Maintaining a healthy weight
- Managing stress
- Physical activity
- Quitting smoking

**Treatment**

Aside from healthy lifestyle changes, other treatments for coronary heart disease include medicines, medical procedures and surgery, and cardiac rehabilitation.

Examples of medical procedures and surgery to be done are Percutaneous Coronary Intervention and Coronary Artery Bypass Grafting.

Furthermore, cardiac rehabilitation has two parts:

- Education, counseling, and training for understanding your condition and learning

to cope with the transition to a new lifestyle.

- Exercise training which involves activities for strengthening patterned after your needs.

**References:**

- NHLBI, "What is coronary heart disease?." <http://www.nhlbi.nih.gov/health/health-topics/topics/cad>, 2015.
- PHA, <em>2014 PHA Clinical Practice Guidelines For The Diagnosis and Management of Patients with Coronary Artery Disease</em>. Philippines: Philippine Heart Association, 2014.
- C. Rimmerman, "Coronary artery disease." <http://www.clevelandclinimed.com/medicalpubs/diseasemanagement/cardiology/coronary-artery-disease/>.
- C. Tidy, "Atheroma." <http://patient.info/health/atheroma>, 2013.
- D. Labarthe, <em>Epidemiology and Prevention of Cardiovascular Diseases: A Global Challenge</em>. Michael Brown, 2011.
- C. Esteban. private interview, Jan. 16 2016.

## Listing 11: calculatorView.php

```

<div class="container" ng-controller="
  TabController1 as tab">
  <div class="row">
    <div class="col-sm-3" id="subOpt">
      <!--<h3>CALCULATORS:</h3><hr-->
      <div class="panel panel-default">
        <div class="panel-heading"><b>CHD Risk
          Calculator</b></div>
        <div class="panel-body">
          <ul class="nav nav-pills nav-stacked" id="subOpt
            ">
            <li ng-class="{_active: tab.isSet(1)}"><a href
              ng-click="tab.setTab(1)">Framingham Risk
              Score</a></li>
          </ul>
        </div>
      </div>
    <div class="panel panel-default">
      <div class="panel-heading"><b>ACS Survival
        Measurement</b></div>
      <div class="panel-body">
        <ul class="nav nav-pills nav-stacked" id="subOpt
          ">
          <li ng-class="{_active: tab.isSet(2)}"><a href
            ng-click="tab.setTab(2)">TIMI Risk Score</a
            ></li>
          <li ng-class="{_active: tab.isSet(3)}"><a href
            ng-click="tab.setTab(3)">GRACE Risk Model</
            a></li>
          <li ng-class="{_active: tab.isSet(4)}"><a href
            ng-click="tab.setTab(4)">HEART Score</a></
            li>
        </ul>
      </div>
    </div>
    <div class="panel panel-default">
      <div class="panel-heading"><b>Based on diagnosis
        </b></div>
      <div class="panel-body">
        <ul class="nav nav-pills nav-stacked" id="subOpt
          ">
          <li ng-class="{_active: tab.isSet(5)}"><a href
            ng-click="tab.setTab(5)">UA/NSTEMI</a></li>
          <li ng-class="{_active: tab.isSet(6)}"><a href
            ng-click="tab.setTab(6)">STEMI (TIMI Risk
            Score)</a></li>
        </ul>
      </div>
    </div>
    <div class="panel panel-default">
      <div class="panel-heading"><b>Derived from
        Philippine Data</b></div>
      <div class="panel-body">

```









```

<form class="form-horizontal_well" role="form"
  id="heartForm" name="heartForm" method="
  post" action="<?php_echo_site_url('
  calculator/result');?>">
<input type="hidden" name="calculator" id="
  calculator" value="HEART">
<div class="form-group">
<label class="control-label_col-xs-5" for="
  h_history">History: <span class="glyphicon_
  glyphicon-info-sign" data-toggle="modal"
  data-target="#myModal2"></span></label>
<div class="col-xs-6">
<select class="form-control" id="h_history" name
  ="h_history">
<option>Slightly Suspicious</option>
<option>Moderately Suspicious</option>
<option>Highly Suspicious</option>
</select>
</div>
</div>

<div id="myModal2" class="modal_fade" role="
  dialog">
<div class="modal-dialog">
<div class="modal-content">
<div class="modal-header">
<button type="button" class="close" data-dismiss
  ="modal">&times;</button>
<h4 class="modal-title"><b>History</b></h4>
</div>
<div class="modal-body">
<table class="table_table-bordered_table-striped
  ">
<tr>
<th id="firstCol">Slightly Suspicious</th>
<td id="secondCol">There are no specific
  elements pertaining to the pattern of chest
  pain, onset and duration, relation with
  exercise, stress or cold, localization,
  concomitant symptoms and the reaction to
  sublingual nitrates</td>
</tr>
<tr>
<th id="firstCol">Moderately Suspicious</th>
<td id="secondCol">It has both specific and
  nonspecific elements</td>
</tr>
<tr>
<th id="firstCol">Highly Suspicious</th>
<td id="secondCol">Elements are primarily
  specific</td>
</tr>
</table>
</div>
</div>
</div>

<div class="form-group">
<label class="control-label_col-xs-5" for="
  h_stSegmentDev">ECG: <span class="glyphicon_
  glyphicon-info-sign" data-toggle="modal"
  data-target="#myModal3"></span></label>
<div class="col-xs-6">
<select class="form-control" id="h_stSegmentDev"
  name="h_stSegmentDev">
<option>Normal</option>
<option>Non specific repolarisation disturbance
  </option>
<option>Significant ST-depression</option>
</select>
</div>
</div>

<div id="myModal3" class="modal_fade" role="
  dialog">
<div class="modal-dialog">
<div class="modal-content">
<div class="modal-header">
<button type="button" class="close" data-dismiss
  ="modal">&times;</button>
<h4 class="modal-title"><b>ECG</b></h4>
</div>
<div class="modal-body">
<table class="table_table-bordered_table-striped
  ">
<tr>
<th id="firstCol">Normal</th>
<td id="secondCol">Normal ECG</td>
</tr>
</table>

```

```

<th id="firstCol">Non specific repolarisation
  disturbance</th>
<td id="secondCol">There are repolarization
  abnormalities without significant ST
  segment depression, bundle branch block (
  BBB), LV hypertrophy (LVH), repolarization
  abnormalities probably due to digoxin use,
  or unchanged known repolarization
  disturbances</td>
</tr>
</table>
</div>
</div>
</div>
</div>

<div class="form-group">
<label class="control-label_col-xs-5" for="h_age
  ">Age:</label>
<div class="col-xs-6_col-md-3">
<input type="number" class="form-control" id="
  h_age" name="h_age" placeholder="years_"
  min=1 max=100 required>
</div>
</div>
</div>
</div>

<div class="form-group">
<label class="control-label_col-xs-5" for="
  h_risk">Risk Factors:</label>
<div class="col-xs-6_col-md-3">
<div class="checkbox">
<input type="checkbox" id="h_risk[]" name
  ="h_risk[]" value="Hypercholesterolemia">
  Hypercholesterolemia</div>
<div class="checkbox">
<input type="checkbox" id="h_risk[]" name
  ="h_risk[]" value="Hypertension">
  Hypertension</div>
<div class="checkbox">
<input type="checkbox" id="h_risk[]" name
  ="h_risk[]" value="Diabetes_Mellitus">
  Diabetes Mellitus</div>
</div>
<div class="col-xs-4_col-md-3">
<div class="checkbox">
<input type="checkbox" id="h_risk[]" name
  ="h_risk[]" value="Cigarette_smoking">
  Cigarette smoking</div>
<div class="checkbox">
<input type="checkbox" id="h_risk[]" name
  ="h_risk[]" value="Positive_family_history">
  Positive family history</div>
<div class="checkbox">
<input type="checkbox" id="h_risk[]" name
  ="h_risk[]" value="Obesity">Obesity</div>
</div>
</div>
</div>

<div class="form-group">
<label class="control-label_col-xs-5" for="
  h_atheros">History of Atherosclerotic
  Disease:</label>
<div class="col-xs-6">
<div class="radio">
<input type="radio" id="h_atheros" name="
  h_atheros" value="Yes" required>Yes</div>
<input type="radio" id="h_atheros" name="
  h_atheros" value="No">No</div>
</div>
</div>
</div>

<div class="form-group">
<label class="control-label_col-xs-5" for="
  h_troponin">Troponin:</label>
<div class="col-xs-6">
<select class="form-control_" id="h_troponin"
  name="h_troponin">
<option>normal limit</option>
<option>1 3x normal limit</option>
<option>3 3x normal limit</option>
</select>

