

until the MTWA converts to positive or avoided altogether in those who remain normal. A safe interval between tests in patients who are normal has not been quantified but, based on the results of this trial, may be every 2 years. Because this study excluded patients with atrial fibrillation and inability to exercise on a treadmill/bicycle or NYHA Class IV heart failure, the MTWA test cannot currently be used to risk stratify for SCD in these patients. ■

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Patients at Risk

Air Pollution and Heart Disease

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Ambient Air Pollution Is Associated With Increased Risk of Hospital Cardiac Readmissions of Myocardial Infarction Survivors in Five European Cities

von Klot S, Peters A, Aalto P, et al.; Health Effects of Particles on Susceptible Subpopulations (HEAPSS) Study Group.

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Air pollution has been found to be associated with increased morbidity and mortality in the general population, primarily related to respiratory effects, but also related to cardiovascular disease. The Health Effects of Particles on Susceptible Subpopulations

(HEAPSS) Study has followed cohorts of first myocardial infarction survivors in 5 European cities: Augsburg (Germany), Barcelona (Spain), Helsinki (Finland), Rome (Italy), and Stockholm (Sweden), assessing the air pollution-related risks in this population. Using the HEAPSS cohort and correlating hospital admissions with several markers of urban air pollution (particle number concentration [PNC], mass of particles < 10 μm [PM_{10}], carbon monoxide [CO], nitrogen dioxide [NO_2], and ozone), the investigators assessed whether ambient air pollution was associated with increased cardiac hospital readmissions in survivors of myocardial infarction.

Methods and Results

Myocardial infarction survivors (N = 22,006) were recruited in the 5 cities between 1992 and 2000. First subsequent cardiac rehospitalizations within the study area were recorded from the 29th day after the index event until the center-specific end of the follow-up period. Readmissions were recorded for those with primary diagnoses of acute myocardial infarction, angina pectoris, dysrhythmia, and heart failure. Air pollution data from fixed monitors were collected for each city and daily means were calculated for each pollutant in each city.

During the follow-up, 2321 hospital readmissions for myocardial infarction, 3541 for angina pectoris, and 6655 for cardiac events were observed among the 22,006 HEAPSS cohort members. Same-day levels of air pollutants were significantly associated with cardiac readmissions. This study found a 2.1% increase in cardiac hospital admissions for every 10 $\mu\text{g}/\text{m}^3$ increase in the mass of particles < 10 μm (PM_{10}). This effect ratio is larger than that seen in prior studies.

Conclusions and Interpretation

In this multicenter cohort study of myocardial infarction survivors, an increased risk of cardiac readmissions during days with elevated concentrations of several markers of urban air pollution (PNC, PM_{10} , CO, NO_2 , and ozone) was observed.

Whereas other studies had observed an association between cardiovascular morbidity and mortality and air pollution in the general population, this study was specifically designed to examine this association in a cohort of potentially vulnerable subjects (ie, those with prior myocardial infarction). This study showed positive and generally larger effects than studies conducted in the general population. Therefore, myocardial infarction survivors might, in fact, be more susceptible to air pollution-related cardiovascular events than members of the general population. ■