

TECH

## Can a Smartphone Tell if You're Depressed?

Apps, Other Tools Help Doctors, Insurers Measure Psychological Well-Being



An app tracked Janisse Flowers's smartphone data to help detect possible postpartum depression. *ANDY MCMILLAN FOR THE WALL STREET JOURNAL*

By **JOSEPH WALKER**

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HUNTERSVILLE, N.C.—Toward the end of Janisse Flowers's pregnancy, a nurse at her gynecologist's office asked her to download an iPhone app that would track how often she text messaged with friends, how long she talked on the phone and how far she traveled each day.

The app was part of an effort by Ms. Flowers's health-care provider to test whether smartphone data could help detect symptoms of postpartum depression, an underdiagnosed condition affecting women after they give birth. The app's developer, San Francisco-based Ginger.io Inc., compared data from Ms. Flowers and nearly 200 other women against their answers to a weekly survey used to diagnose depression. The company says it found that behavioral patterns like decreased mobility on weekends and longer phone calls were associated with poor mood in surveys.

"It's very creepy to think someone can tell your mood" based on smartphone data, says Ms. Flowers, who gave birth to twins last year. But "I felt like this was something that was going to help me while I was in a vulnerable place."

The Ginger.io app is one of a new generation of health-surveillance

technologies that doctors, hospitals and health insurers are starting to use. Where fitness trackers like FitBit record jogging distance and calories burned, newer apps and other tools measure text-message volume, vocal tone and other behaviors to peer into patients' psychological well-being, which doctors say can have a high correlation with physical health. Health insurer Aetna Inc., for instance, says it uses voice-analysis software on some telephone calls to get people who receive short-term disability benefits back to work sooner.

“There are four billion phones on the planet, and it turns out they're incredibly powerful diaries of a person's life,” Ginger.io Chief Executive Anmol Madan says.

Ginger.io's app, called Ginger.io, is being used by 30 medical centers, including Kaiser Permanente and the University of California, San Francisco, the company says. The National Institutes of Health has given a \$2.42 million grant to researchers at the Harvard School of Public Health to develop a smartphone app that will analyze factors including when patients lock and unlock their phones to determine sleep patterns in people with psychiatric disorders. Researchers at the University of Michigan are developing a smartphone app that records and analyzes patients' vocal patterns during telephone calls to predict if someone is on the verge of depression or mania.

Many of the technologies are being developed with the aim of treating mental-health conditions. But signs of possible depression, such as when a person suddenly stops calling family members or stays inside the house for a week, can also flag when patients with diabetes or heart disease aren't motivated to take their medications or follow their exercise and rehabilitation regimens, doctors say.

Many doctors and hospital executives are cautious about using the technologies without hard evidence that the benefits justify the time and expense it takes to use them. There are also concerns about privacy, including data security and whether patients will be alarmed by what could be perceived as intrusive snooping.

“I wonder how companies are going to reassure people that when they download an app that can track everything they're doing, the data will never be used against them,” says Timothy G. Ferris, an internist and senior vice president of population health management at Partners HealthCare, the largest health-care provider in Massachusetts.

Dr. Ferris says he is bombarded by companies pitching their technologies as the way to tamp down on the rising costs of hospital care, but there is rarely compelling evidence to back up the claims. Surveillance technologies like Ginger.io's are promising, but adopting them before they're perfected could increase costs without improving patient care, says Dr. Ferris, who leads Partners' accountable-care organization, which receives financial rewards from Medicare when

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patient costs are lower than expected while still meeting quality goals.

“It’s going to create a bunch of false positives until they get really, really good at the algorithms,” says Dr. Ferris. “I have a limited budget so I have to make trade-offs, and I’m going to be very tough if I am deciding whether or not to do things.”

Other health systems like Novant Health, a nonprofit hospital system in the Southeast where Ms. Flowers gave birth, are starting to use psychological surveillance tools.

Novant is using the Ginger.io app primarily with patients suffering from psychiatric conditions. But the system has also studied it in diabetic patients—and in pregnant women and new mothers—to test whether symptoms of depression in patients’ smartphone data corresponded with self-reports of feeling down. Patient phone data was downloaded to Ginger.io’s computers automatically, and patients received an alert on their phones each week instructing them to complete a survey.

Novant will evaluate the results of the pilot program and decide whether to use the smartphone app as a diagnostic tool for postpartum depression in the future. Ehab Sharawy, head of Novant’s OB-GYN practice in Huntersville, N.C., said the pilot’s results showed the app has the potential to identify depression symptoms but will need to be reproduced in larger studies.

Nurses employed by Aetna have used voice-analysis software since 2012 to detect signs of depression during calls with customers who receive short-term disability benefits because of injury or illness. The software looks for patterns in the pace and tone of voices that can predict “whether the person is engaged with activities like physical therapy or taking the right kinds of medications,” Michael Palmer, Aetna’s chief innovation and digital officer, says.

Nurses using the software are able to identify six times as many people with depression as nurses using their clinical judgment alone, he says. If nurses conclude a patient may be suffering from depression, they will refer the patient to a mental-health specialist.

Patients aren’t informed that their voices are being analyzed, Tammy Arnold, an Aetna spokeswoman, says. The company tells patients the calls are being “recorded for quality,” she says.

“There is concern that with more detailed notification, a member may alter his or her responses or tone (intentionally or unintentionally) in an effort to influence the tool or just in anticipation of the tool,” Ms. Arnold said in an email. Humana Inc., a Louisville, Ky.-based insurance company, uses the same software, made by Boston-based Cogito Corp., to help improve call-center interactions with customers who have mental-health problems.

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Most people don’t expect insurance companies to analyze their voices to make determinations about their health, and some may find it unnerving or an invasion of privacy, says Michelle De Mooy, a privacy expert at the Center for Democracy and Technology. If patients aren’t aware that data is being collected about them, it is impossible for them to correct misimpressions or inaccuracies, Ms. De Mooy says.

Jeffrey Olgin, chief of cardiology at the University of California, San Francisco, says about 1,200 people enrolled in a long-term heart-disease study have downloaded the Ginger.io app. Sleep patterns, stress levels and social interactions are all predictive of heart disease, Dr. Olgin says. He and other researchers are hoping patients’ smartphone data, along with other measures like blood pressure, can help predict when patients are headed toward heart failure.

Researchers initially had difficulty persuading patients to download the app because of privacy concerns, Dr. Olgin says. Researchers told them that only the frequency, and not the content, of their communications would be tracked.

“We first introduced it right after the controversy with the [National Security Agency] trolling people’s data,” he says. “That was one of the concerns, handing over that type of personally sensitive information.”

Tara Dye, who participated in Novant’s postpartum program, said she wasn’t aware of the extent to which her smartphone data was tracked. Ms. Dye says she was told the app would record her location and how far she traveled, but she didn’t realize that her behavior was being probed for a link to depression. She says she doesn’t mind the extent of the tracking, because it was in service of her health care, but she

wishes there had been greater disclosure.

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