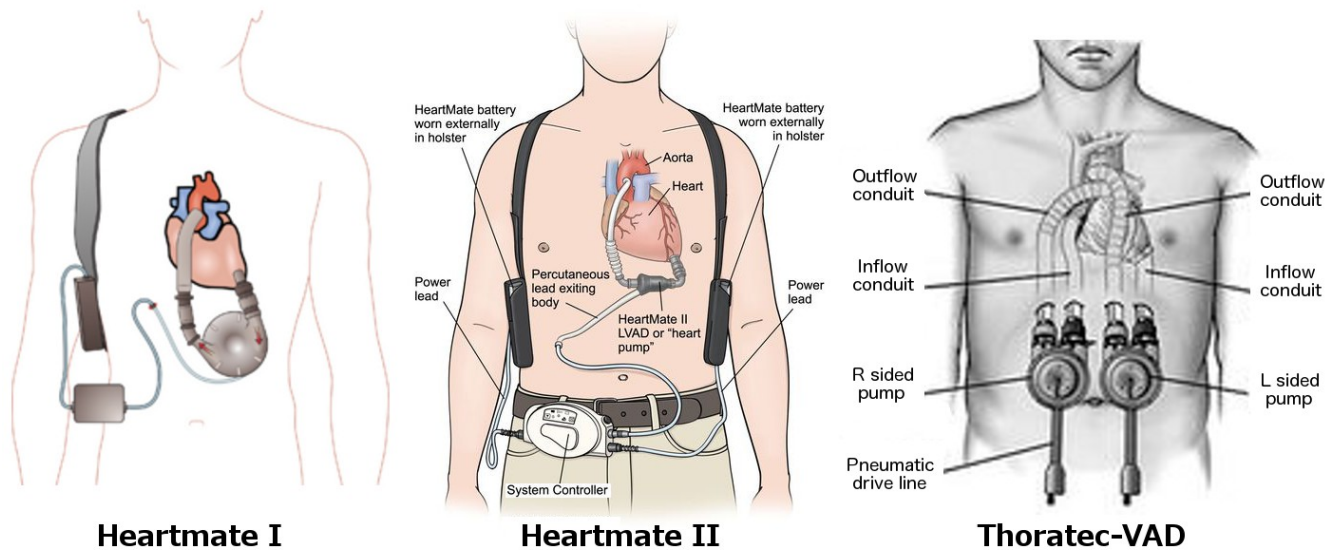


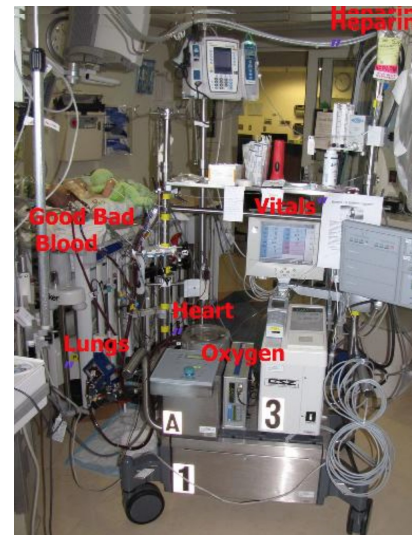
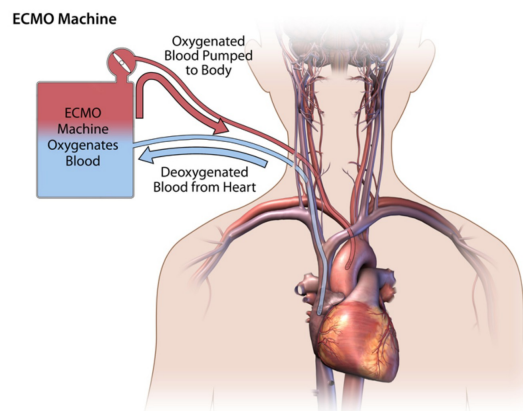
## Left Ventricular Assist Device (LVAD)

LVAD uses an external pump outside the body to bypass the left ventricle. The blood is drained from the apex of the left ventricle via an intake cannula and ejected into the aorta via an output cannula. BiVAD bypasses both ventricles. The development of LVAD began in the 1960s as a bridge to cardiac transplant. It has evolved into a “destination therapy,” meaning a permanent therapy rather than a transitional stage until another therapy. The indication for LVAD candidates is New York Heart Association class 4 heart failure, ejection fraction <25%, VO2 max (the maximum rate of oxygen consumption) less than 15, among other criteria. All VADs are preload dependent, but ECG independent, unlike ICDs. VADs have 3 major variables: speed, flow, and power.