```









```

#calc {
vertical-align: top;
}

</style>

<div>
<table class="header">
<tr class="header">
<td class="header"><center></center></td>
<td class="header">
<h2>Coronary Heart Disease Calculator</h2>
<h3><small>As suggested in Philippine Heart
Association Guidelines</small></h3>
<br><div id="smaller">Generated on <?php
date_default_timezone_set("Asia/Singapore")
; echo date('jS_\of_\F_\Y_\h:i:s_A');></div>
</td>
</tr>
</table>

<hr>

<div id="headerTitle"><h3>RISK CALCULATOR RESULT
REPORT</h3></div>

<p>The following are the values of the coronary
heart disease patient that you have entered
in the calculator.</p>
<table>
<tr>
<th colspan=2 id="tableHeader">Entered Data:</th>
</tr>
<?php
if($calculator == "Framingham"){
echo "<tr><td>Age</td><td>" . $f_age . " _y.o.</td>
"></tr>";
echo "<tr><td>Sex</td><td>" . $f_sex . " </td></tr>";
echo "<tr><td>Total_Cholesterol</td><td>" .
$f_totalChol . " _mg/dL</td></tr>";
echo "<tr><td>High_Density_Lipoprotein</td><td>" .
$f_highDenLip . " _mg/dL</td></tr>";
echo "<tr><td>Systolic_Blood_Pressure</td><td>" .
$f_sysBloodPress . " _mmHg</td></tr>";
echo "<tr><td>Diastolic_Blood_Pressure</td><td>" .
$f_diaBloodPress . " _mmHg</td></tr>";
echo "<tr><td>Diabetic</td><td>" . $f_diabetic . "
</td></tr>";
echo "<tr><td>Smoker</td><td>" . $f_smoker . " </td>
"></tr>";
}
else if($calculator == "TIMI"){
echo "<tr><td>Age</td><td>" . $t_age . " _y.o.</td>
"></tr>";
echo "<tr><td>(" . count($t_risk) . ")_CAD_Factors
</td><td>";
if(strlen($t_risk) != 0)
echo $t_risk;
else
echo "None";
echo "</td></tr>";
echo "<tr><td>Known_CAD_(Stenosis_ _50%)</td><td>" .
$t_historyOfStenosis . " </td></tr>";
echo "<tr><td>ST_deviation_on_ECG_( _0.5mm)</td><td>" .
$t_stSegmentDev . " </td></tr>";
echo "<tr><td>Severe_angina_( _2_episodes_in_
24_hrs)</td><td>" . $t_anginaEvents . " </td>
"></tr>";
echo "<tr><td>Elevated_serum_cardiac_biomarkers
</td><td>" . $t_cardiacMarker . " </td></tr>";
echo "<tr><td>ASA_Use_in_Past_7_days</td><td>" .
$t_aspirinIntake . " </td></tr>";
}
else if($calculator == "GRACE"){
echo "<tr><td>Age</td><td>" . $g_ageInit . " _y.o.
"></td></tr>";
echo "<tr><td>Heart_Rate</td><td>" .
$g_heartRateInit . " _bpm</td></tr>";
echo "<tr><td>Systolic_Blood_Pressure</td><td>" .
$g_sysBloodPressInit . " _mmHg</td></tr>";
echo "<tr><td>Killip_Classification/CHF</td><td>" .
$g_killipClass . " </td></tr>";
echo "<tr><td>Diuretic_Usage</td><td>" .
$g_diureticUsage . " </td></tr>";
echo "<tr><td>Serum_Creatinine</td><td>" .
$g_serumCreatinine . " </td></tr>";
echo "<tr><td>Renal_Failure/CHF</td><td>" .
$g_renalFailure . " </td></tr>";
echo "<tr><td>ST_segment_depression</td><td>" .
$g_stSegmentDev . " </td></tr>";
echo "<tr><td>Positive_initial_cardiac_markers</td><td>" .
$g_cardiacMarker . " </td></tr>";
echo "<tr><td>Cardiac_arrest_at_hospital_arrival
</td><td>" . $g_cardiacArrest . " </td></tr>";
}
else if($calculator == "HEART"){
echo "<tr><td>History</td><td>" . $h_history . " </td>
"></tr>";
echo "<tr><td>ECG</td><td>" . $h_stSegmentDev . "
</td></tr>";
echo "<tr><td>Age</td><td>" . $h_age . " _y.o.</td>
"></tr>";
echo "<tr><td>(" . count($h_risk) . ")_Risk_
Factors:</td><td>";
if(strlen($h_risk) != 0)
echo $h_risk;
else
echo "None";
echo "</td></tr>";
echo "<tr><td>History_of_Atherosclerotic_Disease
</td><td>" . $h_atheros . " </td></tr>";
echo "<tr><td>Troponin</td><td>" . $h_troponin . "
</td></tr>";
}
else if($calculator == "UANSTEM"){
echo "<tr><td>Age</td><td>" . $u_ageInit . " _y.o.
"></td></tr>";
echo "<tr><td>Heart_Rate</td><td>" .
$u_heartRateInit . " _bpm</td></tr>";
echo "<tr><td>Systolic_Blood_Pressure</td><td>" .
$u_sysBloodPressInit . " _mmHg</td></tr>";
echo "<tr><td>(" . count($u_risk) . ")_Risk_
Factors:</td><td>";
if(strlen($u_risk) != 0)
echo $u_risk;
else
echo "None";
echo "</td></tr>";
echo "<tr><td>History_of_Atherosclerotic_Disease
</td><td>" . $u_atheros . " </td></tr>";
echo "<tr><td>Killip_Classification/CHF</td><td>" .
$u_killipClass . " </td></tr>";
echo "<tr><td>ECG</td><td>" . $u_stSegmentDev . "
</td></tr>";
echo "<tr><td>Serum_Creatinine</td><td>" .
$u_serumCreatinine . " </td></tr>";
echo "<tr><td>Troponin</td><td>" . $u_troponin . "
</td></tr>";
echo "<tr><td>History</td><td>" . $u_history . " </td>
"></tr>";
echo "<tr><td>Known_CAD_(Stenosis_ _50%)</td><td>" .
$u_historyOfStenosis . " </td></tr>";
echo "<tr><td>Severe_angina_( _2_episodes_in_
24_hrs)</td><td>" . $u_anginaEvents . " </td>
"></tr>";
echo "<tr><td>ASA_Use_in_Past_7_days</td><td>" .
$u_aspirinIntake . " </td></tr>";
echo "<tr><td>Cardiac_arrest_at_hospital_arrival
</td><td>" . $u_cardiacArrest . " </td></tr>";
}
else if($calculator == "STEMI"){
echo "<tr><td>Age</td><td>" . $s_age . " _y.o.</td>
"></tr>";
echo "<tr><td>Diabetes_Mellitus/HTN_or_angina</td><td>" .
$s_anginaEvents . " </td></tr>";
echo "<tr><td>Systolic_Blood_Pressure</td><td>" .
$s_sysBloodPress . " _mmHg</td></tr>";
echo "<tr><td>Heart_Rate</td><td>" . $s_heartRate .
" _bpm</td></tr>";
echo "<tr><td>Killip_Classification/CHF</td><td>" .
$s_killipClass . " </td></tr>";
echo "<tr><td>Weight</td><td>" . $s_weight . " _kg
</td></tr>";
echo "<tr><td>Anterior_ST_segment_Elevation/LBBB
</td><td>" . $s_stSegmentElev . " </td></tr>";
echo "<tr><td>Time_to_Treatment_(>_4_hours)</td><td>" .
$s_timeToTreat . " </td></tr>";
}
?>
</table>

<div class="pagebreak"> </div>

<p>The table below shows the predicted survival
score and rates determined by the
corresponding models used.</p>
<table>
<tr>
<th colspan=4 id="tableHeader">Prediction

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```

Results:</th>
</tr>
<tr>
<th>Model used</th>
<th>Points</th>
<th>Probability</th>
<th>Time Period</th>
</tr>
<tr>
<?php
if($calculator == "Framingham"){
echo "<td_id='calc'>" . $calculator . "_Risk_Score
</td>";
echo "<td>" . $framPts . " </td>";
echo "<td>" . $framProb . " %</td>";
echo "<td>10_years</td>";
}
else if($calculator == "TIMI"){
echo "<td_rowspan=2>" . $calculator . "_Risk_Score
</td>";
echo "<td_rowspan=2>" . $timiPts . " </td>";
echo "<td>" . $timiProb . " %</td>";
echo "<td>NA</td></tr>";
echo "<tr><td>" . $timiProbPhil . " %</td>";
echo "<td>NA_(Phil._Data)</td></tr>";
}
else if($calculator == "GRACE"){
echo "<td_rowspan=9>" . $calculator . "_Risk_Score
</td>";
echo "<td_rowspan=2>" . $gracePtsInHospitalDeath .
"</td>";
echo "<td>" . $graceProbInHospitalDeath . " %</td>";
;
echo "<td>In-hospital_Death</td></tr>";
if($graceProbInHospitalDeathPhil == 0){
echo "<tr><td></td>";
echo "<td>In-hospital_Death_(Phil._Data)</td></tr>";
}
else{
echo "<tr><td>" . $graceProbInHospitalDeathPhil .
"%</td>";
echo "<td>In-hospital_Death_(Phil._Data)</td></tr>";
