Smartphone App Could Give Voice to Congestion in Heart Failure

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Automated voice analysis using a proprietary smartphone app can detect pulmonary fluid overload with high accuracy in patients admitted with acute decompensated heart failure (ADHF), a new study suggests. Researchers envision the technique as a potential warning system for imminent decompensation in high-risk patients.

The speech analysis app (*HearO*, Cordio Medical) identified voice alterations suggestive of changes in fluid status in such hospitalized patients, based on comparison of specific sentences spoken into it on admission and at discharge.

"Speech analysis technology represents a promising new approach to the detection of volume overload in patients with heart failure and other edematous disorders. If confirmed, this technology can easily be incorporated into the day-to-day evaluation of such patients," William Abraham, MD, Division of Cardiovascular Medicine, Ohio State University Wexner Medical Center, Columbus, told *theheart.org* | *Medscape Cardiology.*

"The technology may provide an early warning system indicating fluid retention, and along with the totality of clinical assessments, allow better insight into patients' clinical status," said Abraham, a coauthor on the study published December 8 in *JACC: Heart Failure* with Offer Amir, MD, Hadassah Medical Center, Jerusalem, Israel, as lead author.

Other studies have suggested a relationship between fluid retention and vocal cord vibration. In research published last year, the authors note, a vocal biomarker derived from patients' recorded speech correlated with hospital admission and death in patients with congestive heart failure.

The current study included 40 adults requiring hospitalization for ADHF. Each recorded five sentences three to four times using the HearO speech processing and analysis app when "wet" on the day of hospital admission and when "dry" on the day of hospital discharge. The app is designed to distinguish the two states based on differences in five distinct speech measures.

A total of 1484 recordings were analyzed to reveal significant differences in the app's voice analysis findings at admission versus discharge.

Discharge recordings were successfully tagged as different from admission recordings in 94% of cases, with distinct differences shown for all five speech measures in 87.5% of cases, the authors report.

"This first study using a novel speech recognition system in patients demonstrated its ability to identify voice alterations reflective of changes in ADHF clinical status, and showed large changes in speech measures between the congested (admission) and decongested (discharge) states," the authors write.

The system, they add, may potentially help in assessing pulmonary congestion in patients with heart failure in other settings, "although confirmation of performance in more subtly different clinical states is still required."

For example, "If further validated in studies of ambulatory outpatients with chronic HF, this speech-based analysis could provide a simple, noninvasive approach for the remote monitoring and management of such patients," the group writes.

Although the technology is currently investigational, "ongoing and future studies may make it broadly available," Abraham said.

A linked editorial says active speech analysis as described in this study represents "an important advance toward expanding the tools available to assess patients with HF."

One potential limitation of this technology is that it requires the patient to engage the app and read the appropriate phrase to be useful, observe the editorialists, Neal Ravindra, PhD, Yale School of Medicine, New Haven, Connecticut, and David Kao, MD, University of Colorado School of Medicine, Aurora. They propose that engagement with the app might be "suboptimal."

They also caution that "an abundance of concerning signals" generated by the app could complicate already involved clinical workflows.

"If use of smartphones in ADHF management, as with the HearO app, is to be scaled," write Ravindra and Kao, "it will be important to discern what steps to take based on the nature of the warning signal to allow cheap, frequent, and accurate volume assessments on a specific schedule and ad hoc basis, without compromising quality of care and contributing to provider burnout."

They propose that "extensive development and validation are required before clinical use, but success in a use case such as HearO may pave the way for even more convenient and generalizable strategies."

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