







THERE'S A REMOTE INTERVENTION FOR THAT—  
OR THERE WILL BE

# AN APP A DAY KEEPS THE DOCTOR AWAY

**O**n April 3, 1973, Martin Cooper, a Motorola division manager, stood on a street corner in Manhattan and placed the first cell phone call to his rival at AT&T's Bell Labs. The first cell phone conversation wasn't documented, but Cooper reportedly said: "I'm ringing you just to see if my call sounds good at your end." His cell phone weighed about 2.5 pounds. It took another decade for cell phones to become commercially available and another 19 years before the first text message was sent. (The first incarnation of the Internet made its debut just four years before Cooper's milestone call.)

We don't have to bring you up to date on the rest of the story. Ninety percent of our population now uses cell phones, the majority of which are smartphones. Digital, particularly Internet-driven, technology has changed how we live, how we work, how we represent ourselves, how we communicate, what we carry in our pockets and handbags. Many hope it can help us manage our health. Yet what exactly is going on at the intersection of health and this technology is, well, a bit cloudy.

Nearly a third of Americans say they can't live without their smartphones—what if they could live better because of them?

Pitt people are building apps to help us take control of our health. At the same time, the University has established a new center to explore the nuances of social and digital technologies in terms of how they affect patients and providers.

ILLUSTRATION | JESSE LENZ



# A CONSTANT PRESENCE

Brian Primack—an MD/PhD associate professor of medicine, of pediatrics, and of clinical and translational science at the University of Pittsburgh—is the newly appointed assistant vice chancellor for research on health and society and director of the University's new Center for Research on Media, Technology, and Health.

"Our brains developed over millions of years of evolution for a certain kind of world and a certain kind of life," he says. "Now, we're literally spending the majority

of our waking hours doing activities that have only been around for the past couple of decades at most. With these huge social and technological changes, we should really see what kinds of impacts they might have on health."

Much of the research that relates to these issues focuses either solely on positive impacts or solely on negative impacts of technology on health, says Primack. His hope is that Pitt's new center will provide collaborators from throughout the University with resources to look critically at the enormous, complex nexus of health and technology while helping to develop effective remote interventions.



MARK BOLSTER/UPMC

Brian Primack will help us navigate the cloudy nexus where health meets personal digital technologies.

"We can leverage these technologies to do unbelievable things that we've never been able to do before," he says.

"There's now an app on my phone that I can put on my chest, and it will do an EKG for me. Then I can set it to automatically send it to my cardiologist. That might improve detection of a potential problem if I have chest pain. It might help reduce costs so I don't have to incur a \$1,000 or \$2,000 bill." However, there are drawbacks to people giving themselves EKGs, he notes. A layperson might take an EKG incorrectly or miss other problems that a physician could detect. Because it's far cheaper to use an app than to get an EKG at a hospital, patients might be inclined to choose the less costly, easier option when they should really meet with their PCP. In other words, an app a day might keep the doctor away, but when and how should it? As we move forward, Primack says, it's essential to research the impact of the tech-based health care interventions that we develop, which is no easy task given how quickly technology is evolving.

"We can't just reduce a human being to an EKG tracing," says Primack. "In some ways there is no substitution for seeing a person in the flesh. There are a lot of times when a person has an EKG that's totally normal, but there's something about what they're saying, or the way they're saying it, that can bring us more concern and can help us clinically make a different determination. There is concern about losing that." All innovation has unintended consequences, Primack points out, which is why it's important to have research and critical thought involved with technological development, especially when it affects our health and health care. —Kristen Cosby

Lots of people at Pitt and elsewhere are realizing that the little computer you probably carry around with you can help you stay (or get) healthy. It's a realm that's ripe for apps, and we got a peek at some under development at the med school and other health science schools. Several of these were finalists or winners of the first Pitt Innovation Challenge (PInCh), a competition orchestrated by Pitt's Clinical and Translational Science Institute with support from the Office of the Provost and the University's Innovation Institute. PInCh provided three \$100,000 prizes and three \$25,000 prizes for the development of promising solutions to health care problems.

## DON'T DO IT: QuitNinja

**ISSUE:** Suppose you want to quit smoking. You throw away your cigarettes, your ashtrays. You make promises to people you love and to yourself. At the end of the first day, you pass someone smoking on the street. More than anything, you want a cigarette. All your good intentions disappear. Wouldn't it be easier if you had a non-judgmental friend by your side day and night to remind you of all the reasons you wanted to quit? Wouldn't it be great if that friend were pocket size and could replace that pack of cigarettes in your jacket?