}
echo "<tr><td>" . $gracePtsInHospitalDeathMI . " </td>";
echo "<td>" . $graceProbInHospitalDeathMI . " %</td>";
;
echo "<td>In-hospital_Death/MI</td></tr>";
echo "<tr><td>" . $gracePtsSixMonthDeath . " </td>";
;
echo "<td>" . $graceProbSixMonthDeath . " %</td>";
echo "<td>6-month_Death</td></tr>";
echo "<tr><td>" . $gracePtsSixMonthDeathMI . " </td>";
;
echo "<td>" . $graceProbSixMonthDeathMI . " %</td>";
;
echo "<td>6-month_Death/MI</td></tr>";
echo "<tr><td></td>";
echo "<td>" . $graceProbOneYearDeath . " %</td>";
echo "<td>1-year_Death</td></tr>";
echo "<tr><td></td>";
if($graceProbOneYearDeathMI == 0 &&
$graceProbThreeYearDeath == 0 &&
$graceProbThreeYearDeathMI == 0){
echo "<td></td>";
echo "<td>1-year_Death/MI</td></tr>";
echo "<tr><td></td>";
echo "<td></td>";
echo "<td>3-year_Death</td></tr>";
echo "<tr><td></td>";
echo "<td></td>";
echo "<td>3-year_Death/MI</td>";
}
else{
echo "<td>" . $graceProbOneYearDeathMI . " %</td>";
echo "<td>1-year_Death/MI</td></tr>";
echo "<tr><td></td>";
echo "<td>" . $graceProbThreeYearDeath . " %</td>";
echo "<td>3-year_Death</td></tr>";
echo "<tr><td></td>";
echo "<td>" . $graceProbThreeYearDeathMI . " %</td>";
;
echo "<td>3-year_Death/MI</td>";
}
}
else if($calculator == "HEART"){
echo "<td_id='calc'>" . $calculator . "_Score</td>";
;
echo "<td>" . $heartPts . " </td>";
echo "<td>" . $heartProb . " %</td>";
;
echo "<td>NA</td>";
}
else if($calculator == "UANSTEMI"){
echo "<td_id='calc' _rowspan=2>TIMI_Risk_Score</td>";
echo "<td_rowspan=2>" . $timiPts . " </td>";
echo "<td>" . $timiProb . " %</td>";
echo "<td>NA</td></tr>";
echo "<tr><td>" . $timiProbPhil . " %</td>";
echo "<td>NA_(Phil._Data)</td></tr>";
echo "<tr><td_rowspan=9_id='calc'>GRACE_Risk_Score</td>";
echo "<td_rowspan=2>" . $gracePtsInHospitalDeath .
"</td>";
echo "<td>" . $graceProbInHospitalDeath . " %</td>";
;
echo "<td>In-hospital_Death</td></tr>";
if($graceProbInHospitalDeathPhil == 0){
echo "<tr><td></td>";
echo "<td>In-hospital_Death_(Phil._Data)</td></tr>";
}
else{
echo "<tr><td>" . $graceProbInHospitalDeathPhil .
"%</td>";
echo "<td>In-hospital_Death_(Phil._Data)</td></tr>";
}
echo "<tr><td>" . $gracePtsInHospitalDeathMI . " </td>";
echo "<td>" . $graceProbInHospitalDeathMI . " %</td>";
;
echo "<td>In-hospital_Death/MI</td></tr>";
echo "<tr><td>" . $gracePtsSixMonthDeath . " </td>";
;
echo "<td>" . $graceProbSixMonthDeath . " %</td>";
echo "<td>6-month_Death</td></tr>";
echo "<tr><td>" . $gracePtsSixMonthDeathMI . " </td>";
;
echo "<td>" . $graceProbSixMonthDeathMI . " %</td>";
;
echo "<td>6-month_Death/MI</td></tr>";
echo "<tr><td></td>";
echo "<td>" . $graceProbOneYearDeath . " %</td>";
echo "<td>1-year_Death</td></tr>";
echo "<tr><td></td>";
echo "<td>" . $graceProbOneYearDeathMI . " %</td>";
echo "<td>1-year_Death/MI</td></tr>";
echo "<tr><td></td>";
echo "<td>" . $graceProbThreeYearDeath . " %</td>";
echo "<td>3-year_Death</td></tr>";
echo "<tr><td></td>";
echo "<td>" . $graceProbThreeYearDeathMI . " %</td>";
;
echo "<td>3-year_Death/MI</td></tr>";
}
}
else if($calculator == "STEMI"){
echo "<td_rowspan=2_id='calc'>" . $calculator . "
</td>";
echo "<td_rowspan=2>" . $stemiPts . " </td>";
echo "<td>" . $stemiProbThirtyDays . " %</td>";
echo "<td>30_days</td></tr>";
echo "<td>" . $stemiProbOneYear . " %</td>";
echo "<td>1_year</td>";
}
?>
</tr>
</table>
<br>
<table>
<tr>
<th id="tableHeader">Interpretation of Risk
Probability:</th>
</tr>
<?php
if($calculator == "Framingham"){
echo "<tr><td>Means_" . $framProb . "_of_100_people_
with_this_level_of_risk_could_be_diagnosed_
with_Coronary_Heart_Disease_in_the_next_10_
years.</td></tr>";
}
else if($calculator == "TIMI"){
if($timiPts >= 0 && $timiPts <= 2) {
echo "<tr><td_id='normal'><b>Low_risk_patient:_
</b>Drug_therapy_is_appropriate_and_
surgical_intervention_is_reserved_for_those

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        _who_fail_to_settle_with_drug_therapy.</td>
    </tr>";
}
else if($timiPts >= 3 && $timiPts <= 4) {
echo "<tr><td_id='warning'><b>Medium_risk_
patient:</b>Patient_should_be_treated_with
_multiple_drugs_and_considered_for_early_
coronary_angiography_and_revascularization
.</td></tr>";
}
else {
echo "<tr><td_id='danger'><b>High_risk_patient:</b>
Patient_should_be_treated_with_multiple_
drugs_and_considered_for_early_coronary_
angiography_and_revascularization.</td></tr>";
}
}
else if($calculator == "GRACE"){
echo "<tr><td>The_probabilities_correspond_to_
the_risk_of_death_or_death/myocardial_
infarction_from_hospital_admission_until_
the_corresponding_time_period_of_that_
probability.</td></tr>";
}
else if($calculator == "HEART"){
if($heartProb == 1.6) {
echo "<tr><td_id='normal'>Patient_may_have_the_
possibility_of_early_discharge.</td></tr>";
}
else if($heartProb == 13) {
echo "<tr><td_id='warning'>Immediate_discharge_
for_patient_is_not_possible._Patient_must_
be_admitted_for_clinical_observation_and_
subjected_to_non-invasive_investigations_
such_as_repeated_troponin_or_advanced_
ischemia_detection.</td></tr>";
}
else {
echo "<tr><td_id='danger'>Patient_must_receive_
early_aggressive_treatments_including_
invasive_strategies_without_preceding_non-
invasive_testing.</td></tr>";
}
}
else if($calculator == "UANSTEMI"){
if($timiPts >= 0 && $timiPts <= 2) {
echo "<tr><td_id='normal'>TIMI:<b>Low_risk_
patient:</b>Drug_therapy_is_appropriate_
and_surgical_intervention_is_reserved_for_
those_who_fail_to_settle_with_drug_therapy
.</td></tr>";
}
else if($timiPts >= 3 && $timiPts <= 4) {
echo "<tr><td_id='warning'>TIMI:<b>Medium_risk_
patient:</b>Patient_should_be_treated_with_
_multiple_drugs_and_considered_for_early_
coronary_angiography_and_revascularization
.</td></tr>";
}
else {
echo "<tr><td_id='danger'>TIMI:<b>High_risk_
patient:</b>Patient_should_be_treated_with_
_multiple_drugs_and_considered_for_early_
coronary_angiography_and_revascularization
.</td></tr>";
}
}
echo "<tr><td>GRACE:_The_probabilities_
correspond_to_the_risk_of_death_or_death/
myocardial_infarction_from_hospital_
admission_until_the_corresponding_time_
period_of_that_probability.</td></tr>";
if($heartProb == 1.6) {
echo "<tr><td_id='normal'>HEART:_Patient_may_
have_the_possibility_of_early_discharge.</
td></tr>";
}
else if($heartProb == 13) {
echo "<tr><td_id='warning'>HEART:_PImmediate_
discharge_for_patient_is_not_possible._
Patient_must_be_admitted_for_clinical_
observation_and_subjected_to_non-invasive_
investigations_such_as_repeated_troponin_or_
advanced_ischemia_detection.</td></tr>";
}
else {
echo "<tr><td_id='danger'>HEART:_PPatient_must_
receive_early_aggressive_treatments_
including_invasive_strategies_without_
preceding_non-invasive_testing.</td></tr>";
}
}
}

