Quality Control

All studies will be performed in the UW Atherosclerosis Imaging Research Program Laboratory under the supervision of Dr. James Stein. Dr. Stein is an expert in non-invasive cardiac imaging and is certified by the National Board of Echocardiography (NE).in Comprehensive Adult Echocardiography. Dr. Stein was Chairman of the American Society of Echocardiography Carotid IMT Task Force and was lead author on the American Society of Echocardiography Consensus Statement "Use of Carotid Ultrasound to Identify Subclinical Vascular Disease and Evaluate Cardiovascular Disease Risk."[1] He was co-author of the American Society of Echocardiography's "Recommendations for Use of Echocardiography in Clinical Trials."[2] All imaging is performed by dedicated cardiac, medical, or vascular reseach technologists under Dr. Stein's supervision. Images are over read by Dr. Stein or another cardiologist certified by the NBE.

All echocardiographic procedures will be performed in accordance with the ASE Consensus Statements on the use of echocardiography in clinical trials as well as statements on chamber quantification (1,2) For echocardiographic measurements, the first 25 subjects will undergo repeat imaging 1-14 days after their initial study to establish reproducibility all echocardiographic parameters for this study.

For evaluation of central pulse wave velocity (PWVc) and parameters derived from arterial tonometry such as aortic augmentation index (AAIx), standard procedures outlined in a recent consensus statement on arterial stiffness are used (3). PWVc and AAIx are derived from stable tonometry signals of the radial, carotid, and femoral arteries, respectively. The quality control of the system is configured in order to detect variations in pulse height, maximum pulse variation and maximum diastolic variation. They are expressed as: average pulse height (signal strength), pulse height variation (%), diastolic or baseline variation (%), pulse length variation (%), and Maximum dp/dt. A combination of these scores (average pulse height, pulse height variation and diastolic variation) are used to calculate the Operator Index. Per study protocol any signal with an Operator Index below 90% is rejected and the tonometry tracings are re-obtained. When obtaining paired tonometry data for PWVc (carotid and femoral signals) the system displays the mean and standard deviation (SD) of the Δ times (ms) from the onset of ECG and each site waveforms. This information indicates how consistent the data are during the 10 seconds recording period. An SD of <5% from the mean Δtime is an acceptable variation. According to protocol, we re-obtain paired tracings when any or both of the signals have an SD higher than 5%. If subjects have a very irregular cardiac rhythm with large SDs, we do not use the PWV data. The first 25 subjects will undergo repeat tonometry 1-14 days after their initial study to establish reproducibility all echocardiographic parameters for this study.

All carotid IMT procedures will performed in accordance with consensus statements by the ASE on the use of echocardiography in clinical trials and on use of carotid IMT (1,4). Details are in the attached manual of operations and protcols. In brief, imaging standardization is accomplished using a standardized head position (assisted by the use of a wedge), a uniform ultrasound imaging platform, and a standardized imaging protocol. Our imaging protocol relies on an internal landmark defined as the "optimal angle of interrogation." This is the "tuning fork" view, whereby double lines on the near and far walls of the distal common carotid artery are clearly seen, as well as the bifurcation of the bulb into the internal and external carotid arteries. Although only the far wall is measured, double lines on the near and far walls indicate a perpendicular angle of insonation and, therefore, a true carotid wall thickness ("double line sign"). Predefined circumferential anterior and posterior angulation of the probe is used to identify two additional angles on each side, requiring the presence of near and far wall double lines form each angle. Longitudinal tracking of internal and external landmarks is used to identify the same vessel segments. Reading standardization is covered by the CIMT Reading MOP. Key steps include verification of image calibration using DICOM, identifying the correct segment and wall, and verifying correct instrument settings and the absence of artifacts. Then, an R-wave gated frame is selected for each segment that best demonstrates the "double line sign." From this segment, the leading edges of the blood-intima and media-adventitia interfaces are traced 1 cm proximally from the onset of the carotid bulb into the common carotid artery, in triplicate. If necessary, the digital tracing is edited so all mean CIMT measurements are within 0.05 mm (1/2 digital pixel) of each other. Tracing is truncated at areas of edge drop out. For echocardiographic measurements, the first 25 subjects will undergo repeat imaging 1-14 days after their initial study to establish reproducibility all echocardiographic parameters for this study.

1. Gottdiener JS, Bednarz J, Devereux RM, Gardin J, Klein A, Kitzman D, Manning W, Morehead A, Oh J, Quinones M, Riley W, Stein JH, Weismann N. Recommendations for use of echocardiography in clinical trials: A report from the American Society of Echocardiography's Nomenclature and Standards Committee and The Task Force on Echocardiography in Clinical Trials. Journal of the American Society of Echocardiography. 2004;17:1086-1119.

2. Lang RM, Bierig M, Devereux RB, Flachskampf FA, Foster E, Pellikka PA, Picard MH, Roman MJ, Seward J, Shanewise JS, Solomon SD, Spencer KT, Sutton MS, Stewart WJ; Chamber Quantification Writing Group; American Society of Echocardiography's Guidelines and Standards Committee; European Association of Echocardiography. Recommendations for chamber quantification: a report from the American Society of Echocardiography's Guidelines and Standards Committee and the Chamber Quantification Writing Group, developed in conjunction with the European Association of Echocardiography, a branch of the European Society of Cardiology. J Am Soc Echocardiogr. 2005 Dec;18(12):1440-63.

3. Laurent S, Cockcroft J, Van Bortel L, Boutouyrie P, Giannattasio C, Hayoz D, Pannier B, Vlachopoulos C, Wilkinson I, Struijker-Boudier H. Expert consensus document on arterial stiffness: methodological issues and clinical applications. Eur Heart J 2006;27(21):2588-2605

4. Stein JS, Korcarz CE, Hurst RT, Lonn E, Kendall CB, Mohler ER, Najjar S, Rembold CM, Post WS. Use of carotid ultrasound to identify subclinical vascular disease and evaluate cardiovascular disease risk: A consensus statement from the American Society of Echocardiography Carotid Intima-Media Thickness Task Force. Journal of the American Society of Echocardiography. 2008;91:93-111.