1a. **Title:** Evaluation of the longitudinal association between systolic blood pressure and ABI

1b. **Abbreviated title:** ABI and blood pressure

2. **Writing Group:** Andy Brown, Gerardo Heiss, Pam Schreiner

   **Correspondence:** Marsha Eigenbrodt  
   Department of Epidemiology  
   Cardiovascular Disease Program  
   137 E. Franklin St.  
   Nations Bank Plaza, Suite 306  
   Chapel Hill, NC 27514

3. **Timeline:**

   Begin analysis 4 months after approval of proposal and have first draft within the following 6 months.

4. **Rationale:**

   The ankle-brachial index (ABI) is a non-invasive method used to assess the degree of patency of lower extremity arteries. In cross-sectional studies, ABI has been shown to be inversely associated with IMT of carotid arteries in both men and women and the IMT of the popliteal arteries in men and so has been considered a measure of atherosclerosis. An inverse association has been shown between ABI and CVD risk factors and cardiovascular disease among older adults, especially current smoking and systolic blood pressure.

   While the development of atherosclerosis is multifactorial in origin, elevated blood pressure has been identified as a strong risk factor. It has been hypothesized that the turbulence of blood flow at bifurcation points, which is increased with increased blood pressures, results in the preferential distribution of atherosclerosis at these locations. ABI decreases with age as blood pressure increases, and cross-sectional studies have shown a strong association between hypertension and ABI.
In this study we intend to investigate the effect of baseline blood pressure on incident LEAD (ABI<0.9) as well as the association between change in blood pressure and change in ABI from exam 1 to exams 3 and 4.

5. **Main Study Questions/Hypotheses:**

1. Since systolic blood pressure has been shown to be inversely associated with ABI in cross-sectional studies, we hypothesize that prevalent hypertension at baseline will predict incident LEAD (ABI<0.9) at follow-up after adjusting for other risk factors of atherosclerosis such as age, ethnicity, gender, BMI, HDL, LDL, ethanol consumption, diabetes, education, physical activity, fibrinogen, and smoking.

   a. Similarly, we hypothesize that among prevalent hypertensives the degree of control of blood pressure at baseline (using JNCVI levels of blood pressure categories) will predict incident LEAD at follow-up after adjusting for other risk factors. We will need to stratify by or adjust for antihypertensive medication use.

2. We hypothesize that a change in systolic blood pressure from exam 1 to follow-up will be inversely associated with change in ABI (change per year or relative change such as percentile ranking of ABI). To evaluate change, the statistical model used will need to control for lack of independence of repeat measures as well as adjust for measurement error at baseline. The best model to use will be optimized on the data. (The change in ABI associated with a decline in systolic blood pressure may vary depending on whether the decline in blood pressure is because of control of hypertension or because of poor cardiac function associated with myocardial injury.)

   a. We hypothesize that a given change in systolic blood pressure may produce larger changes in ABI (change per year or relative change) in those with baseline evidence of atherosclerosis. IMT in the highest tertile or evidence of plaque at any site may be used as the indicator of underlying atherosclerosis.

6. **Data (Variables and Sources)**

1. Exam 1: v1age01, racegrp, gender, elevel02, BMI01, HDLSIU02, LSLSIU02, ethanl03, cigt01 or cigtyr01, diabts03, hypert05, hyptmd01, sprt_I01, ABI02, SBPA21, SUM45_32 (weighted average of DA45), plaque01 (plaque at any site), ECGMI03

2. Exams 3 and 4: ABI at exam 3 or 4 and SBPC22 and SBPD19, hyptmd31 and exam 4 anti-hypertensive medication use, and ecg from exam 3 and 4 for evidence of MI.