```

```

else if($calculator == "STEMI"){
echo "<tr><td>The_result_means_that_patient_has_
$.stemiProbThirtyDays."_risk_of_all-cause_
mortality_at_30_days_and_".
$.stemiProbOneYear."_risk_of_all-cause_
mortality_at_1_year.</td></tr>";
}
?>
</table>
<br>
<table>
<tr>
<th id="tableHeader">Physician's_Notes:</th>
</tr>
<tr>
<td>
<p_id="notes"><?php_echo_$.notes;_?></p>
</td>
</tr>
</table>
<br>
<b>References_for_Interpretation:</b>
<ul>
<li>PHA,<em>2014_PHA_Clinical_Practice_
Guidelines_For_The_Diagnosis_and_Management_
_of_Patients_with_Coronary_Artery_Disease</em>
</li>
<li>Philippines:_Philippine_Heart_
Association,_2014.</li>
<li>"Estimate_of_10-year_risk_for_coronary_heart_
disease_framingham_point_scores."_http://
www.nhlbi.nih.gov/health-pro/guidelines/_
current/cholesterol-guidelines/quick-desk-
reference-html/10-year-risk-framingham-
table.</li>
<li>C._Esteban._private_interview,_Jan._16_
2016.</li>
</ul>
</div>

```

## Listing 14: resultView.php

```

<div class="container">
<div class="row">
<div class="col-sm-12">
<h3>Risk Calculator Result Report</h3>
<br>
</div>
</div>
<form role="form" method="post" action="<?php_
echo_site_url('export/result');?>">
<div class="row">
<div class="col-sm-6">
<div class="table-responsive">
<table class="table table-bordered table-striped">
<tr>
<th colspan=2 id="tableHeader">Entered Data:</th>
</tr>
<tr>
<td colspan=2><?php
if($calculator == "Framingham"){
echo "<tr><td>Age</td><td>"_.$.age._".y.o.</td>
"></tr>";
echo "<tr><td>Sex</td><td>"_.$.sex._".</td></tr>";
echo "<tr><td>Total_Cholesterol</td><td>"_.
$.totalChol._".mg/dL</td></tr>";
echo "<tr><td>High_Density_Lipoprotein</td><td>"_.
$.highDenLip._".mg/dL</td></tr>";
echo "<tr><td>Systolic_Blood_Pressure</td><td>"_.
$.sysBloodPress._".mmHg</td></tr>";
echo "<tr><td>Diastolic_Blood_Pressure</td><td>"_.
$.diaBloodPress._".mmHg</td></tr>";
echo "<tr><td>Diabetic</td><td>"_.$.diabetic._".
"></td></tr>";
echo "<tr><td>Smoker</td><td>"_.$.smoker._".</td>
"></tr>";
}
else if($calculator == "TIMI"){
echo "<tr><td>Age</td><td>"_.$.age._".y.o.</td>
"></tr>";
echo "<tr><td>("_.count($.risk).)_".CAD_Factors
"></td><td>";
if(count($.risk) != 0){
foreach($.risk as $risk)

```





```

echo "<tr><td_id='danger'>TIMI:<b>High_risk_patient :</b>Patient_should_be_treated_with_multiple_drugs_and_considered_for_early_coronary_angiography_and_revascularization.</td></tr>";
}
echo "<tr><td>GRACE:The_probabilities_correspond_to_the_risk_of_death_or_death/myocardial_infarction_from_hospital_admission_until_the_corresponding_time_period_of_that_probability</td></tr>";
if($heartProb == 1.6) {
echo "<tr><td_id='normal'>HEART:Patient_may_have_the_possibility_of_early_discharge.</td></tr>";
}
} else if($heartProb == 13) {
echo "<tr><td_id='warning'>HEART:Immediate_discharge_for_patient_is_not_possible.Patient_must_be_admitted_for_clinical_observation_and_subjected_to_non-invasive_investigations_such_as_repeated_troponin_or_advanced_ischemia_detection.</td></tr>";
}
} else {
echo "<tr><td_id='danger'>HEART:PPatient_must_receive_early_aggressive_treatments_including_invasive_strategies_without_preceding_non-invasive_testing.</td></tr>";
}
} else if($calculator == "STEMI"){
echo "<tr><td>The_result_means_that_patient_has_". $stemiProbThirtyDays." risk_of_all-cause_mortality_at_30_days_and_". $stemiProbOneYear." risk_of_all-cause_mortality_at_1_year.</td></tr>";
}
?>
</table>
</div>

<div class="table-responsive">
<table class="table table-bordered">
<tr>
<th id="tableHeader">Physician's_Notes:</th>
</tr>
<tr>
<td>
<div class="form-group">
<textarea id="noteInput" name="noteInput"></textarea>
</div>
</td>
</tr>
</table>
</div>
</div>

<div class="row">
<div class="col-sm-12 id="exportPDF">
<input type="hidden" value="<?php_&str;_?>" id="html" name="html">
<button class="btn btn-primary pull-right"><span class="glyphicon glyphicon-save"></span> Export_report_as_PDF_file</button>
</div>
</div>

<?php
if($calculator == "Framingham"){
echo "<input type='hidden' id='f_age' name='f_age' value='&_.' $f_age.' '>";
echo "<input type='hidden' id='f_sex' name='f_sex' value='&_.' $f_sex.' '>";
echo "<input type='hidden' id='f_totalChol' name='f_totalChol' value='&_.' $f_totalChol.' '>";
echo "<input type='hidden' id='f_highDenLip' name='f_highDenLip' value='&_.' $f_highDenLip.' '>";
echo "<input type='hidden' id='f_sysBloodPress' name='f_sysBloodPress' value='&_.' $f_sysBloodPress.' '>";
echo "<input type='hidden' id='f_diaBloodPress' name='f_diaBloodPress' value='&_.' $f_diaBloodPress.' '>";
echo "<input type='hidden' id='f_diabetic' name='f_diabetic' value='&_.' $f_diabetic.' '>";
echo "<input type='hidden' id='f_smoker' name='f_smoker' value='&_.' $f_smoker.' '>";
echo "<input type='hidden' id='calculator' name='calculator' value='&_.' $calculator.' '>";
echo "<input type='hidden' id='framPts' name='framPts' value='&_.' $framPts.' '>";
echo "<input type='hidden' id='framProb' name='framProb' value='&_.' $framProb.' '>";
}
else_if($calculator == "TIMI"){
if(count($t_risk) != 0){
$trisk = implode(" , ", $t_risk);
}
else {
$trisk = $t_risk;
}
echo "<input type='hidden' id='t_age' name='t_age' value='&_.' $t_age.' '>";
echo "<input type='hidden' id='t_risk' name='t_risk' value='&_.' $trisk.' '>";
echo "<input type='hidden' id='t_historyOfStenosis' name='t_historyOfStenosis' value='&_.' $t_historyOfStenosis.' '>";
echo "<input type='hidden' id='t_stSegmentDev' name='t_stSegmentDev' value='&_.' $t_stSegmentDev.' '>";
echo "<input type='hidden' id='t_anginaEvents' name='t_anginaEvents' value='&_.' $t_anginaEvents.' '>";
echo "<input type='hidden' id='t_cardiacMarker' name='t_cardiacMarker' value='&_.' $t_cardiacMarker.' '>";
echo "<input type='hidden' id='t_aspirinIntake' name='t_aspirinIntake' value='&_.' $t_aspirinIntake.' '>";
echo "<input type='hidden' id='calculator' name='calculator' value='&_.' $calculator.' '>";
echo "<input type='hidden' id='timiPts' name='timiPts' value='&_.' $timiPts.' '>";
echo "<input type='hidden' id='timiProb' name='timiProb' value='&_.' $timiProb.' '>";
echo "<input type='hidden' id='timiProbPhil' name='timiProbPhil' value='&_.' $timiProbPhil.' '>";
}
else_if($calculator == "GRACE"){
echo "<input type='hidden' id='g_ageInit' name='g_ageInit' value='&_.' $g_ageInit.' '>";
echo "<input type='hidden' id='g_heartRateInit' name='g_heartRateInit' value='&_.' $g_heartRateInit.' '>";
echo "<input type='hidden' id='g_sysBloodPressInit' name='g_sysBloodPressInit' value='&_.' $g_sysBloodPressInit.' '>";
echo "<input type='hidden' id='g_killipClass' name='g_killipClass' value='&_.' $g_killipClass.' '>";
echo "<input type='hidden' id='g_diureticUsage' name='g_diureticUsage' value='&_.' $g_diureticUsage.' '>";
echo "<input type='hidden' id='g_serumCreatinine' name='g_serumCreatinine' value='&_.' $g_serumCreatinine.' '>";
echo "<input type='hidden' id='g_renalFailure' name='g_renalFailure' value='&_.' $g_renalFailure.' '>";
echo "<input type='hidden' id='g_stSegmentDev' name='g_stSegmentDev' value='&_.' $g_stSegmentDev.' '>";
echo "<input type='hidden' id='g_cardiacMarker' name='g_cardiacMarker' value='&_.' $g_cardiacMarker.' '>";
echo "<input type='hidden' id='g_cardiacArrest' name='g_cardiacArrest' value='&_.' $g_cardiacArrest.' '>";
echo "<input type='hidden' id='calculator' name='calculator' value='&_.' $calculator.' '>";
echo "<input type='hidden' id='gracePtsInHospitalDeath' name='gracePtsInHospitalDeath' value='&_.' $gracePtsInHospitalDeath.' '>";
echo "<input type='hidden' id='graceProbInHospitalDeathPhil' name='graceProbInHospitalDeathPhil' value='&_.' $graceProbInHospitalDeathPhil.' '>";
echo "<input type='hidden' id='graceProbInHospitalDeath' name='graceProbInHospitalDeath' value='&_.' $graceProbInHospitalDeath.' '>";
echo "<input type='hidden' id='";
}
}

