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Perspective

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Swallowing a Spy — The Potential Uses of Digital Adherence Monitoring

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I recently cared for a middle-aged woman, Ms. G., who presented with an acute coronary syndrome. Some years ago, she'd had a cardiac arrest and was found to have extensive coronary artery disease, for which she underwent urgent multivessel coronary-artery bypass surgery. Though we often assume that near-death experiences will motivate patients to take prescribed medications to prevent recurrence, Ms. G. was among the many patients with coronary artery disease who don't.[1,2] "I just don't like how pills make me feel," she told me. This time, before she underwent revascularization, we discussed the need to take dual antiplatelet therapy regularly after the procedure. Ms. G. expressed both understanding and willingness to adhere. Withholding therapy because I doubted her commitment seemed unethical, though I was not convinced that I, or her other doctors, had the tools to sustain that commitment beyond the hospital walls.

A few weeks later, when the Food and Drug Administration approved Abilify MyCite, the first pill with a built-in sensor for adherence monitoring, my first reaction was, "Now there's an app for that." Then, like many people, I puzzled over the irony that the technology was being piloted in a drug used for paranoia. Abilify MyCite combines aripiprazole, often used for schizophrenia or bipolar disease, with Proteus's ingestible event marker (IEM). The IEM is activated when the pill contacts liquid gastric contents and transmits a signal to a cutaneous patch worn on the abdomen. The signal is then sent to a cell-phone app that also tracks activity, mood, and rest quality. The technology, also called a digital health feedback system (DHFS), is already being used in clinical trials to monitor adherence and will probably soon be combined with other chronic disease medications. In the midst of a society-wide reckoning with the extent to which our behavior is tracked without our awareness, one need not be paranoid to find digital adherence monitoring somewhat creepy.

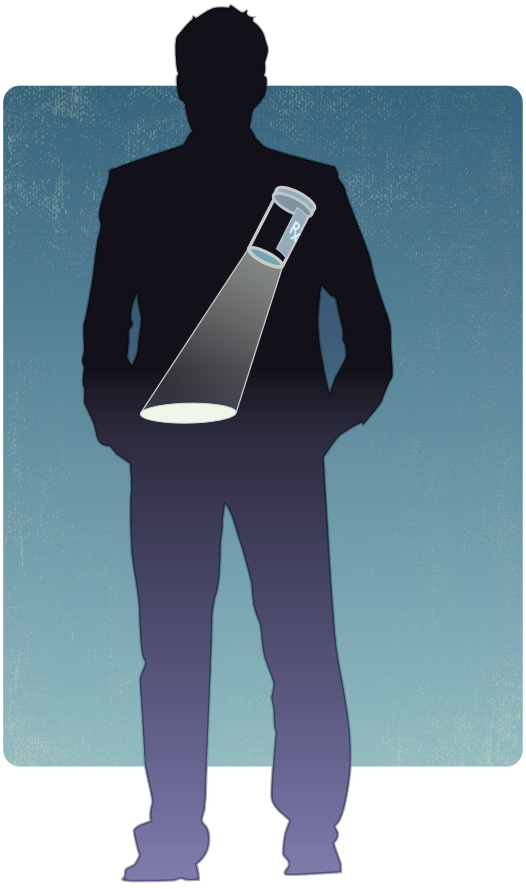
But use of the technology is completely voluntary. In the case of Abilify MyCite, patients decide who can view the data on a Web portal, and they can remove the patch at any time. Moreover, an early feasibility study in 28 people with schizophrenia or bipolar disorder (but without more than

mild paranoia) revealed no associated exacerbation of psychoses. Of the 27 participants who completed the study, 19 found the concept easy to understand, 24 thought the technology could be useful to them, and 21 said they would like to receive reminders on their phones if they forgot to take their medications.[3]

As John Kane, a psychiatrist at Albert Einstein College of Medicine who led the study, explained, most patients can distinguish between a paranoid delusion and a voluntary contract with a doctor. In fact, Kane thinks the assumption that people with schizophrenia won't engage with technology reflects stigmatization of people with mental illness. "Anything we can do to give them more information to help them manage their disease is a step in the right direction," he said.

