CLAIMS

1. A method for providing a treatment recommendation to a physician for treating a patient, the method comprising:

determining, from a processor in communication with a patient data repository, a first treatment recommendation based on a combination of selected patient demographics from the patient data repository applicable to the patient and operational parameters of a plurality of ventricular assist devices (VADs) suitable for treating the patient, the first treatment recommendation having a first survival rate and comprising ~~the~~ use of a first VAD;

using the first VAD to treat the patient;

obtaining, from a controller, a first signal;

determining, by the processor, a second treatment recommendation based on the first signal and the first treatment recommendation, the second treatment recommendation having a second survival rate; and

providing, by the processor, the second treatment recommendation to the physician if the second survival rate is higher than the first survival rate, wherein the second treatment recommendation comprises continuing use of the first VAD from the first treatment recommendation in addition to a second VAD.

2. The method of claim 1, further comprising

informing the physician to continue using the first VAD to treat the patient if the second survival rate is not higher than the first survival rate.

3. The method of ~~any of the preceding claims~~claim 1, wherein each VAD comprises at least one sensor for providing the first signal to the controller.

4. The method of ~~any of the preceding claims~~claim 1, wherein the first signal comprises information concerning ~~the~~ a patient's vitals.

5. The method of claim 1~~any of the preceding claims~~, wherein the first signal comprises at least one of: Mean Arterial Pressure (MAP), Left Ventricular Pressure (LVP), Left Ventricular End-Diastolic Pressure (LVEDP), Pulmonary Arterial Wedge Pressure (PAWP), Pulmonary Capillary Wedge Pressure (PCWP), Pulmonary Artery Occlusion Pressure (PAOP).

6. The method of claim 1~~any of the preceding claims~~, further comprising treating the patient with the second treatment recommendation.

7. The method of claim 1~~any of the preceding claims~~, wherein the VAD comprises at least one of: an Impella® pump, an Extracorporeal Membrane Oxygenation (ECMO) pump, a balloon pump, and a Swan-Ganz catheter.

8. The method of claim 7, wherein the Impella® pump comprises any one of: Impella 2.5® pump, an Impella 5.0® pump, an Impella CP® pump, an Impella RP® pump and an Impella LD® pump.

~~9. The method of any of the preceding claims, wherein the second treatment recommendation comprises continuing use of the first VAD from the first treatment recommendation in addition to a second VAD.~~

~~10. The method of any claims 1-8, wherein the second treatment recommendation comprises the use of at least one of the following for treating the patient: the first VAD, a second VAD, and no VAD.~~

~~11.~~9. The method of claim 1~~any of the preceding claims~~, wherein the patient is in cardiogenic shock.

~~12.~~10. The method of claim 1~~any of the preceding claims~~, wherein the first treatment recommendation is determined by a prediction model executed by the processor.

~~13.~~11. The method of claim ~~12~~10, wherein the prediction model is based on a machine learning algorithm comprising any one of: a bagging and random forest algorithm, a logistic regression algorithm, a classification decision tree algorithm, a deep learning algorithm, a naïve Bayes algorithm, and a support vector machines algorithm .

~~14.~~12. The method of claim 1~~any of the preceding claims~~, wherein the ~~types of~~selected patient demographics comprise: gender, age, region, duration of support, indication for use and insertion site.

~~15.~~13. The method of claim 1~~any of the preceding claims~~, further comprising:

displaying the survival rate for each available VAD; and

identifying the VAD with the highest survival rate.

~~16.~~14. The method of claim 1~~any of the preceding claims~~, further comprising:

displaying the combination of the selected patient demographics used for determining the survival rate using a branched-tree representation.

~~17.~~15. The method of claim 1~~any of the preceding claims~~, wherein ~~the~~ each survival rate comprises a probability of survival of a patient belonging to the combination of selected patient demographics when treated with a VAD.

~~18.~~16. The method of claim 1~~any of the preceding claims~~, wherein the patient data repository comprises an Acute Myocardial Infarction Cardiogenic Shock (AMICS) database or a High-Risk Percutaneous Coronary Interventions (High-Risk PCI) database.

~~19.~~17. A method for providing a treatment recommendation to a physician for treating a patient, the method comprising:

obtaining, by a processor, patient data from a patient data repository, the data stored in the repository according to patient demographics;

determining, by the processor, at least one ventricular assist device (VAD) suitable for treating patient;

determining, by the processor using a prediction model, a survival rate for each suitable VAD based on data from the patient data repository for a combination of selected patient demographics applicable to the patient;

providing, to a controller, a recommended first VAD associated with the highest survival rate; and

using, by the physician, the recommended first VAD to treat the patient wherein the patient data repository comprises an Acute Myocardial Infarction Cardiogenic Shock

(AMICS) database or a High-Risk Percutaneous Coronary Interventions (High-Risk PCI) database.