```

```

        gracePtsInHospitalDeathMI '_name='
        gracePtsInHospitalDeathMI '_value=' ..
        $gracePtsInHospitalDeathMI .. '>";
echo_"<input_type='hidden'_id='
        graceProbInHospitalDeathMI '_name='
        graceProbInHospitalDeathMI '_value=' ..
        $graceProbInHospitalDeathMI .. '>";
echo_"<input_type='hidden'_id='
        gracePtsSixMonthDeath '_name='
        gracePtsSixMonthDeath '_value=' ..
        $gracePtsSixMonthDeath .. '>";
echo_"<input_type='hidden'_id='
        graceProbSixMonthDeath '_name='
        graceProbSixMonthDeath '_value=' ..
        $graceProbSixMonthDeath .. '>";
echo_"<input_type='hidden'_id='
        gracePtsSixMonthDeathMI '_name='
        gracePtsSixMonthDeathMI '_value=' ..
        $gracePtsSixMonthDeathMI .. '>";
echo_"<input_type='hidden'_id='
        graceProbSixMonthDeathMI '_name='
        graceProbSixMonthDeathMI '_value=' ..
        $graceProbSixMonthDeathMI .. '>";
echo_"<input_type='hidden'_id='
        graceProbOneYearDeath '_name='
        graceProbOneYearDeath '_value=' ..
        $graceProbOneYearDeath .. '>";
echo_"<input_type='hidden'_id='
        graceProbOneYearDeathMI '_name='
        graceProbOneYearDeathMI '_value=' ..
        $graceProbOneYearDeathMI .. '>";
echo_"<input_type='hidden'_id='
        graceProbThreeYearDeath '_name='
        graceProbThreeYearDeath '_value=' ..
        $graceProbThreeYearDeath .. '>";
echo_"<input_type='hidden'_id='
        graceProbThreeYearDeathMI '_name='
        graceProbThreeYearDeathMI '_value=' ..
        $graceProbThreeYearDeathMI .. '>";
    }
    else_if ($calculator == "HEART") {
        if (count ($h_risk) != 0) {
            $hrisk == implode (" , ", $h_risk );
        }
        else {
            $hrisk == $h_risk ;
        }
echo_"<input_type='hidden'_id=' h_history '_name='
        h_history '_value=' .. $h_history .. '>";
echo_"<input_type='hidden'_id=' h_stSegmentDev '_name='
        h_stSegmentDev '_value=' ..
        $h_stSegmentDev .. '>";
echo_"<input_type='hidden'_id=' h_age '_name='
        h_age '_value=' .. $h_age .. '>";
echo_"<input_type='hidden'_id=' h_risk '_name='
        h_risk '_value=' .. $hrisk .. '>";
echo_"<input_type='hidden'_id=' h_atheros '_name='
        h_atheros '_value=' .. $h_atheros .. '>";
echo_"<input_type='hidden'_id=' h_troponin '_name='
        h_troponin '_value=' .. $h_troponin .. '>";
echo_"<input_type='hidden'_id=' calculator '_name='
        calculator '_value=' .. $calculator .. '>";
echo_"<input_type='hidden'_id=' heartPts '_name='
        heartPts '_value=' .. $heartPts .. '>";
echo_"<input_type='hidden'_id=' heartProb '_name='
        heartProb '_value=' .. $heartProb .. '>";
    }
    else_if ($calculator == "UANSTEMI") {
        if (count ($h_risk) != 0) {
            $hrisk == implode (" , ", $h_risk );
        }
        else {
            $hrisk == $h_risk ;
        }
echo_"<input_type='hidden'_id=' g_ageInit '_name='
        g_ageInit '_value=' .. $g_ageInit .. '>";
echo_"<input_type='hidden'_id=' g_heartRateInit '_name='
        g_heartRateInit '_value=' ..
        $g_heartRateInit .. '>";
echo_"<input_type='hidden'_id='
        g_sysBloodPressInit '_name='
        g_sysBloodPressInit '_value=' ..
        $g_sysBloodPressInit .. '>";
echo_"<input_type='hidden'_id=' h_risk '_name='
        h_risk '_value=' .. $hrisk .. '>";
echo_"<input_type='hidden'_id=' h_atheros '_name='
        h_atheros '_value=' .. $h_atheros .. '>";
echo_"<input_type='hidden'_id=' g_killipClass '_name='
        g_killipClass '_value=' ..
        $g_killipClass .. '>";
echo_"<input_type='hidden'_id=' h_stSegmentDev '_name='
        h_stSegmentDev '_value=' ..
        $h_stSegmentDev .. '>";
        $h_stSegmentDev .. '>";
echo_"<input_type='hidden'_id=' g_serumCreatinine '_name='
        g_serumCreatinine '_value=' ..
        $g_serumCreatinine .. '>";
echo_"<input_type='hidden'_id=' h_troponin '_name='
        h_troponin '_value=' .. $h_troponin .. '>";
echo_"<input_type='hidden'_id=' h_history '_name='
        h_history '_value=' .. $h_history .. '>";
echo_"<input_type='hidden'_id='
        t_historyOfStenosis '_name='
        t_historyOfStenosis '_value=' ..
        $t_historyOfStenosis .. '>";
echo_"<input_type='hidden'_id=' t_anginaEvents '_name='
        t_anginaEvents '_value=' ..
        $t_anginaEvents .. '>";
echo_"<input_type='hidden'_id=' t_aspirinIntake '_name='
        t_aspirinIntake '_value=' ..
        $t_aspirinIntake .. '>";
echo_"<input_type='hidden'_id=' g_cardiacArrest '_name='
        g_cardiacArrest '_value=' ..
        $g_cardiacArrest .. '>";
echo_"<input_type='hidden'_id=' calculator '_name='
        calculator '_value=' .. $calculator .. '>";
echo_"<input_type='hidden'_id=' timiPts '_name='
        timiPts '_value=' .. $timiPts .. '>";
echo_"<input_type='hidden'_id=' timiProb '_name='
        timiProb '_value=' .. $timiProb .. '>";
echo_"<input_type='hidden'_id=' timiProbPhil '_name='
        timiProbPhil '_value=' .. $timiProbPhil .. '>";
echo_"<input_type='hidden'_id='
        gracePtsInHospitalDeath '_name='
        gracePtsInHospitalDeath '_value=' ..
        $gracePtsInHospitalDeath .. '>";
echo_"<input_type='hidden'_id='
        graceProbInHospitalDeath '_name='
        graceProbInHospitalDeath '_value=' ..
        $graceProbInHospitalDeath .. '>";
echo_"<input_type='hidden'_id='
        graceProbInHospitalDeathPhil '_name='
        graceProbInHospitalDeathPhil '_value=' ..
        $graceProbInHospitalDeathPhil .. '>";
echo_"<input_type='hidden'_id='
        gracePtsInHospitalDeathMI '_name='
        gracePtsInHospitalDeathMI '_value=' ..
        $gracePtsInHospitalDeathMI .. '>";
echo_"<input_type='hidden'_id='
        graceProbInHospitalDeathMI '_name='
        graceProbInHospitalDeathMI '_value=' ..
        $graceProbInHospitalDeathMI .. '>";
echo_"<input_type='hidden'_id='
        graceProbInHospitalDeathPhil '_name='
        graceProbInHospitalDeathPhil '_value=' ..
        $graceProbInHospitalDeathPhil .. '>";
echo_"<input_type='hidden'_id='
        gracePtsInHospitalDeathMI '_name='
        gracePtsInHospitalDeathMI '_value=' ..
        $gracePtsInHospitalDeathMI .. '>";
echo_"<input_type='hidden'_id='
        graceProbInHospitalDeathMI '_name='
        graceProbInHospitalDeathMI '_value=' ..
        $graceProbInHospitalDeathMI .. '>";
echo_"<input_type='hidden'_id='
        gracePtsSixMonthDeath '_name='
        gracePtsSixMonthDeath '_value=' ..
        $gracePtsSixMonthDeath .. '>";
echo_"<input_type='hidden'_id='
        graceProbSixMonthDeath '_name='
        graceProbSixMonthDeath '_value=' ..
        $graceProbSixMonthDeath .. '>";
echo_"<input_type='hidden'_id='
        gracePtsSixMonthDeathMI '_name='
        gracePtsSixMonthDeathMI '_value=' ..
        $gracePtsSixMonthDeathMI .. '>";
echo_"<input_type='hidden'_id='
        graceProbSixMonthDeathMI '_name='
        graceProbSixMonthDeathMI '_value=' ..
        $graceProbSixMonthDeathMI .. '>";
echo_"<input_type='hidden'_id='
        graceProbOneYearDeath '_name='
        graceProbOneYearDeath '_value=' ..
        $graceProbOneYearDeath .. '>";
echo_"<input_type='hidden'_id='
        graceProbOneYearDeathMI '_name='
        graceProbOneYearDeathMI '_value=' ..
        $graceProbOneYearDeathMI .. '>";
echo_"<input_type='hidden'_id='
        graceProbThreeYearDeath '_name='
        graceProbThreeYearDeath '_value=' ..
        $graceProbThreeYearDeath .. '>";
echo_"<input_type='hidden'_id='
        graceProbThreeYearDeathMI '_name='
        graceProbThreeYearDeathMI '_value=' ..
        $graceProbThreeYearDeathMI .. '>";
echo_"<input_type='hidden'_id=' heartPts '_name='
        heartPts '_value=' .. $heartPts .. '>";
echo_"<input_type='hidden'_id=' heartProb '_name='
        heartProb '_value=' .. $heartProb .. '>";
    }
    else_if ($calculator == "STEMI") {
echo_"<input_type='hidden'_id=' s_age '_name='
        s_age '_value=' .. $s_age .. '>";
echo_"<input_type='hidden'_id=' s_anginaEvents '_name='
        s_anginaEvents '_value=' ..
        $s_anginaEvents .. '>";

