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## Redefining Medicine With Apps and iPads

SAN FRANCISCO — Dr. Alvin Rajkomar was doing rounds with his team at the University of California, San Francisco Medical Center when he came upon a puzzling case: a frail, elderly patient with a dangerously low sodium level. As a third-year resident in internal medicine, Dr. Rajkomar was the senior member of the team, and the others looked to him for guidance. An infusion of saline was the answer, but the tricky part lay in the details. Concentration? Volume? Improper treatment could lead to brain swelling, seizures or even death. Dr. Rajkomar had been on call for 24 hours and was exhausted, but the clinical uncertainty was “like a shot of adrenaline,” he said. He reached into a deep pocket of his white coat and produced not a well-thumbed handbook but his iPhone. With a tap on an app called MedCalc, he had enough answers within a minute to start the saline at precisely the right rate.

The history of medicine is defined by advances born of bioscience. But never before has it been driven to this degree by digital technology. The proliferation of gadgets, apps and Web-based information has given clinicians — especially young ones like Dr. Rajkomar, who is 28 — a black bag of new tools: new ways to diagnose symptoms and treat patients, to obtain and share information, to think about what it means to be both a doctor and a patient. And it has created something of a generational divide. Older doctors admire, even envy, their young colleagues' ease with new technology. But they worry that the human connections that lie at the core of medical practice are at risk of being lost. “Just adding an app won't necessarily make people better doctors or more caring clinicians,” said Dr. Paul C. Tang, chief innovation and technology officer at Palo Alto Medical Foundation in Palo Alto, Calif. “What we need to learn is how to use technology to be better, more humane professionals.”

Dr. Paul A. Heineken, 66, a primary care physician, is a revered figure at the San Francisco V.A. Medical Center. He is part of a generation that shared longstanding assumptions about the way medicine is practiced: Physicians are the unambiguous source of medical knowledge; notes and orders are written in paper records while standing at the nurses' station; and X-rays are film placed on light boxes and viewed over a radiologist's shoulder. One recent morning, while leading trainees through the hospital's wards, Dr. Heineken faced the delicate task of every teacher of medicine — using the gravely ill to impart knowledge. The team arrived at the room of a 90-year-old World War II veteran who was dying — a ghost of a man, his face etched with pain, the veins in his neck protruding from the pressure of his failing heart. Dr. Heineken apologized for the intrusion, and the patient forced a smile. The doctor knelt at the bedside to perform the time-honored tradition of percussing the heart. “Do it like this,” he said, placing his left hand over the man's heart, and tapping its middle finger with the middle finger of his right.

One by one, each trainee took a turn. An X-ray or echocardiogram would do the job more accurately. But Dr. Heineken wanted the students to experience discovering an enlarged heart in a physical exam. Dr. Heineken fills his teaching days with similar lessons, which can mean struggling upstream against a current of technology. Through his career, he has seen the advent of CT scans, ultrasounds, M.R.I.'s and countless new lab tests. He has watched peers turn their backs on patients while struggling with a new computer system, or rush patients through their appointments while forgetting the most fundamental tools — their eyes and ears.

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