**VVCR Outcomes Study Abstract**

The focus of the project is a disease of the heart and lungs named Pulmonary Hypertension (PH). More specifically, this research initiative targets PH amongst a pediatric population. Strictly speaking, PH is a microvascular disease that induces a high resistance to blood flow in the pulmonary circulation. The fine blood vessels in the pulmonary circulation narrow, yielding increased blood pressure. The right side of the heart, which pushes blood to the lungs, cannot cope with this state, which eventually leads to death in the majority of cases. The disease most commonly originates in children as a result of genetic heritage, classified as idiopathic, or along with congenital heart defects, classified as associated. PH is a fatal disease that progressively deteriorates individuals’ lives and remains with no cure.

In order to diagnose the disease, a physician will utilize a variety of non-invasive measurements such as echocardiography, electrocardiograms, x-rays, and light exercise tests. The clinical tools mentioned above are instrumental in the diagnosis, however, cardiac catheterization, an invasive tool, remains the gold standard in the identification of PH. Catheterization may take place under anesthesia, which poses an undesired risk, particularly in pediatric patients. Furthermore, the current standard of care involves a metric named pulmonary vascular resistance (PVR) that is derived from catheterization. This measurement approximates the resistance to flow in the main pulmonary artery. While PVR provides insightful information about the mechanical state of the heart, and subsequently the progression of the disease, it does not adequately capture the dynamic nature of heart acting as a mechanical pump.

Vascular ventricular coupling ratio is a metric that has been around the cardiovascular research community for over 30 years, yet it has not been integrated into standard clinical care. VVCR originated as a measurement that takes volumetric and pressure measurement to compare the distensibility of the walls of the heart to the walls of the pulmonary vasculature. Other research groups have conducted experiments on canine where the main pulmonary artery was occluded, and a predictable VVCR was obtained. Thus, VVCR allows physicians to better evaluate the current state of the heart compared with a hypothetical scenario of heart failure, where the right ventricle can no longer push blood into the pulmonary vasculature due to increased resistance.

In this project, we conduct an observational retrospective clinical study target at the exploration of a new metric called vascular ventricular coupling ratio (VVCR). The project will involve a statistical analysis of longitudinal data involving a variety of metrics derived from standard of care such as blood pressure, blood flow, resistance. These metrics will be compared with our calculated VVCR. Finally, we plan on evaluating what metrics can be used as the most useful predictors to hard outcomes such as death, hospitalization, or lung transplantation.