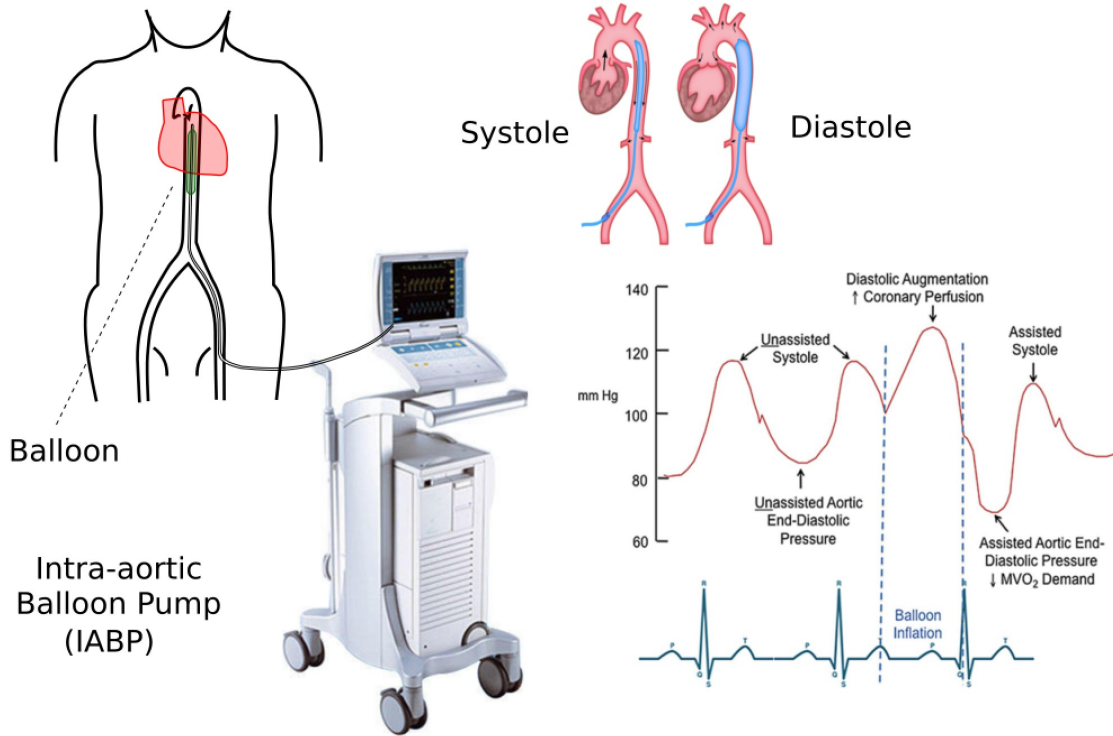
## Extracorporeal Membrane Oxygenation (ECMO)

Extracorporeal membrane oxygenation (ECMO) is an extracorporeal technique of providing prolonged cardiac and respiratory support to persons whose heart and lungs are unable to provide an adequate amount of gas exchange or perfusion to sustain life. The technology for ECMO is largely derived from cardiopulmonary bypass, which provides shorter-term support. This intervention has mostly been used on children, but it is seeing more use in adults with cardiac and respiratory failure. ECMO works by removing blood from the person's body and artificially removing the carbon dioxide and oxygenating red blood cells. Generally, it is used either post-cardiopulmonary bypass or in late stage treatment of a person with profound heart and/or lung failure, although it is now seeing use as a treatment for cardiac arrest in certain centers, allowing treatment of the underlying cause of arrest while circulation and oxygenation are supported.



## Intra-aortic Balloon Pump (IABP)

The intra-aortic balloon pump (IABP) stabilizes a patient in the hospital who suffers from acute myocardial infarction (AMI), severe congestive heart failure (CHF), or acute mitral valve regurgitation. It is only used for a short period of time (hours to days), before a long-term treatment will likely be needed, such as valve surgery or the insertion of a left ventricular assist device (LVAD). The IABP increases myocardial oxygen perfusion while at the same time increasing cardiac output and peripheral blood flows. The IABP consists of a cylindrical polyethylene balloon that sits in the aorta, approximately 2 cm from the left subclavian artery and counterpulsates. That is, it actively deflates in systole, increasing forward blood flow by reducing afterload through a vacuum effect. It actively inflates in diastole, increasing blood flow to the coronary arteries via retrograde flow. These actions combine to decrease myocardial oxygen demand and increase myocardial oxygen supply



## Impella® (Abiomed, Danvers, Massachusetts)

The Impella heart pump is an intravascular microaxial blood pump that delivers up to 5.0 l/min of forward flow blood from the left ventricle to the aorta. It can be inserted into the left ventricle via femoral cut down or through the axillary artery, and goes through the ascending aorta, across the valve and into the left ventricle.

