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DANIEL HERTZBERG

# Devices to Help You Sleep, Robotic Boots and Other Technologies That Will Change Your Health

Doctors and researchers at Google, MIT and more forecast advances they see coming for health and wellness

By [Ariana Perez-Castells](#)

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Innovative [devices and technologies are coming](#) that will change the way patients get care and stay healthy, doctors and healthcare experts say.

Here, a look ahead at some of the most promising potential advances, including wearable devices to improve quality of life, new applications of artificial intelligence, and expanding options for treatment at home.



ILLUSTRATION: KYLE HILTON

## **Do-It-Yourself Ultrasounds**

**Eric Topol, Scripps Research Translational Institute**

In the future, ultrasound imaging could be done from home as easily as we deposit a check from a cellphone, [says Eric Topol](#), a cardiologist and founder and director of the Scripps Research Translational Institute.

Probes linked to a phone or tablet will allow patients to take an ultrasound image themselves, Dr. Topol predicts. That could let patients share their results directly with their medical practitioners from wherever they are, without having to travel to a hospital.

AI will help ensure accuracy, Dr. Topol says. “For the heart, which is the most difficult ultrasound—echocardiogram—you can have someone with no training [do it],” he says. “As long as you put the probe on the left side of the chest, the AI will tell you to move it up or down, clockwise, counterclockwise and automatically capture the video images.”

But Dr. Topol warns that the interpretation should have oversight from a human as well.

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Researchers [at Massachusetts Institute of Technology](#) and [University of California San Diego](#) have also been developing different ultrasound technologies that use patches to capture ultrasound imaging over a period

of time, not just in distinct snapshots, says Dr. Topol. “It’s pretty exciting because then you could get like a week’s worth of continuous imaging. This isn’t just lying in a bed. You want to see how an organ is working under real-life circumstances.” Currently the patches need to be linked up to computers with wires, but researchers envision devices that can be used at home.

A challenge Dr. Topol foresees in harnessing these technologies is ensuring the probes and patches can deliver high-resolution results while still making them affordable.

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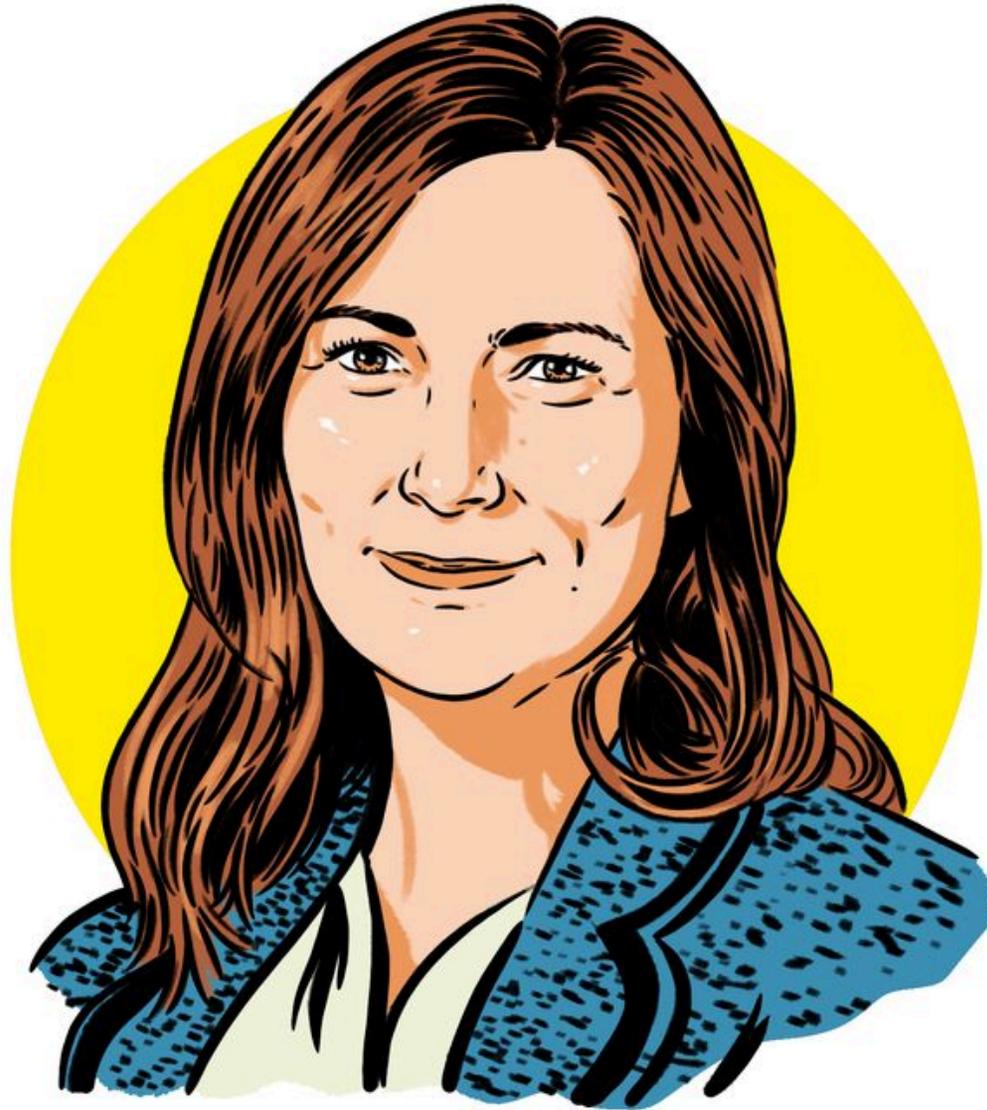


