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Title: Associations between arterial calcification and stiffness, bone density, emphysema and all-cause mortality in COPD patients

Ms. Elisabeth 7452 Romme lisette.romme@catharinaziekenhuis.nl MD ^{1,2}, Dr. David 8185 McAllister david.mcallister@ed.ac.uk MD ³, Dr. John 8186 Murchison john.murchison@luht.scot.nhs.uk MD ⁴, Prof. Dr Edwin 8187 Van Beek edwin-vanbeek@ed.ac.uk MD ⁵, Dr. George 8188 Petrides gpetrides@googlemail.com MD ⁶, Dr. Erica 8190 Rutten ericarutten@ciro-horn.nl ⁷, Dr. Frank 8191 Smeenk frank.smeenk@catharinaziekenhuis.nl MD ¹, Prof. Dr Emiel 8192 Wouters e.wouters@mumc.nl MD ² and Prof. Dr William 8196 MacNee W.MacNee@ed.ac.uk MD ⁸. ¹ Respiratory Medicine, Catharina Hospital, Eindhoven, Netherlands ; ² Respiratory Medicine, Maastricht University Medical Centre+, Maastricht, Netherlands ; ³ Centre for Population Health Sciences, University of Edinburgh, Edinburgh, United Kingdom ; ⁴ Radiology, Royal Infirmary of Edinburgh, Edinburgh, United Kingdom ; ⁵ Clinical Research Imaging Centre, University of Edinburgh, Edinburgh, United Kingdom ; ⁶ Radiology, Newcastle University Teaching Hospitals, Newcastle upon Tyne, United Kingdom, NE4 5PL ; ⁷ Program Development Centre, Centre of Expertise for Chronic Organ Failure, Horn, Netherlands and ⁸ Centre for Inflammation Research, University of Edinburgh, Edinburgh, United Kingdom .

Body: Background: Cardiovascular disease, osteoporosis and emphysema are associated with COPD. However, associations between these factors in COPD patients are not well understood. Objective: To examine associations between markers of cardiovascular disease (coronary artery calcification [CAC], thoracic aortic calcification [TAC] and arterial stiffness), bone density (bone attenuation of the thoracic vertebrae [BATV]), emphysema (PI-950 and 15th percentile) and all-cause mortality in a COPD cohort. Methods: We measured arterial stiffness as carotid-radial pulse wave velocity (PWV) in a COPD cohort. We assessed CAC, TAC, BATV, PI-950 and 15th percentile on chest CT and identified deaths from a national register. Results: We studied 119 COPD subjects; aged 67.8 ± 7.3 , 66% were males and mean FEV1 % predicted was 46.0 ± 17.5 . Subjects were classified into three pre-specified groups: CAC=0 (n=14), $0 < \text{CAC} \leq 400$ (n=41) and $\text{CAC} > 400$ (n=64). Subjects with higher CAC were more likely to be older ($p < 0.001$) and male ($p = 0.03$) and more likely to have higher systolic blood pressure ($p = 0.001$) and a history of hypertension ($p = 0.002$) or ischemic heart disease ($p = 0.003$). Higher CAC was associated with higher PWV (OR 1.62) and lower BATV (OR 0.32), but not with 15th percentile after adjustment for age, sex and pack-years of smoking. In a Cox proportional hazards model, CAC, TAC and 15th percentile predicted all-cause mortality (HR 2.01, 2.09 and 0.66, respectively). Conclusion: Increased CAC was associated with increased arterial stiffness and lower bone density, and CAC, TAC and extent of emphysema predicted all-cause mortality in a COPD cohort.