```

```

    $s_anginaEvents._.' '>;
echo_<"<input_type='hidden' _id='s_sysBloodPress' _
name='s_sysBloodPress' _value=''_.'
    $s_sysBloodPress._.' '>;
echo_<"<input_type='hidden' _id='s_heartRate' _name
='s_heartRate' _value=''_.' $s_heartRate._.'
    '>;
echo_<"<input_type='hidden' _id='s_killipClass' _
name='s_killipClass' _value=''_.'
    $s_killipClass._.' '>;
echo_<"<input_type='hidden' _id='s_weight' _name='
s_weight' _value=''_.' $s_weight._.' '>;
echo_<"<input_type='hidden' _id='s_stSegmentElev' _
name='s_stSegmentElev' _value=''_.'
    $s_stSegmentElev._.' '>;
echo_<"<input_type='hidden' _id='s_timeToTreat' _
name='s_timeToTreat' _value=''_.'
    $s_timeToTreat._.' '>;
echo_<"<input_type='hidden' _id='calculator' _name=
'calculator' _value=''_.' $calculator._.' '>;
echo_<"<input_type='hidden' _id='stemiPts' _name='
stemiPts' _value=''_.' $stemiPts._.' '>;
echo_<"<input_type='hidden' _id='
stemiProbThirtyDays' _name='
stemiProbThirtyDays' _value=''_.'
    $stemiProbThirtyDays._.' '>;
echo_<"<input_type='hidden' _id='stemiProbOneYear'
_name='stemiProbOneYear' _value=''_.'
    $stemiProbOneYear._.' '>;
}
?>
<input_type="hidden" _id="val" _name="val">
</form>
<b>References_for_ Interpretation:</b>
<ul>
<li>PHA, <em>2014_PHA_Clinical_Practice_
Guidelines_For_The_Diagnosis_and_Management
_of_Patients_with_Coronary_Artery_Disease</
em>._Philippines:_Philippine_Heart_
Association,_2014.</li>
<li>"Estimate_of_10-year_risk_for_coronary_heart
_disease_framingham_point_scores." _http://
www.nhlbi.nih.gov/health-pro/guidelines/_
current/_cholesterol-guidelines/quick-desk-
reference-html/10-year-risk-framingham-
table.</li>
<li>C._Esteban._private_interview,_Jan._16_
2016.</li>
</ul>
</div>

```

Listing 15: summaryReportView.php

```

<div class="container">
<div class="row">
<div class="col-sm-3">
<script>
function countChecked(){
var pred1 = document.getElementsByName("
    predictor1 []");
var pred2 = document.getElementsByName("
    predictor2 []");
var ctr1 = 0;
var ctr2 = 0;
for(var i = 0; i < pred1.length; i++){
if(pred1[i].checked)
ctr1++;
}
for(var i = 0; i < pred2.length; i++){
if(pred2[i].checked)
ctr2++;
}
if(ctr1 <= 0 && ctr2 <= 0){
$('#myModal9').modal('show');
return false;
}
else{
return true;
}
}
</script>
<div id="myModal9" class="modal_fade" role="
dialog">
<div class="modal-dialog">
<div class="modal-content">

