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The AbioCor Artificial Heart

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The human heart is the equivalent of a car engine; it keeps everything running. In a day, your heart pumps approximately 2,000 gallons of blood. Like any engine, if the heart is not well taken care of it can break down and pump less efficiently. This condition is called heart failure. In the United States, heart failure is associated with an annual mortality of 10% and is the leading cause of hospitalized people over the age of 65.

Unlike a car engine, the procedure to replace a problematic human heart is not a guaranteed success. Finding a donor heart is very difficult because it must come from a person that recently died or is on life support, which is different from other organs such as kidneys. Timing is also very important, because there is no good way to keep the donor heart alive for long periods of time.

Fortunately, there have been advances in medical technology to meet the growing demand for replacement hearts. The AbioCor artificial heart is the latest development in this cutting edge technology. The AbioCor is the first completely self-contained total artificial heart. It is designed to sustain the body's circulatory system and to extend the lives of patients who would otherwise die of heart failure. Its unique design allows it to be totally implanted within the body. Unlike past artificial hearts, patients are not connected to a large, air-pumping console nor do they have wires or tubes piercing their skin. The AbioCor is designed so that a patient can remain mobile and continue a productive lifestyle.

Equipped with an internal motor, the AbioCor is able to move blood through the lungs and to the rest of the body, simulating the rhythm of a heartbeat. The AbioCor consists of an internal thoracic unit, an internal rechargeable battery, an internal miniaturized electronics package and an external battery pack. The implantable electronics package monitors and controls the pumping speed of the heart based on the physiologic needs of the patient. With a successful surgery, the AbioCor artificial heart can allow a patient to live an additional six months to two years.

During our presentation, we will give a brief overview of heart transplants and the growing demand for the surgery. Then, we will give a detailed explanation of how the AbioCor heart was developed and how it works. We will focus the majority of the presentation on the electrical components of the AbioCor heart including the energy transfer system which involves magnetic forces. Additionally, we will go over the surgical procedure's electrical components and the success and failures of past surgeries. Finally, we will conclude with a discussion of the future prospects for the AbioCor heart and possible improvements in the electrical components of next generation artificial hearts.