**APP:** Enter QuitNinja, developed by a team of researchers at Pitt led by Ellen Beckjord (PhD/MPH assistant professor of psychiatry and of clinical and translational science) with help from Pitt's Saul Shiffman (PhD professor of psychology) and Vignet Corporation's Praduman Jain and David Klein. Smokers with an urge to light up can send a message to the app and receive an intervention—maybe a positive message about the benefits of quitting, a suggestion about how to change the immediate environment, or a personal motivator, like a photograph of the kids. QuitNinja helps people during those "weak" moments.

**AWARDED:** \$100,000 PInCh Prize and Beckjord's \$660,000 KL2 research grant from the Clinical and Translational Science Institute.

**WHAT'S NEXT:** An upgraded QuitNinja will incorporate an artificial intelligence component. The



app will actively gather data on the smoker through a Q&A. In addition, QuitNinja will passively gather data that pinpoints the time of the urge, the locale of the user, and the amount of time lapsed from the last cigarette; it will then predict when the user will have another urge to smoke. In the future, QuitNinja could be adapted for other behaviors that require self-regulation. The app is being beta tested by a group of 30 smokers. Pilot trials begin in early 2015.

—Kristen Cosby

## HELP FOR GOOD AND BAD DAYS: SPark

**ISSUE:** The medication schedule and dosage for patients with Parkinson's can be complicated and variable. The meds are time sensitive, lasting only a few hours, and have different effects on different people. Those effects might vary depending on whether the patient is having a "good" or "bad" day. Patients often are left to guess when they need to medicate. That's rough enough for people who don't have a neurological disorder—imagine having to negotiate all the physical and emotional challenges of a disease that makes your body's movements unpredictable from one hour to the next.

**APP:** SPark helps patients with Parkinson's disease remember to take their meds and administer those drugs more effectively. It also keeps a record of dosage so that when patients visit their physicians, they can spend less time trying to figure out what medication adjustments are necessary and more time on other challenges they might be having.

Parkinson's patients can experience "bad episodes" involving tremors and stiffness that endanger them. Standard smartphones and smartwatches have motion sensors embedded within them that, when employed by SPark, can determine when a patient's movements are becoming abnormal. SPark uploads their medication record and information about their body movements into a private record in the cloud that both patients and their care providers can access. Pitt's Samay Jain, an MD assistant professor of neurology specializing in movement disorders, is developing SPark with colleagues from Pitt's Department of Bioengineering, Carnegie Mellon

University, and the Parkinson's Disease Foundation.

**AWARDED:** \$100,000 PInCh Prize.

**WHAT'S NEXT:** An upgrade may include customizable alerts. In a pilot study of 24 patients with Parkinson's, SPark was able to detect tremors with more than 90 percent accuracy. The team will conduct four focus group studies to test the software. If SPark continues to predict the need to medicate with at least 90 percent accuracy, it will be rolled out for larger trials. —KC



QuitNinja is like a pocket-size friend that can remind you why you want to quit smoking. (Illustration adapted from an app prototype.)

## JOINT DECISIONS: PIVOT

**ISSUE:** Consider the mighty anterior cruciate ligament (ACL). When it works well, it controls the back and forth movement of the knee, providing necessary stability. When it doesn't work, it's the scourge of many an athlete. Each year, about 150,000 people in the United States undergo ACL reconstructive surgery. The orthoped's classic diagnostic tool is the manual pivot-shift test, in which the examiner rotates the patient's extended leg toward the inside and then flexes the knee past 30 degrees to assess whether the tibia's position on the femur is lax or misaligned. The problem? The condition is subjectively graded on a severity scale. "Grade 1 in my hands may be grade 2 in yours," says Volker Musahl (Res '08), Pitt associate professor of orthopaedic surgery and bioengineering, as well as medical director of the UPMC Center for Sports Medicine.

