

## Deep-Learning Quantification of Coronary Calcium on CT and Mortality in the National Lung Screening Trial (NLST)

Tuesday 9:00-9:10 AM | RC303-02 | Room: E350

### PURPOSE

Coronary artery calcification (CAC) is quantifiable on low-dose chest CT and can guide statin therapy. Quantification is not routinely performed due to time and equipment limitations. We developed a deep-learning algorithm that automatically quantifies coronary calcium on standard lung screening CT and evaluated prognostic value in 14,959 National Lung Screening Trial (NLST) participants.

### METHOD AND MATERIALS

The deep learning algorithm was developed in 1,600 cardiac CTs from with manual CAC measurement as the reference. The deep learning calcium score was categorized as: High (CAC>300), Moderate (CAC: 101-300), Low (CAC: 1-100), and Very Low (CAC: 0). The association of the deep learning calcium score with all-cause and cardiovascular mortality was then tested in 14,959 heavy smokers aged 55-74 having lung cancer screening chest CT at 33 US sites in NLST. The intraclass correlation coefficient (ICC) between automated and human manual CAC was assessed in 396 NLST chest CTs.

### RESULTS

All-cause (7.3% (1,092/14,959)) and cardiovascular (1.9% (288/14,959)) mortality was assessed over median follow-up of 6.5 years. There was a significant association between deep learning calcium score and all cause mortality: High: HR 2.9 (95%CI: 2.4-3.5), Moderate: 1.9 (1.5-2.3), Low: 1.3 (1.1-1.6), all  $p < 0.01$  compared to Very Low; as well as for cardiovascular mortality: High: HR 6.6 (4.3-10.3), Moderate: 3.8 (2.3-6.1), Low: 2.2 (1.4-3.6), all  $p < 0.001$  compared to Very Low. The ICC between manual and automatic calcium classes was 0.858 (95%CI: 0.830-0.882).

### CONCLUSION

The automated deep learning algorithm quantified CAC on lung screening CT. Automated CAC corresponded closely to human readers and was strongly associated with all-cause and cardiovascular mortality in a large multicenter cohort of NLST participants having lung screening.

### CLINICAL RELEVANCE/APPLICATION

Automated quantification of coronary calcium using existing lung screening CTs identifies persons at high and low risk to guide cardiovascular prevention.