```

```

<div class="modal-header">
<button type="button" class="close" data-dismiss
="modal">&times;</button>
<h4 class="modal-title"><b>ERROR</b></h4>
</div>
<div class="modal-body">
<p>Choose at least one (1) predictor.</p>
</div>
</div>
</div>
</div>
<form class="form-horizontal_well" role="form"
id="summaryForm" name="summaryForm"
onsubmit="return_countChecked()" method="
post" action="<?php_echo_site_url('report/
summary');?>">
<div class="form-group">
<div id="sideOpt" ng-init="category='one'">
<label class="control-label" for="category">
Category:</label><br>
<select class="form-control" id="category" name=
"category" ng-model="category">
<option value="one">CHD Risk</a></option>
<option value="two">ACS Survival</a></option>
</select>
</div>
</div>
<a></a>
<div class="form-group" ng-show="category=='one'
">
<div id="sideOpt">
<label class="control-label" for="predictor1">
Predictors:</label><br>
<div id="indent">
<div class="checkbox">
<label><input type="checkbox" id="predictor1 []"
name="predictor1 []" value="Age">Age</label>
</div>
<div class="checkbox">
<label><input type="checkbox" id="predictor1 []"
name="predictor1 []" value="Sex">Sex</label>
</div>
<div class="checkbox">
<label><input type="checkbox" id="predictor1 []"
name="predictor1 []" value="TotalCholesterol
">Total Cholesterol</label>
</div>
<div class="checkbox">
<label><input type="checkbox" id="predictor1 []"
name="predictor1 []" value="HDL-Cholesterol"
">HDL-Cholesterol</label>
</div>
<div class="checkbox">
<label><input type="checkbox" id="predictor1 []"
name="predictor1 []" value="
SystolicBloodPressure">Systolic Blood
Pressure</label>
</div>
<div class="checkbox">
<label><input type="checkbox" id="predictor1 []"
name="predictor1 []" value="
DiastolicBloodPressure">Diastolic Blood
Pressure</label>
</div>
<div class="checkbox">
<label><input type="checkbox" id="predictor1 []"
name="predictor1 []" value="Diabetic">
Diabetic</label>
</div>
<div class="checkbox">
<label><input type="checkbox" id="predictor1 []"
name="predictor1 []" value="Smoker">Smoker</
label>
</div>
</div>
</div>
</div>
<div class="form-group" ng-show="category=='two'
">
<div id="sideOpt">
<label class="control-label" for="predictor2">
Predictors:</label><br>
<div id="indent">
<div class="checkbox">
<label><input type="checkbox" id="predictor2 []"
name="predictor2 []" value="Age">Age</label>
</div>

```





```

}
echo "</tr><tr>";
foreach($factors as $factor){
echo "<td><b>". $factor."</b></td><td>";
switch($factor){
case "Age":
if($category == "one")
convertToStat($ageQuery, "Age");
else
convertToStat($ageQuery2, "Age");
break;
case "Sex": convertToStat($sexQuery, "Sex");
break;
case "TotalCholesterol": convertToStat(
$totalCholQuery, "TotalCholesterol"); break
;
case "HDL-Cholesterol": convertToStat(
$hdlCholQuery, "HDLCholesterol"); break;
case "SystolicBloodPressure":
if($category == "one")
convertToStat($sysBPQuery, "SystolicBP");
else
convertToStat($sysBPQuery2, "SystolicBP");
break;
case "DiastolicBloodPressure": convertToStat(
$diaBPQuery, "DiastolicBP"); break;
case "Diabetic":
$rate1 = round((count($diabeticQuery)/count(
$patientQuery))*100, 2);
echo "Yes:_" . count($diabeticQuery) . "_(" .
$rate1 . "%)";
$diff = count($patientQuery)-count(
$diabeticQuery);
$rate2 = round(($diff/count($patientQuery))*100,
2);
echo "<br>No:_" . $diff . "_(" . $rate2 . "%)";
break;
case "Smoker":
$rate1 = round((count($smokerQuery)/count(
$patientQuery))*100, 2);
echo "Yes:_" . count($smokerQuery) . "_(" .
$rate1 . "%)";
$diff = count($patientQuery)-count($smokerQuery)
;
$rate2 = round(($diff/count($patientQuery))*100,
2);
echo "<br>No:_" . $diff . "_(" . $rate2 . "%)";
break;
case "HeartRate": convertToStat($heartRateQuery,
"HeartRate"); break;
case "RiskFactors": convertToStat(
$riskFactorsQuery, "Name"); break;
case "KillipClassification": convertToStat(
$killipClassQuery, "KillipClass"); break;
case "STSegmentDepression": convertToStat(
$segQuery, "STSegmentDepression"); break;
case "SerumCreatinine": convertToStat(
$serumCreatQuery, "SerumCreatinine"); break
;
case "Troponin": convertToStat($troponinQuery, "
Troponin"); break;
case "History": convertToStat($historyQuery, "
History"); break;
case "Stenosis": convertToStat($stenosisQuery, "
Stenosis"); break;
case "Angina": convertToStat($anginaQuery, "
AnginaEvents"); break;
case "ASAUse": convertToStat($aspirinQuery, "
AspirinIntake"); break;
case "Cardiac-arrest-at-hospital-arrival":
convertToStat($cardiacArrestQuery, "
CardiacArrest"); break;
}
}
echo "</td></tr>";
}
echo "</table></div>";
}
else{
echo "<div_class='table-responsive_col-sm-10_col
-sm-offset-1'_id='chartArea'>";
foreach($factors as $factor){
echo "<div_id='chart'>";
switch($factor){
case "Age":
if($category == "one"){
$graphName = "Age_(Total_#:_)" . count($ageQuery)
. ")";
$jsonTable = createGraph($ageQuery3, "RangeName"
);
}
else{
$graphName = "Age_(Total_#:_)" . count($ageQuery2

```



```

echo "<br/>Median:_" . round($median, 2);
}
}

function createGraph($allDetails, $info){
$rows = array();

if(!isset($sarr))
$sarr = array();
if(!isset($detailArray))
$detailArray = array();

foreach($allDetails as $detail){
$detailArray = (array)$detail;
if(!isset($sarr[$detailArray[$info]]))
$sarr[$detailArray[$info]] = 0;

$sarr[$detailArray[$info]] += 1;
}

if($info != "KillipClass" && $info != "Name" &&
    $info != "Age" && $info != "SerumCreatinine"
    && $info != "HeartRate" && $info != "SystolicBP"
    && $info != "DiastolicBP" &&
    $info != "TotalCholesterol" && $info != "HDLCholesterol"){
foreach($sarr as $key => $sarrval){
if($key == "1"){
$key1 = "Yes";
$data[] = "[" . $key1 . ", " . $sarrval . " ]";
}
else if($key == "0"){
$key1 = "No";
$data[] = "[" . $key1 . ", " . $sarrval . " ]";
}
else{
$data[] = "[" . $key . ", " . $sarrval . " ]";
}
}
}
else{
foreach($sarr as $key => $sarrval){
$data[] = "[" . $key . ", " . $sarrval . " ]";
}
}

$data_for_chart = implode("\n", $data);
return $data_for_chart;
}
?>

```

Listing 16: header.php

```

<!DOCTYPE html>

<html ng-app="onlineCalc">
<head>
<title>CHD Calculator</title>
<meta charset="utf-8">
<meta name="viewport" content="width=device-
width, _initial-scale=1">
<base href="<?php_echo_base_url();?>">
<link href="assets/css/bootstrap.css" rel="
stylesheet">
<link href="assets/css/bootstrap-datetimerpicker.
min.css" rel="stylesheet">
<link href="assets/css/myStyle.css" rel="
stylesheet">
<!--<script src="https://ajax.googleapis.com/
ajax/libs/jquery/2.1.3/jquery.min.js"></
script>-->
<script src="assets/js/jquery-2.1.4.min.js"></
script>
<script src="assets/js/angular.min.js"></script>
<script src="assets/js/bootstrap.min.js"></
script>
<script src="assets/js/moment.js"></script>
<script src="assets/js/bootstrap-datetimerpicker.
min.js"></script>
<!--<script src="https://maxcdn.bootstrapcdn.com
/bootstrap/3.3.6/js/bootstrap.min.js"></
script>-->
<script src="assets/js/app.js"></script>
<!--<script src="assets/js/myScript.js"></script
-->

<link rel="shortcut_icon" href="assets/images/
logo.ico">
</head>

```

```

<body>
<div class="container-fluid">
<div class="row">
<div class="col-xs-12_col-sm-3_col-md-2">
<center></center>
</div>
<div class="clearfix_visible-xs"></div>
<div class="col-xs-12_col-sm-9_col-md-10" id="
headerTitle">
<div class="visible-xs">
<center>
<h1>Coronary Heart Disease Calculator</h1>
<h3><small>As suggested in Philippine Heart
Association Guidelines</small></h3>
</center>
</div>
<div class="visible-sm_visible-md_visible-lg">
<h1>Coronary Heart Disease Calculator</h1>
<h3><small>As suggested in Philippine Heart
Association Guidelines</small></h3>
</div>
</div>
</div>
</div>
</div>

<nav class="navbar_navbar-inverse">
<div class="container-fluid">
<div class="navbar-header">
<button type="button" class="navbar-toggle" data
-toggle="collapse" data-target="#myNavbar">
<span class="icon-bar"></span>
<span class="icon-bar"></span>
<span class="icon-bar"></span>
</button>
<!--<div class="navbar-brand"><span class="
glyphicon_glyphicon-heart"></span></div-->
</div>
<div class="collapse_navbar-collapse" id="
myNavbar">
<ul class="nav_navbar-nav">
<li><a href="index.php/home/index">Home</a></li>
<li><a href="index.php/about/index">About CHD</a
></li>
<li><a href="index.php/calculator/about">About
the Calculators</a></li>
<li><a href="index.php/calculator/index">
Calculators</a></li>
<li><a href="index.php/report/index">Summary
Reports</a></li>
</ul>
</div>
</div>
</nav>

