MAJOR EQUIPMENT: Baylor College of Medicine/Texas Children's Hospital

NIHem and Echocardiography Machines

Available research equipment includes the NIHem hemodynamic workstation (Cardiovascular Engineering Inc, Norwood MA USA) and the Philips IE33 echocardiography system (Philips Healthcare, the Netherlands). NIHem hemodynamic workstation has been used to study arterial hemodynamics and brachial reactivity in several peer-reviewed manuscripts. The system uses a customized micromanometer and blood pressure cuff to integrate pulse wave analysis with blood pressure. The system then adds echo- and Doppler echo-derived flow data to the pulse wave analysis for pressure-flow data across the cardiac cycle. Pressure-flow data is then able to precisely describe pulsatile and steady state arterial load characteristics with a minimum of physiologic assumptions. Tonometry testing using the NIHem system has been performed well over 12,000 times without incident. In multi-center, multiple operator studies, the key hemodynamic variables assessed in this proposed project had inter-observer and intra-observer correlation coefficients of 0.91-0.96 ($p<0.001$ for all). The NIHem workstation is located on a rolling cart in proximity to the PI's office. It is fully portable as the entire system is the size of a desktop computer.

The Cardiovascular Clinical Research Core (CCRC) owns 1 Phillips IE33 and 1 GE Vivid E9 IE33 Echocardiography machines with a full array of probes to optimize imaging in normal and excess weight adolescents. These machines capture the same views of the left ventricular outflow tract required for this study between 40 and 80 times per day for clinical purposes. Required images for flow analysis will be primarily stored by the NIHem workstation. In addition all acquired images are backed up onto password protected and encrypted cardiology research servers. There are 3 dedicated echocardiographic workstations in the CCRC for off-line image processing if needed. Echocardiography machines are portable on wheels and all are in close proximity to the location of the research visits.

Endo PAT 2000 and SphygmoCor

Additional available research equipment include the Endo PAT 2000. The Endo Pat 2000 is a non-invasive, diagnostic aid that helps in the detection of coronary artery endothelial dysfunction (positive or negative) and arterial stiffness using a reactive hyperemia procedure and providing an Augmentation Index (AI). The system includes a main control unit, finger probes, tubing and software that works with a standard PC or laptop. Multiple studies have shown the system to be safe and effective. The Endo PAT 2000 is very portable and will be stored in the CCRC. A SphygmoCor will also be available. Similar to the Endo PAT 2000, the SphygmoCor is also a non-invasive assessment of the measures of arterial stiffness, autonomic function, and central blood pressures (also known as pulse wave velocity). The average of 3 measurements of the distance between the two recording sites is obtained (from the carotid pulse above the sternal notch to the femoral artery pulse) and entered into the software. A high-fidelity tonometer (pressure sensor) is placed on the carotid artery to obtain the 'proximal' pressure waveform and then on the femoral pulse to obtain the 'distal' waveform. The device calculates PWV as the difference in the carotid-to-distal path length divided by the difference in R-wave-to-waveform times (Δdistance/Δtime, m/sec). The SphygmoCor is very portable and will be stored in the CCRC.