**APP:** Musahl and his collaborators came up with PIVOT, an iPad app that video records the pivot-shift test as a physician performs it. Before the test, three markers are placed at strategic points on the side of the knee. The app then tracks those markers, and a built-in algorithm computes how much movement occurred during the test. "It's been validated in the laboratory on cadaver studies," says Musahl. "Now, instead of saying, 'This is a grade 1 or grade 2 pivot shift,' we can say, '[It's a] 2.6 millimeter shift.'" The app is currently being tested in an international multicenter clinical study involving four medical centers, including UPMC.



**AWARDED:** PIVOT received honors in 2013 from the Brazilian Congress of Orthopedics and Traumatology and the International Society of Arthroscopy, Knee Surgery, and Orthopaedic Sports Medicine.

**WHAT'S NEXT:** If the app, which has received a U.S. patent, proves its mettle in the multicenter trial, Musahl would like to get it to market so any orthopaedic surgeon can use it. PIVOT, he says, has other potential uses, including assessing injuries on the sidelines of athletic fields and tracking the success of rehab therapy. He expects that one day there will be an Android version.

—Sally Ann Flecker

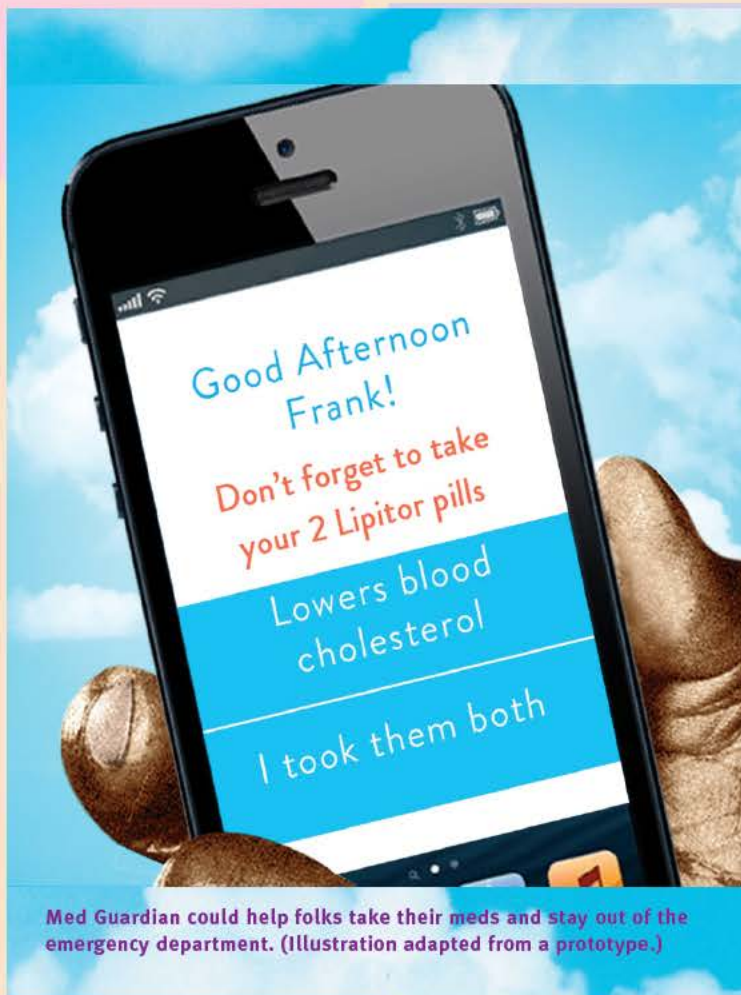
## MORATORIUM ON MEDS MISUSE: Med Guardian

**ISSUE:** Half the drug regimens prescribed in this country aren't carried out as directed. People fail to take their medications for many reasons: expense, confusion, inability to feel the effects of the medication, or the presumption that they're cured (as is frequently the case with antibiotics). In addition, accidental poisoning from prescription drugs is a growing concern. In 2010, misuse of prescribed medications caused more than 35,000 deaths and more than 400,000 emergency department visits.

**APP:** Like SPark—the app for Parkinson's patients—Med Guardian should help patients keep track of their prescriptions. But Med Guardian is for a wider audience. Say you have type 2 diabetes, high blood pressure, and arthritis. You (or your pharmacist) could enter all of your scripts into Med Guardian, which would then upload that information to a database. When you needed to take your blood pressure medicine, an alert would appear on your smartphone showing you a picture of your blood pressure pills (so you know you're taking the right medication) and a description of the purpose of the medicine. You would then confirm that you'd taken it. That record could be uploaded to the cloud so that you (or a member of your family or a health care provider) could track your medication adherence online. You'd also get feedback about how successful you were at adhering to medication regimens.