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## **A Blood Substitute**

**Kerri Dugan, U.S. Department of Defense**

Transporting blood from a donation site to where it is needed on the battlefield isn't easy, says Kerri Dugan, the director of the Biological Technologies Office at the Defense Advanced Research Projects Agency, part of the U.S. Department of Defense. It's challenging to access a constant supply and keep the blood refrigerated as it travels.

“What if instead, you had a dehydrated powder, that when you add water to it, it provides all the qualities that you need from whole blood in an emergency situation?,” says Dr. Dugan, who has a doctoral degree in molecular biology.

A few months ago, she and her team embarked on a four-year program to research and develop a substitute for blood that can be shelf-stable and made at scale.

The project was started with the goal of aiding soldiers who lose blood in battlefield situations, but a blood substitute could eventually be used in civilian settings as well, Dr. Dugan says. In 2020, the country's blood supply [was dangerously low](#) as the pandemic shut down donation sites. Successful [development of a blood substitute](#) could decrease the country's dependence on donations, she says.

One of the challenges is, the substitute has to have three crucial characteristics of blood to be viable, Dr. Dugan says. It needs to raise blood pressure, deliver oxygen, and have the ability to stop bleeding. She says there's no blood substitute that can do all this yet.

“If you have just one of those three pieces, it doesn't fulfill all the needs of whole blood,” she says.



ILLUSTRATION: KYLE HILTON

## Computer-Aided Diagnosis

Atul Gawande, U.S. Agency for International Development

Artificial intelligence is likely to have a growing role in interpreting our medical tests and scans, says Atul Gawande, assistant administrator for global health at the U.S. Agency for International Development.

“We have proof that double readings of mammograms in the U.S. are able to be more accurate and have more sensitive detection of cancers—fewer misses—but it is challenging and expensive to have two different readings,” says Dr. Gawande, who is a surgeon [and writer](#). If an AI tool was able to provide an initial screening to accompany an expert radiologist read, the double reading could become a more commonplace and accurate method for doing mammograms, he says. “I suspect that could spread to other things as well.”

