**ACHA 2023 Research Grant Award**

**Providers Involved:** Christopher Broda, MD, faculty member at the Adult Congenital Heart Disease Program at Texas Children's Hospital/Baylor College of Medicine in Houston, Texas. Dr. Broda together with his Co-Investigators Yaxin Wang, PhD, and Katharine Fraser, MPhys, PhD.

**Title:** ***In Silico Evaluation of a Dual-Impeller Single-Drive Fontan Circulation Assist Device***

Fontan Circulation is the desired treatment for all patients born with single-ventricle lesions, in which blood returns to the lungs without the support from the heart. Though lifesaving, this alteration in blood flow and heart physiology comes at a cost and negatively affects many of the body's organ systems over time. The body's organ systems gradually fail, and although patients require symptom control with medicines and hospitalization, they eventually succumb to premature death. The majority of patients with Fontan circulation survive childhood but endure a failing Fontan circulation in early or mid-adulthood. Currently, patients with Fontan circulation are the largest and most rapidly growing subgroup of adult congenital heart disease patients referred for transplant assessment. The only definitive therapy for patients is heart transplantation, but even this procedure comes with significant limitations. Addressing the right-sided heart failure, an intrinsic limitation of Fontan circulation, is a significant unmet need because this could reverse or prevent many forms of a failing Fontan circulation.

A device is needed to adapt blood flow and other parameters in the Fontan circulation to that of a normal circulation physiology. Our group is currently developing an innovative Fontan circulation Assist Device (FAD), which can be used on a long-term basis to improve Fontan circulation physiology, thereby minimizing complications and prolonging patients' lives. The focus of this grant is **completing the computational modeling of the device**. While our preliminary data shows the device has theoretical benefit, we need to "fit" the device in patient relevant scenarios. In this project, we will extract patient anatomy and virtually test the FAD which can help us identify potential benefits and potential issues.

Others have attempted similar projects; however, our core group includes the necessary disciplines of engineering and cardiology, and we are building on proven concepts to speed a solution to patients in need. Our researchers have a deep knowledge of experimental mechanical circulatory support devices and Fontan circulation. Few, if any, facilities in North America are as equipped as ours with resources and know-how to bring promising mechanical circulatory support concepts to the bedside of sick patients.