**AWARDED:** \$25,000 PlnCh Prize.

**WHAT'S NEXT:** The team—including Pitt med's James Kaus (MD '15), Olufunmilola Odukoya (PhD assistant professor of pharmacy and therapeutics), and several others—is developing the app's architecture, designing the clinical trial, and engaging in discussions with patients, pharmacists, and physicians about improving medication adherence with the app. The team intends to have the product ready for wider market release by January 2015. —KC



Med Guardian could help folks take their meds and stay out of the emergency department. (Illustration adapted from a prototype.)

## SIREN CALL: ThinkSepsis

**ISSUE:** Quick—name the most common condition prompting a call to the EMS. No, it's not heart attack, stroke, or even traumatic injury. It's sepsis, a deadly syndrome affecting more than 1 million adults in the United States each year and the number one killer of patients in the hospital. Still, it's not on everyone's radar. Patients present with fever, high respiration and heart rate, and, perhaps, confusion, which could point in many different directions. But every one-hour delay in the treatment of sepsis increases the risk of death by about 7 percent. So the more quickly sepsis can be diagnosed and treated, the better the chances of survival.

**APP:** Identifying and treating sepsis as early as possible—in the ambulance—is the goal for sepsis tool innovator Christopher Seymour, an MD assistant professor in the departments of critical care medicine and emergency medicine. He and his collaborators within those departments and at Pitt's Clinical and Translational Science Institute are developing ThinkSepsis to prompt first responders—including paramedics and firefighter EMTs—to recognize the signs and symptoms of septic patients. Not only that, but the app will report the symptoms and transmit the patient's biometrics to doctors at the receiving hospital or the medical command personnel who are helping the paramedics to activate a system of care.

**AWARDED:** \$50,000 CTSI grant.

**WHAT'S NEXT:** Seymour expects a prototype to be built in the coming months. "EMS and medical practitioner awareness of sepsis is so lacking," says Seymour. "We think it's a really important area." —SAF



Everything's coming up  
remote interventions.







## HEY KIDS, IT'S OKAY TO ASK: IOTAS

**ISSUE:** For the past 24 years, the Education Department of Planned Parenthood of Western Pennsylvania sponsored face-to-face peer education in resource classrooms within schools. A student with questions about sexual health could show up at a designated resource classroom and ask questions of a trained peer helper. A Planned Parenthood educator would be in the room to help, yet the students could exchange information in a private conversation. This kind of peer education has been effective in disseminating accurate information about sexual health among teens.

Then the kids stopped coming as much. It wasn't clear why, but we can guess: The Internet offers a lot of information that resource rooms used to; and maybe kids prefer that anonymity to talking about this stuff in person. Still, it's clear that teens don't mind texting, and they don't mind texting about sex.

**INTERVENTION:** Planned Parenthood's Katie Horowitz, Jose Garth, and other agency educators, with consultants from Pitt's Graduate School of Public Health (including Christina Mair, a PhD assistant professor of behavioral and community health sciences) as well as developers at Apps N'at, teamed up to create IOTAS, or It's Okay to Ask Someone, a text line about sexual health for high school students.

This is how it works. Say a girl wanted to know whether she could contract HIV from kissing. She could send a text to IOTAS. Through a customized app, Planned Parenthood educators would then screen the incoming question and deliver it to a queue for any of its 150–175 peer helpers. The peer helpers would access the queue from an app on their smartphones or from tablets provided by Planned Parenthood and select questions to respond to. Their supervisors would then review the answers, make suggestions, and approve the best responses. For example, "HIV can only be contracted through the exchange of blood, semen, vaginal fluid, and breast milk. You cannot get it from spit!" Approved answers and comments from the peer helpers would then get texted back to the teen who asked the question.

**AWARDED:** \$25,000 PlnCh Prize.

**WHAT'S NEXT:** The program will be piloted in four Pittsburgh high schools in the 2014–2015 academic year and marketed throughout Allegheny County in the summer of 2015. —*Kristen Cosby*

LET'S  
TALK/  
CHAT/  
POST/  
SMS  
ABOUT  
IT



Pitt researchers are engaging young people and others through texts and online support groups to help them build healthy lifestyles and get them through tough times.

