SPAP Plan for Our Project:

1. Goal

Determine the features that can improve the chance of survival for patients with previous heart failure.

2. Dependant variables
Death Event: if the patient survived during the follow-up period. (0: deceased, 1: survived)

3. Specific Questions

- **Q1:** Do the demographic features improve the chance of survival of heart failure patients?
- **Q2:** Do the clinical features improve the chance of survival of heart failure patients?

4. Independent variables

Independent Variables for Q1:
Age, Sex

Independent Variables for Q2:
Anaemia, High blood pressure, Creatinine Phosphokinase (CPK), Diabetes, Ejection Fraction, Platelets, Serum Creatinine, Serum Sodium, Smoking

Other Independent Variable:
Time

5. Specific analyses and graphs

Independent Variables for Q1:
Age: histogram, Sex: bar chart/pie chart

Independent Variables for Q2:
Anaemia, High blood pressure, Diabetes, Smoking: bar chart/pie chart
CPK, Ejection Fraction, Platelets, Serum Creatinine, Serum Sodium: histogram

Other Independent Variable:
Time: histogram

Key Performance Indicators (KPI's)

The KPI's for our project are as follows -

Classification	**KPI's**
Outcome (Dependent Variable)	Death Event
Clinical Features (Independent Variables)	Anaemia, High blood pressure, Creatinine Phosphokinase (CPK), Diabetes, Ejection Fraction, Platelets, Serum Creatinine, Serum Sodium, Smoking

Demographic Features (Independent Variables)	Age, Sex
Time (Independent Variable)	Time

1. **What is your desired outcome?**
To determine the features, both clinical and demographical, that can improve the chance of survival for patients with previous heart failure.

2. **Why does this outcome matter?**
This will help us understand the factors that affect the chance of survival for patients with previous heart failure, so that we can learn how to improve their survival chance clinically.

3. **How are you going to measure progress?**
Progress will be measured by models using different features to predict the survival rate of the heart failure patient population.

4. **How can you influence the outcome?**
By altering the age and sex of patients and by altering their clinical features to see if and how the predicted survival rate changes.

5. **Who is responsible for the outcome?**
We will go through the SPAP plan by measuring the effects of each independent variable listed above on the dependent variable. The outcome may be helpful for clinicians and medical scientists to tackle heart failure recovery.

6. **How will you know you have achieved the outcome?**
If we can determine the factors responsible for a patient's survival rate, we can achieve the outcome.

7. **How often will you review progress towards the outcome?**
The progress can be reviewed using the "Time" variable in our dataset, i.e. patient's follow-up period.

Hypotheses:

1. **Hypotheses to Specific Question Q1:**

Age: Younger patients have a higher chance to survive than elder patients, holding other features constant.

Sex: Male patients have a higher chance of survival than female patients, holding other features constant.

2. **Hypotheses to Specific Question Q2:**

Anaemia: If the red blood cells do not decrease, the patient has higher chance of survival compared to patients with decreased blood cells, holding other features constant.

High blood pressure: Patients without high blood pressure have a higher chance of survival compared to patients with high blood pressure, holding other features constant.

Creatinine Phosphokinase (CPK): Patients with lower level of CPK have a higher chance of survival, holding other features constant.

Diabetes: Patients without diabetes have a higher chance of survival than patients having diabetes, holding other features constant.

Ejection Fraction: Patients with lower Ejection Fraction percent will have a higher chance of survival, holding other features constant.

Platelets: Patients with higher platelets count have a higher chance of survival, holding other features constant.

Serum Creatinine: Patients with a lower level of Serum Creatinine in blood have a higher chance of survival, holding other features constant.

Serum sodium: Patients with normal sodium range (135-145 mEq/L) have a higher chance of survival, holding other features constant.

Smoking: Patients who do not smoke have a higher chance of survival than non-smoking patients, holding other features constant.