



Monitoring Cardiac Health Using a Laser Doppler Approach to Measure Pulse Wave Velocity

Design Excellence Award Executive Summary

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To Whom It May Concern:

Pulse wave velocity is a commonly used quantity for measuring arterial stiffness, which is often a signifier of cardiovascular health. Many diseases and ailments such as hypertension, chronic kidney disease, Kawasaki disease, and atherosclerosis can be diagnosed through the measurement of arterial stiffness among other variables.

In terms of competing designs, there are none that measure pulse wave velocity as simplistically as our project since most other instruments used are much more complicated and bulky. One example is the VICORDER® Vascular Complete Model. Though it is able to perform many different diagnostic tests, it requires a neck and thigh cuff. With some minor discomfort, adults can handle this. However, children can become distraught due to having these cuffs on. The other significant competition that arises is the ShygmCor system, which uses a cuff around the femoral artery (thigh) and a tonometer to capture carotid artery information. This system requires a rather long distance to be measured between the carotid and femoral arteries. While the longer length can give better results because of the added separation in time between the waveforms, this is counteracted by the fact that consistent measurements can be hard to obtain between the patients and the individuals administering the test itself. Our project begins to alleviate this issue by creating a standardized method to choose locations for the two probes used over a much shorter and easier to measure distance that will help create more consistency between measurements. In the creation of our design, we conducted literature searches to identify optimal probe placements, obtained data through clinical testing, and compared various analytic methods for interpreting the data.

This design will provide a more simple and standardized way to measure pulse wave velocity and characterize arterial stiffness. This method will allow for early detection of cardiac abnormalities in various health conditions including hypertension, chronic kidney disease, and obesity, as well as accurately demonstrate if a patient has recovered or needs further treatment. Additionally, this design will decrease health care expenditures by improving efficiency of doctor visits for all patients.

Sincerely,

The Pulse Wave Velocity Using Laser Doppler Design Team