```

Listing 17: footer111.php

```

<div class="container">
<div class="row">
<div class="col-xs-12">
<noscript>
<div id="alert-danger">
<strong>Warning!</strong><div class="visible-xs">
<br></div> JavaScript is disabled in your
browser. This website requires JavaScript
in order to function properly.
</div>
</noscript>
</div>
</div>
</div>

<br>
<footer class="container-fluid">
<hr>
<div class="col-sm-9">
<h5>Developed by <b>Evangeline Louise Carandang
</b> &#169; 2016</h5>
<h5><small>University of the Philippines Manila<
br>
College of Arts and Sciences<br>
Department of Physical Sciences and Mathematics<
br>
Mathematics and Computing Sciences Unit</small
></h5><br>
</div>
<div class="col-sm-3" id="relLinksContainer">
<h5>Related Links:<
br>
<ul id="relLinks">

```

```

<li><a href="http://philheart.org">Philippine
Heart Association</a><br></li>
<li><a href="https://www.framinghamheartstudy.
org/index.php">Framingham Risk Score</a><br>
</li>
<li><a href="http://www.timi.org/">TIMI Risk
Score</a><br></li>
<li><a href="http://www.outcomes-umassmed.org/
GRACE/default.aspx">GRACE Risk Model</a><br>
</li>
<li><a href="http://www.heartscore.nl/">HEART
Score</a></li>
</ul>
</h5>
</div>
</footer>
</body>
</html>

```

## Listing 18: routes.php

```

<?php
defined('BASEPATH') OR exit('No direct script
access allowed');

$route['default_controller'] = 'home';
$route['404_override'] = 'my404';
$route['translate_uri_dashes'] = FALSE;

```

## Listing 19: app.php

```

(function() {
var app = angular.module('onlineCalc', []);
app.controller('TabController1', function() {
this.tab = 1;

this.setTab = function(tab) {
this.tab = tab;
};

this.isSet = function(tab) {
return (this.tab === tab);
};
});
})();

```

## Listing 20: myStyle.php

```

/*-----header.php
-----*/

#loading {
width: 100%;
height: 100%;
position: fixed;
display: block;
opacity: 0.5;
background-color: #fff;
z-index: 99;
text-align: center;
vertical-align: middle;
}

#loading-image {
position: relative;
top: 50%;
transform: translateY(-50%);
z-index: 100;
}

#logo {
width: 100px;
height: 100px;
margin-top: 10px;
margin-left: 30px;
}

#headerTitle {
margin-top: 15px;
}

#headerTitle h1 {
margin-bottom: 0;
}

```

```

#headerTitle h3 {
margin-top: 0;
}

```

```

hr {
background-color: black;
}

```

```

#alert-danger {
padding: 15px;
margin-bottom: 20px;
border: 1px solid transparent;
border-radius: 4px;
color: #a94442;
background-color: #f2dede;
border-color: #ebccd1;
}

```

```

#carImage {
width: 1200px;
height: 350px;
}

```

```

#welcome {
text-align: justify;
}

```

```

#miniHeader {
text-align: center;
color: #800000;
}

```

```

#caption {
background-color: rgba(0, 0, 0, 0.7);
text-align: center;
}

```

```

/*-----footer.php
-----*/

```

```

#relLinksContainer {
border-left: 1px solid rgba(80, 80, 80, 0.2);
}

```

```

#relLinks a{
text-decoration: none;
cursor: pointer;
}

```

```

/*-----error_*.php
-----*/

```

```

#error404, #errorphp {
height: 300px;
line-height: 300px;
text-align: center;
background-color: #87CEEB;
}

```

```

#error404 span, #errorphp span {
display: inline-block;
vertical-align: middle;
line-height: normal;
}

```

```

/*-----aboutView.php
-----*/

```

```

#navSide1 li {
border-bottom: 1px solid rgba(80, 80, 80, 0.12);
}

```

```

#navSide1 li:last-child {
border-bottom: none;
}

```

```

#myNavbar ul li:last-child {
border-right: 1px solid rgba(80, 80, 80, 0.12);
}

```

```

#subheader {
color: #800000;
font-weight: strong;
}

```

```

/*-----calculatorView.php
-----*/

```

```

#subOpt .panel-body{
padding: 5px;
}

```

```

#subOpt h3 {
padding-bottom: 0;
}

#subOpt hr {
padding: 0;
margin-top: 0;
}

#accordion .panel-heading a {
text-decoration: none;
color: black;
}

#accordion .panel-heading a: hover {
color: #800000;
}

input [type="submit"], input [type="reset"] {
width: 90px;
padding: 8px;
}

input [type="submit"] {
background-color: #b30000;
color: white;
}

input [type="submit"]: hover {
background-color: #800000;
color: white;
}

input [type="number"] {
text-align: right;
text-indent: 5;
}

input [type=number]::-webkit-inner-spin-button,
input [type=number]::-webkit-outer-spin-button {
opacity: 1;
}

#framingham, #timi, #grace, #heart {
display: none;
}

#calcContainer {
background-color: #D3D3D3;
}

label [for=g-diureticUsage], label [for=
g-renalFailure] {
color: #808080;
}

.modal-dialog > .modal-content {
border-radius: 0;
}

.glyphicon.glyphicon-info-sign {
cursor: pointer;
color: #4169e1;
}

.glyphicon.glyphicon-info-sign: hover {
color: #191970;
}

#firstCol {
width: 200px;
}

#secondCol {
text-align: justify;
}

/*-----resultView.php-----*/

#tableHeader {
background-color: #D3D3D3;
}

#noteInput {
min-width: 100%;
max-width: 100%;
border: 1px solid #d3d3d3;
min-height: 100px;
max-height: 100px;
}

#addButton {
background-color: #b30000;
border: 1px solid #b30000;
color: white;
}

#addButton: hover {
background-color: #800000;
border-color: #adadad;
}

.btn.btn-primary {
border-radius: 0;
border: 1px solid #337ab7;
}

#normal {
background-color: #d6e9c6;
text-align: justify;
}

#warning {
background-color: #faebcc;
text-align: justify;
}

#danger {
background-color: #ebccd1;
text-align: justify;
}

/*-----summaryReportView.
php-----*/

#indent {
padding-left: 20px;
}

#sideOpt {
padding-left: 20px;
padding-right: 20px;
}

#chart {
border: 1px solid black;
}

/*#chartArea {
overflow: auto;
height: 580px;
}*/

input [type="text"], .input-group-addon {
border-radius: 0;
}

/*-----general-----*/

.navbar, .panel, input [type="number"], input [type
="button"], input [type="submit"], input [type
="reset"], .nav-pills > li > a, .well {
border-radius: 0;
}

select.form-control, input [type="checkbox"].form
-control {
border-radius: 0;
}

.nav-pills > li {
margin-top: 0;
}

.btn {
border: 1px solid #d3d3d3;
}

input [type="submit"] {
border: 1px solid #b30000;
}

div > p {
text-align: justify;
}

```

Listing 21: error\_404.php

```

<?php
/*defined('BASEPATH') OR exit('No direct script
access allowed');

echo "\nERROR: ",
$heading,
"\n\n",
$message,
"\n\n";*/
?>

<div class="container_text-center">
<div id="error404">
<span>
<h3><b>Error 404!</b></h3>
<h4>The page you are looking for does not exist
.</h4>
</span>
</div>
</div>

```

Listing 22: error\_noInout.php

```

<div class="container_text-center">
<div id="error404">
<span>
<h3><b>No results yet!</b></h3>
<h4>Please input values in the calculator first
.</h4>
</span>
</div>
</div>

```

Listing 23: error\_noPdf.php

```

<div class="container_text-center">
<div id="error404">
<span>
<h3><b>No PDF generated!</b></h3>
<h4>Please use a calculator first to view and
export the results.</h4>
</span>
</div>
</div>

```

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