## TEXTING V. BINGEING: TRAC

**ISSUE:** Binge, or hazardous, drinking is defined as the consumption of enough alcohol to raise blood alcohol level to .08 percent. (For men, that typically translates to imbibing five or more drinks within about two hours; women typically would have to have just four or more drinks.) Binge drinking is a common pattern of alcohol abuse among young people.

**INTERVENTION:** Imagine you are a college student. You tend to drink too much on Friday and Saturday nights. You aren't interested in quitting, but you'd like to control your party habits. Maybe your phone could help you.

Brian Suffoletto, an MD assistant professor of emergency medicine at Pitt, and his team have developed a program called TRAC (which stands for Texting to Reduce Alcohol Consumption) that uses texting to help reduce binge drinking among young adults who have already ended up in the emergency room and are considered at risk for the behavior. (That's about a third of young patients in the emergency department.) This system is the first intervention for binge drinking that's proven itself in a large, randomized clinical trial.

If you subscribed to TRAC, every Thursday at 4 p.m. you would receive a text message like, "Hey, it's the TRAC team checking in. Do you have any plans to drink this weekend?" If you reply that you won't be drinking, TRAC sends a message of positive reinforcement, maybe, "Good, you are healthier for it!" But if you say that you are planning on drinking, TRAC then asks, "Are you planning on having more than three (or four) drinks?" If you say yes, you are asked to set a short-term goal for the weekend to restrict your drinking to less than that. But if you reply that you have no plans to restrict yourself, TRAC then asks you to reflect on your choices and reminds you that drinking is associated with injury and illness. The program checks back in with you on Sunday at noon to review whether you've met your goals.

A clinical trial of 756 young adults at four emergency departments throughout Pittsburgh demonstrated that young people are more candid in their texts to TRAC about their drinking habits and their failures to meet their goals than they might be with a physician. After three months, TRAC users reported consuming fewer drinks per session and drinking fewer days per week. Suffoletto's team published its results this July in the *Annals of Emergency Medicine*.

**AWARDED:** A five-year \$873,125 National Institutes of Health grant funds further research and development of TRAC.

**WHAT'S NEXT:** The TRAC team hopes to program the software so that it can text with its users while they are in high-risk

situations, like at a party or a bar. The team enrolled Pitt undergrads in its studies of the app; it will continue to expand enrollment among Pitt students and other young people by partnering with other colleges and medical centers. —KC

## TAKE YOUR SUPPORT GROUP WITH YOU: Online Treatment

**ISSUE:** Patients often turn to the Internet to build their support networks and answer their health questions. Unfortunately, the accuracy of the information that they find online isn't always reliable. Additionally, no one has ever studied the effects of health-related social networking on patients.

**INTERVENTION:** In October 2012, Pitt's Bruce Rollman (an MD/MPH professor of medicine, of psychiatry, of biomedical informatics, and of clinical and translational science) and his team launched Online Treatment for Mood and Anxiety Disorders, an Internet support group, or ISG, built for UPMC primary care patients who show signs of depression and anxiety. (A mobile-device-friendly version loads automatically for patients logging in on the go.) The ISG, which may be the first with ties to an organized health care delivery system, offers a forum for patients to commiserate over shared experiences—from sleep disturbances, to weight management, to how to talk to people in their lives about their illness.

In a randomized trial of 704 depressed and anxious patients from 26 UPMC-affiliated primary care practices, Rollman's team will compare the effectiveness of usual care, versus using the ISG on its own, versus using the ISG in combination with Beating the Blues (a Web-based cognitive behavioral therapy program). Beating the Blues replaces tried-and-true paper workbooks that help patients learn better ways to view and respond to challenges.

Online, patient engagement is much easier to track, Rollman notes.

So are patients' needs. For example, as the team monitored ISG discussion board comments from the patients (who are anonymous), they learned that there was a lot of interest in the topic of domestic abuse. So, the team created a page with relevant information and resources.

**AWARDED:** \$2.6 million grant from the National Institute of Mental Health.

**WHAT'S NEXT:** Rollman's team opens the study blind in 2015. Preliminary results on patient engagement are "very encouraging," reports Rollman. He's hopeful that this model of a UPMC-branded support group might prove useful for other patient populations. —Elaine Vitone