Although we don't yet know how Abilify MyCite will affect adherence, the sensor technology is being studied in combination with other medications for various other chronic diseases, physical as well as mental. One recent randomized trial sponsored by Proteus, for instance, showed that patients with poorly controlled hypertension and diabetes who received medications with the DHFS had a significantly greater reduction in systolic blood pressure than those receiving usual care.[4]

Though it's impossible to extrapolate from one small trial, given the magnitude of nonadherence, its costs, and the associated poor outcomes,[1,5] any effective intervention is welcome. But for a DHFS to improve adherence, patients with a propensity toward nonadherence would have to use it. Furthermore, their lapses would probably need to reflect pragmatic rather than psychological obstacles, particularly for diseases for which medication taking isn't associated with relief of symptoms. For instance, feedback might well help the patient with diabetes who often forgets whether he's taken his sulfonylurea and who's had hypoglycemic episodes after an unintentional extra dose. But a patient with uncontrolled hypertension who resents being told to take his medications because he "feels just fine" probably won't use the technology, much less respond favorably to reminders after a missed dose.



Indeed, Ira Wilson, an adherence expert at Brown University, argues that the technology will benefit patients whose "lesion is forgetting" — but that forgetting is not the primary driver of nonadherence. We don't forget to pick our kids up at day care, he points out, or to make them dinner — or anything that's important to us. Most patients with adherence lapses would rather tell physicians "I forget" than "I can't be bothered to remember because it's not important to me." But are such patients merely unwilling to be honest with doctors — or also with themselves?

For some, particularly if they perceive their diseases as personal failings, or as signs of aging, taking medication requires an identity reckoning. Wilson gives the classic example of the 48-year-old man with hypertension and hyperlipidemia. "Maybe he's a lawyer," Wilson says, "maybe he runs a radio station. His kids are in high school. He's overweight and stressed, and his contact with the medical system is infrequent." Wilson finds that it takes at least 2 years to shift from seeing oneself as "an invincible 18-year-old to being 48 with two chronic conditions."

If the loss of our healthier selves is a bitter pill to swallow, that pill is no sweeter when embedded with a sensor. But although digital monitoring alone can't address the many psychological factors driving nonadherence, if the feedback pushes us to move beyond the guise of for-

getting, perhaps it offers an opportunity to understand rather than just remind.

Wilson likens the typical approach to nonadherence to using the same chemotherapy for patients with all different types of cancer. Sure, some would probably get better, but that's clearly not the standard of care. Instead, "We make a diagnosis, and we tailor our treatment," Wilson says. Why, when it comes to nonadherence, do we ignore this paradigm?

Probably because understanding takes time, and it's often easier to tell people what to do than explore why they don't do it. Even having studied the psychological factors driving nonadherence among patients with coronary disease, I often lapse into check-the-box mode with my patients. For instance, I explained to Ms. G. that the acceleration of her coronary disease might have been prevented had she taken her medications. I told her she had a good shot at staying "healthy" if she took them now. And I gently admonished her that failure to take medications after revascularization could be catastrophic. What I didn't do was try to understand.

I realized my error one evening when I went to see her because she was having diarrhea. As I questioned her, her son interjected, "This is what happens when she takes all her medications." Ms. G. nodded. "Same thing happens to me," he added. "Unless I eat a banana." Though further discussion suggested that additional factors contributed to Ms. G.'s nonadherence, it also revealed that physicians had never offered her any agency over this aspect of her life. "Doc," her son said, "all anyone ever does is lecture her about taking her medications. Then she doesn't want to go back."

Recognizing this risk, Wilson doesn't push reluctant patients to take their medications. During a visit with a man with poorly controlled hypertension, for example, Wilson began by asking, "What does hypertension mean to you?" The man replied, "I'm kind of a hyper guy. And sometimes I get tense." He explained that he takes his medications only when he feels both hyper and tense. In such situations, I would probably reply, "That's not how it works," but Wilson gently asks, "May I share a different perspective?" And patients usually say, "Of course, that's why I'm here."

People like Wilson don't need a digital reminder to have these conversations or to abandon the "doctor knows best" dynamic. For those of us who struggle, the most effective adherence booster may be giving doctors and patients the time to explore the beliefs and attributions informing medication behaviors. These conversations can't happen in a 15-minute visit. Given how little our health care system seems to value such interactions, it's no wonder that skepticism often greets these new, unproven, and costly technologies. But though this skepticism may be warranted, it may also reflect a fear that the technology is intended to replace our efforts, rather than facilitate them. For technologies like digital adherence monitoring to do their jobs, we have to be willing to let them help us do ours.

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Dr. Rosenbaum is a national correspondent for the *Journal*.

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