

# 'Face time' for the heart diagnoses cardiac disease

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To the careful observer, a person's face has long provided insight into what is going on beneath the surface. Now, with the assistance of a web camera and software algorithms, the face can also reveal whether or not an individual is experiencing atrial fibrillation, a treatable but potentially dangerous heart condition.

A pilot project, the results of which were published online today in the journal *Heart Rhythm*, demonstrates that subtle changes in skin color can be used to detect the uneven blood flow caused by atrial fibrillation. The technology was developed in a partnership between the University of Rochester School of Medicine and Dentistry and Xerox.

"This technology holds the potential to identify and diagnosis cardiac disease using contactless [video monitoring](#)," Jean-Philippe Couderc, Ph.D., with the University of Rochester's Heart Research Follow-up Program. "This is a very simple concept, but one that could enable more people with atrial fibrillation to get the care the care they need."

Atrial fibrillation is an irregular or sometimes [rapid heart rate](#) that commonly causes [poor blood flow](#) to the body. This occurs when erratic cardiac electrical activity causes the upper and lower chambers of the heart to beat out of sync. More than three million Americans suffer from the disease.

While, the condition can be readily diagnosed, in many people it goes undetected, either because it comes and goes or because the symptoms –

fatigue and weakness – are too general to warrant concern. Consequently, it is estimated that 30 percent of the people with atrial fibrillation do not know they have the condition.

Furthermore, while atrial fibrillation is treatable if detected – both by medication and through a procedure that essentially resets the heart's electrical activity – many individuals with the condition will experience a re-occurrence. If untreated, the condition places individuals at a significantly higher risk for blood clots and stroke.

The technology described in the study employs a software algorithm developed by Xerox that scans the face and can detect changes in [skin color](#) that are imperceptible to the naked eye. All this requires is that the subject remain still for 15 seconds.

Sensors in digital cameras are designed to record three colors: red, green, and blue. Hemoglobin – a component of blood – "absorbs" more of the green spectrum of light and this subtle change can be detected by the camera's sensor. It turns out that the face is the ideal place to detect this phenomenon, because the skin is thinner than other parts of the body and blood vessels are closer to the surface.

The study participants were simultaneously hooked up to an electrocardiogram (ECG) so results from the facial scan could be compared to the actual electrical activity of the heart.

The researchers found that the color changes detected by video monitoring corresponded with an individual's heart rate as detected on an ECG. Essentially, the irregular [electrical activity](#) of the heart found in people with atrial fibrillation could be identified by "observing" the pulses of blood flowing through the veins on the face as it absorbed or reflected green light with each heartbeat.

The study found that the video monitoring technique – which researchers have dubbed videoplethymography – had an error rate of 20 percent, comparable to the 17 to 29 percent error rate associated with automated ECG measurements.

While the pilot study was only conducted on 11 people and intended to demonstrate that the technology was feasible, the researchers are now in the process of evaluating the technology on a larger study population, including those without atrial fibrillation.

Couderc contends that these new studies – coupled with the application of image stabilizing technology and the ongoing improvement in the resolution of cameras – will lower the error rate. "This study was intended to be a proof of concept and, as is the case with many new technologies, we believe that we can significantly improve its accuracy and the usability," said Couderc.

Like many other personal health technologies that have emerged in recent years, the authors see this as a way to diagnose or monitor people at risk for [atrial fibrillation](#) and alert them and/or their physicians when the condition is detected. The contactless nature of the technology and the proliferation of web cameras could even eventually allow the screening to occur without interrupting the user. For example, the program could run in the background while someone is reading their email on their tablet, computer, or smart phone.

Provided by University of Rochester Medical Center

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