For cardiac rehab patients, in-home portable air cleaners lower fine-particle pollutant exposure

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Using an in-home portable air cleaner (PAC) can significantly reduce exposure to fine-particle air pollutants - a major risk factor for

cardiovascular events in people with pre-existing heart disease, reports a pilot study in the July issue of *Journal of Cardiopulmonary Rehabilitation and Prevention*.

"We show here for the first time that providing cardiac patients with PAC for use in their homes results in approximately a 40 percent reduction in personal-level exposure to PM2.5 air pollution," according to the new research by Robert L. Bard, MS, of Michigan Medicine, Ann Arbor, and colleagues. They plan further studies to see if the reducing particulate exposure with PACs leads to reductions in cardiovascular events.

In-Home PACs Reduce Particulate Exposure, Can They Reduce Cardiovascular Events?

The Cardiac Rehabilitation Air Filter Trial (CRAFT) pilot study included 20 patients, average 71 years, undergoing cardiac rehabilitation at the authors' medical center. Each patient received two PACs to use at home, running continuously: one in their bedroom and one in their main living space.

For the first five days, patients were randomly assigned to use their PAC in active mode, using a high-efficiency particulate air (HEPA) filter; or in sham mode, with no HEPA filter installed. For a subsequent five-day period, patients were crossed over to the other PAC mode. The study was "double-blind"—patients and researchers were both unaware of the order of the two modes.

After four days on each mode, patients were given a portable monitor to measure their personal exposure to fine-particle pollutants: particles or droplets measuring 2.5 microns in width. (A micron, or micrometer, is one-millionth of a meter.) Exposure to PM2.5 is a major risk factor for

myocardial infarction, sudden death, and other events throughout the population, but especially in patients with cardiac disease.

In 18 patients who completed the study, exposure to fine-particle pollutants was significantly lower with the PAC in active mode. Compared to the sham period, active in-home PAC use reduced personal PM2.5 exposure by about 44 percent.

The improvement remained significant on analysis excluding a few patients with very high short-term PM2.5 values, possibly related to secondhand smoke or cooking. Use of active PAC with a HEPA filter reduced personal PM2.5 exposure for all but two of the 18 patients.

The results were similar to a previous study evaluating PAC use in a senior facility. The researchers also note that the reductions in PM2.5 exposure were achieved in a region (southeast Michigan) with good air quality; in more-polluted areas, even greater reductions might be achieved. The PAC devices are relatively inexpensive: retail cost of about $120 each.

"These pilot study findings are important because they validate the effectiveness of PAC in a real-world clinical setting and represent a critical next step required to rationalize and design large scale outcome trials," Mr. Bard and coauthors write. By conservative estimates, the reported PM2.5 reductions might lower the cardiovascular event rate by five percent in the general population, and by up to 20 percent in high-risk cardiac patients.

The results support moving forward with the full-scale CRAFT study, which aims to show that PAC use can improve risk markers such as blood pressure or blood vessel (endothelial) function. The researchers conclude: "Such data are required to design future outcome trials which are urgently needed to help inform on how to protect the global public

health from the threats posed by air pollution."

More information: Robert L. Bard et al, Reduced Fine Particulate Matter Air Pollution Exposures Using In-Home Portable Air Cleaners, *Journal of Cardiopulmonary Rehabilitation and Prevention* (2020). DOI: 10.1097/HCR.0000000000000516