The future of healthcare, which I will call "wellcare," is going to be driven by information. More things will collect, integrate, and analyze information, and we'll have new ways to use this information in our everyday lives.

For example, wearables have emerged in the past few years, collecting information about our waking and sleeping hours and nudging us to make lifestyle changes. But this is just the tip of the information iceberg. The Internet of Things will extend to include wearables, creating what I will call "everywhereables." We don't have enough experience yet to know exactly how far these things will go, but it's certainly reasonable to expect that our houses will be watching us, our cars will be watching us, and our clothing and jewelry will be watching us. Commercial success of nanotechnology will allow us to do a much better job of keeping track of what we're doing and how we're doing it, and this information will be synthesized in amazing new ways.

New data sources will be pervasive and startling. For example, MIT Media Lab and Microsoft have already started experimenting with smart tattoos. One current opportunity is the use of machine learning to help identify patterns in big data. More correctly, big data will evolve into huge data. We could data mine electronic health records, looking for correlations—where patients live, their genetic markers, their family medical histories, and their physiological characteristics. Based on the history of people with similar backgrounds and diseases, we might find evidence to show what types of therapies are most effective for them.

Now imagine what will happen when everywhereables are also feeding into huge data. Even though the data collected by everywhereables might not be as accurate as other technologies, the sheer pervasiveness of them will lead to valuable insights. More data will feed into better analysis techniques, which will generate more data—and the cycle feeds upon itself.

In the United States alone, tens of millions of surgeries occur every year. Imagine what we could learn from minutely detailed medical records for each surgery: real-time recording of vital signs, interventions, anesthesia monitoring, and even motion trackers on the surgeon's scalpel! We could analyze that along with patient information before the surgery, immediately after, and months later. Huge data will enable "standardized customization of wellcare." Medical professionals constantly tell me that one of healthcare's challenges is that every patient is unique. If we have thousands of terabytes of data about what has worked for other patients, I am positive that we can construct a unique healthcare profile for every patient that is based on standard profiles derived from every other patient.

Impact on Healthcare Technology

The coupling of everywhereables and huge data won't just benefit patients; it also will benefit medical devices themselves. Everywhereables can track the health of the equipment used in healthcare. Instead of periodic maintenance driven by historical wear-out curves, tiny inexpensive sensors can monitor a device's calibration, wear, sensor drift, and other key parameters and notify you when it needs maintenance. Taking this a step further, devices could produce vital signs on their relative health, and we could take action before a device needs to be taken out of service. Devices will troubleshoot themselves, and huge data can spot patterns in device performance, just as we will do with patients.

On a side note, one consequence of miniaturization and mass production is that many things are increasingly smaller and cheaper. Therefore, if an everywhereable breaks, rather than fixing it, you'll likely throw it away—a reality that has obvious drawbacks in addition to its advantages.
People are interacting with technology rather than other people. The same is true with today’s healthcare, with health professionals spending most of their time interacting with technology rather than patients, and this trend likely will continue.

Several skills. People once navigated by the stars during the daytime; our retinas are sensitive enough to see the stars in daylight, but this skill has become atrophied in modern humans. Another example of a skill that most of us have lost is the ability to hunt by smell alone. The Waorani tribe in Ecuador can still do this amazing feat. But, alas, we have other skills today that have taken their place. Although the typical reader of Bi&T may have lost those Waorani-level navigational or hunting skills, we can build a mean spreadsheet.

Every time I see a news report about self-driving cars, I wonder what skills are going to be lost. What will happen to someone who relies on self-driving cars for day-to-day use, but then vacations in another country where only people-driven cars are available? Can they drive at highway speed? Can they drive in the rain at night? Are we, as a society, comfortable with this tradeoff?

I know that I’ve gained some skills over the past few years and lost others. I’ve become quite adept at polytasking, and usually once a month you will find me on two conference calls at the same time, using two Bluetooth headsets connected to separate phones, while reading email and answering text messages. I don’t know whether 10 years ago I would have been able to do that. However, along the way, I lost the ability to read books. I can read multiple emails at once, but I can’t concentrate on a single task long enough to make it all the way through a book chapter.

In a similar vein, I worry that huge data, coupled with machine learning, will cause us to lose critical-thinking skills. We see this everyday as, “I read it on the Internet, so it must be true.” The future analog is “I’m here to see a doctor because my earrings say I have the Zika virus.”

We are already seeing this, in fact. Several stories have appeared in the press about people overexercising because they believed their consumer heart monitor and not their own senses. Although they could feel their heart beating quickly and knew they were breathing heavily, their wearables said they still weren’t at their target heart rate, so they increased the pace of their exercise. Although some people will rightly claim that this is off-label use and no one should expect technology to be accurate enough for that use case, the point is that people often believe whatever their device tells them.

Combining these dark thoughts, I wonder what will happen to healthcare if we no longer need critical-thinking skills. If everywhereables are constantly monitoring us, and if medical diagnosis and treatments are being driven by machine learning and the collective experience of millions of patients, will healthcare providers be mere servants of the machine?

I hope not.