**Full Title:** Coronary Artery Calcium Measurement and Prediction of Cardiovascular Disease by Different CT Scanner Types: the Multi-Ethnic Study of Atherosclerosis

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**Background**
Coronary artery calcium (CAC) using cardiac computed tomography (CT) is a powerful tool for cardiovascular disease (CVD) risk prediction. The standard method, the Agatston score, weighs lesion area upward for density, and has been shown to be consistent across CT scanner type. The volume (positive association) and density (inverse association) scores, however, improve risk prediction, but have not been evaluated based on CT scanner type.

**Methods**
We performed a prospective cohort study using data from participants in the MESA (Multi-Ethnic Study of Atherosclerosis) Study free of baseline CAC. CAC was measured using either EBCT (electron beam CT) or MDCT (multi-detector CT) based on exam location. We compared risk prediction for coronary heart disease (CHD) and CVD events using the Agatston method, the volume and density scores, and the volumetric and volumetric density scores using Cox proportional hazards models in a time to event analysis.

**Results**
The 3,362 MESA participants with CAC >0 were studied. Using the Agatston method, the HR for CHD was 1.28 (95% CI 1.16, 1.42) for EBCT and 1.22 (95% CI 1.12, 1.34) for MDCT. Using the volume score adjusted for density, the HR for CHD was 2.11 (95% CI 1.70, 2.63) for EBCT and 1.71 (95% CI 1.41, 2.07) for MDCT. Similar results, with somewhat lower HRs, were seen for CVD risk prediction. Analyses stratified by participant sex, BMI, age, and baseline statin use gave similar results. The volume and density score model demonstrated significantly higher area under the curve (AUC) than Agatston in the EBCT group (0.702, 95% CI 0.665, 0.738 vs 0.677, 95% CI 0.638, 0.715, p=0.013) and numerically higher AUC in the MDCT group (0.669, 95% CI 0.632, 0.705 vs 0.653, 95% CI 0.616, 0.690, p = 0.107).

**Conclusions**
The CAC volume score, adjusted for density, provides consistently improved risk prediction for CHD and CVD events over the Agatston score, regardless of CT scanner type, or stratification by age, BMI, sex, or statin use.