~~20.~~18. The method of claim ~~19~~17, further comprising:

providing the physician with the survival rate for each suitable VAD for all combinations of the selected patient demographics applicable to the patient.

~~21.~~19. The method of claim 17~~any of claims 19-20~~, further comprising:

providing the physician with a survival rate for not using a VAD for each combination of the selected patient demographics applicable to the patient.

~~22.~~20. The method of claim 17~~any of claims 19-21~~, wherein the first VAD comprises at least one of: an Impella® pump, an Extracorporeal Membrane Oxygenation (ECMO) pump, a balloon pump, and a Swan-Ganz catheter.

~~23.~~21. The method of claim ~~22~~20, wherein the Impella® pump comprises any one of: Impella 2.5® pump, an Impella 5.0® pump, an Impella CP® pump, an Impella RP® pump and an Impella LD® pump.

~~24.~~22. The method of claim 17~~any of claims 19-23~~, wherein the patient demographics comprise: age, gender, region, year of implantation, support device, duration of support, insertion site and ejection fraction.

~~25.~~23. The method of claim 17~~any of claims 19-24~~, wherein the prediction model uses a machine learning algorithm to determine ~~the~~ each survival rate.

~~26.~~24. The method of ~~any of claims 19-25~~claim 23, wherein the machine learning algorithm comprises any one of: a bagging and random forest algorithm, a logistic regression algorithm, a classification decision tree algorithm, a deep learning algorithm, a naïve Bayes algorithm, and a support vector machines algorithm.

~~27.~~25. The method of claim 17~~any of claims 19-26~~, wherein the combination of the selected patient demographics follows a tree-model.

~~28.~~26. The method of claim ~~27~~25, wherein the tree-model has an order of any one of: two, three, four, five and six.

~~29.~~27. The method of claim 17~~any of claims 19-28~~, further comprising

treating the patient using the first treatment recommendation.

~~30.~~28. The method of claim 17~~any of claims 19-29~~, further comprising:

displaying the survival rate for each available VAD; and

identifying the VAD with the highest survival rate.

~~31.~~29. The method of claim 17~~any of claims 19-30~~, further comprising:

displaying the combination of the selected patient demographics used for determining the survival rate using a branched-tree representation.

30. The method of claim 17~~any of claims 19-31~~, wherein the survival rate comprises a probability of survival of a patient belonging to the combination of selected patient demographics when treated with a VAD.

31. A method for providing a treatment recommendation to a physician for treating a patient, the method comprising:

determining, from a processor in communication with a patient data repository, a first treatment recommendation based on a combination of selected patient demographics from the patient data repository applicable to the patient and operational parameters of a plurality of ventricular assist devices (VADs) suitable for treating the patient, the first treatment recommendation having a first survival rate and comprising use of a first VAD;

using the first VAD to treat the patient;

obtaining, from a controller, a first signal;

determining, by the processor, a second treatment recommendation based on the first signal and the first treatment recommendation, the second treatment recommendation having a second survival rate; and

providing, by the processor, the second treatment recommendation to the physician if the second survival rate is higher than the first survival rate, wherein the patient data repository comprises an Acute Myocardial Infarction Cardiogenic Shock (AMICS) database or a High-Risk Percutaneous Coronary Interventions (High-Risk PCI) database.

32. The method of claim 31, wherein the second treatment recommendation comprises the use of at least one of the following for treating the patient: the first VAD, a second VAD, and no VAD.

33. The method of claim 31, wherein the second treatment recommendation comprises continuing use of the first VAD from the first treatment recommendation in addition to a second VAD.

~~32. The method of any of claims 19-32, wherein the patient data repository comprises a Acute Myocardial Infarction Cardiogenic Shock (AMICS) database or a High-Risk Percutaneous Coronary Interventions (High-Risk PCI) database.~~

~~33. A system for providing a treatment recommendation to a physician for treating a patient, the system comprising:~~

~~at least one ventricular assist device (VAD) comprising a sensor;~~

~~a processor in communication with the VAD, the processor configured to be in communication with an Acute Myocardial Infarction Cardiogenic Shock (AMICS) repository or a High-Risk Percutaneous Coronary Interventions (High-Risk PCI) repository; and~~

~~a controller in communication with the VAD and the processor, the controller configured to perform the method according to any of claims 1-33.~~

~~34. A system for providing a treatment recommendation to a physician for treating a patient, the system comprising:~~

~~a processor; and~~

~~a controller configured to perform the method according to any of claims 1-33.~~

~~35. A computer program comprising computer executable instructions, which, when executed by a computing apparatus comprising a processor and a controller, causes the computing apparatus to perform a method according to any of claims 1-33.~~

~~36. A non-transitory computer-readable storage medium having stored thereon computer-readable code which, when executed by a computing apparatus comprising a processor and a controller, causes the computing apparatus to perform a method according to any of claims 1-33.~~