

# Airflow obstruction and reduced lung function increase the risk of heart failure

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A large population-based study has found that lung function and obstructive airway diseases are strongly and independently associated with increased risk of heart failure. Importantly, say the investigators, this association was even evident in never-smokers and was still evident after adjustment for smoking status and number of years smoking. This, they add, indicates "that our results are not primarily confounded by smoking".

Heart failure is by far the single biggest reason for acute [hospital admission](#). Around 30 million people in Europe have [heart failure](#) and its incidence is still increasing: more cases are being identified, more people are living to an old age, and more are surviving a heart attack (but with damage to the [heart muscle](#)).

The latest study, published on Friday 25 February 2012 in the [European Journal of Heart Failure](#), found that the long-term risk of developing heart failure increased with reduced lung function as measured by forced expiratory volume ([FEV1](#)) by spirometry, findings which were not altered by age, prior heart disease, or [cardiovascular risk factors](#) (including smoking).(1) The results were derived from the Atherosclerosis Risk in Communities (ARIC) study, a population-based cohort from the USA, funded by the National Heart, Lung and Blood Institute (NHLBI), part of the National Institutes of Health, in which almost 16,000 adults aged 45 - 64 years were followed for an average of 15 years.

The investigators acknowledge that [chronic obstructive pulmonary disease](#) (COPD) is a common co-morbidity in [patients with heart failure](#), and vice versa. However, not until very recently has prior COPD been shown as a long-term risk factor for heart failure. Indeed, an editorial accompanying the report says that the study now "strengthens the hypothesis that pulmonary obstruction itself is a major risk factor for heart failure".(2)

The editorial goes on to say that "thinking of heart failure as a possible cause in any patient with [shortness of breath](#) and fatigue, or an increase in such symptoms, irrespective of other disease labels, including COPD, means that physicians need to 'reset' their clinical reasoning", and reconsider their pharmacological management.

Baseline data of the ARIC cohort was collected between 1987 and 1989 and included information on socioeconomic indicators, medical history, family history, cardiovascular risk factors, serum chemistries, ECGs, medication use, and lung volumes. Three re-examinations followed the baseline visit, as well as annual telephone interviews and active surveillance of hospitalisations and death. Incident heart failure was ascertained from hospital records and death certificates up to 2005 in 13,660 eligible subjects.

Hazard ratios for heart failure, which were calculated according to quartiles of FEV1 in both men and women and adjusted for age, smoking and height, increased steadily over descending quartiles of FEV1. After further adjustment for CVD risk factors, the hazard ratio for heart failure comparing the lowest with the highest quartile FEV1 was 3.91 for white women, 3.03 for white men, 2.11 for black women, and 2.23 for black men. These associations were seen at all levels of smoking.

Thus, the investigators advise that a low FEV1 reading by spirometry

"was strongly predictive" of heart failure, independent of other CVD risk markers.

The study's first author, Dr Sunil Agarwal from the University of North Carolina, Chapel Hill, USA, said that the results, when interpreted in the context of existing scientific evidence, support a temporal relationship between low lung capacity and development of heart failure. "This risk", he added, "given a low FEV1, is similar in magnitude - and may be stronger - than that seen for common and modifiable [risk factors](#) such as diabetes or hypertension. The public health implications are huge, particularly since smoking and air pollution affect [lung function](#) adversely. So it will be important to determine whether interventions that sustain or improve FEV1 are associated with lower risk of heart failure."

Dr Agarwal noted "multiple drivers" (such as genetic or environmental factors) as a potential explanation for the association. Smoking is known to be associated with heart failure, although in this study the association with low FEV1 was also present in never-smokers. He added that a recent study by Barr et al, published in the New England Journal of Medicine, showed an association between subclinical emphysema with impaired relaxation of the heart, a process which may contribute to the development of heart failure. (3) "Whether pulmonary shunting of blood due to COPD, pulmonary hypertension or arrhythmias also drive this association remains unclear at this time," he said.

"Our study does add to a growing literature indicating that COPD or low FEV1 influence one's risk of heart failure, even if the observed association cannot be equated with causation. So we have to focus on interventions to prevent or reverse COPD or improve FEV1, and to test whether such interventions reduce the risk of heart failure. Given the complex interaction between the respiratory and cardio-circulatory functions, causation will be hard to disentangle."

Commenting on the patient management implications of the study, Dr Gerardo Heiss, the study's senior investigator, said: "COPD is common in patients with heart failure, but we cannot infer from our results that screening for COPD will reduce the risk of heart failure, or that managing COPD in heart failure patients will improve outcomes. However, our results should add to the growing awareness among practitioners that patients with COPD do have a higher risk of heart failure, and that shortness of breath or impaired vigour should not be ascribed *prima facie* to COPD without careful consideration of the presence of heart failure."

**More information:** 1. Agarwal SK, Heiss G, Barr RG, et al. Airflow obstruction, lung function and risk of incident heart failure: The atherosclerosis risk in communities (ARIC) study. *Eur J Heart Fail* 2012; [doi:10.1093/eurjhf/hfs016](https://doi.org/10.1093/eurjhf/hfs016)

2. Rutten FH, Hoes, AW. Chronic obstructive pulmonary disease: a slowly progressive cardiovascular disease masked by its pulmonary effects? *Eur J Heart Fail* 2012; [doi:10.1093/eurjhf/hfs022](https://doi.org/10.1093/eurjhf/hfs022)

3. Barr RG, Bluemke DA, Ahmed FS, et al. Percent emphysema, airflow obstruction, and impaired left ventricular filling. *N Engl J Med* 2010; 362: 217-227.

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