At USAID, Dr. Gawande and his team are already using computer-aided detection to combat tuberculosis in countries across the world, from Nigeria to Vietnam, using a portable X-ray system in a backpack that is able to provide a reading of the X-ray it produces. In the future, he says, we could see more applications of this computer-aided detection across various different diseases, and it will be more common for AI to support doctors making diagnoses.

“From a clinician point of view, you can understand ways in which this could be better for clinicians who are doing very routine kinds of screenings and, have the detection help alleviate that burden, especially where we have shortages of clinicians,” he says. “I can also see ways that clinicians can be threatened by it.”

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## The Doctor in Your Pocket

Karen DeSalvo, Google

The smartphone could become the central device for most health and wellness needs, says Karen DeSalvo, the chief health officer at [Alphabet Inc.](#)'s Google.

“Sometimes in medicine, we want to add things on, like, what’s the new thing?...but this is already in people’s pockets. If it’s already part of your life, how do we enable it so that it’s helping your health, which is a critical part of life?” says Dr. DeSalvo, who is an internist.

Among her team’s efforts at Google is an AI system that has been trained on large language models—the type of technology that drives Chat GPT—to provide answers to medical questions, as a possible building block for future healthcare applications.

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Greater reliance on phones could bring far-reaching positive changes, she says. Now, the healthcare system holds patient information and occasionally lets those patients in to see it. But during the pandemic, she says, the way patients relate to their medical information and seek care started to shift that power dynamic. “What we started to see during the pandemic was this explosion of consumers saying, you’re going to open the door and share my mammogram results with me—but what if I could actually have the mammogram, have the image? What if I could get a second read on that because I had an app on my phone that would allow that to happen?,” she says.

Getting doctors to trust data patients may provide on their phones could be a challenge, she says. Patients may also have privacy concerns.

“What people want to know is that they have a choice about whether their phone is a tool for their health, that they have transparency about how that data is being collected and shared, and that they can change things if they want to,” Dr. DeSalvo says.

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ILLUSTRATION: KYLE HILTON

## **A Robotic Boot**

**Steve Collins, Stanford University**

“People have been dreaming about robots they could wear on their bodies since the advent of machines,” says Steve Collins, associate professor of mechanical engineering and director of the Biomechatronics Laboratory at Stanford University.

“It’s only been in the last decade actually, that we’ve had any exoskeletons or prosthetic limbs that demonstrably improve any aspect of human performance. But we have hit that tipping point recently,” says Prof. Collins who has a doctorate in mechanical engineering. “The near future looks really exciting.”

He’s been developing a wearable robotic boot that gives the user a personalized “push” to help them walk with less effort. The device could allow aging people experiencing a decline in mobility to continue to live at home, and enjoy socializing in the ways they’re used to. Going up stairs or crossing the street quickly could become easier.

People might not want to wear a device that signals their age, he says. But perceptions are changing. “The culture seems to be really shifting around these technologies, maybe through popular media sci-fi. People find this high-tech stuff kind of cool,” he says.

The boot is being tested in laboratory trials, as his team figures out how to improve balance and potentially reduce joint pain. In the future it could either become a consumer device which people pay for out of pocket at their local pharmacy, or an approved medical device that could be covered under insurance, he says.

“In order to actually help people, these technologies have to be commercially viable,” Prof. Collins says. He hopes that proving this

technology works for a large market would encourage companies to invest in building such exoskeletons for smaller patient populations with various physical disabilities.

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## On-the-Spot Treatments

### Pattie Maes, Massachusetts Institute of Technology

Devices that provide on-the-spot treatments for health issues, similar to an insulin pump for diabetes, are on the horizon, says Pattie Maes, professor of Media Technology at the Massachusetts Institute of Technology Media Lab.

Her team has been at work designing wearable devices that use electronic and audio stimulation to help people fall asleep and get better rest. One device simulates the sensation of rocking to help people fall asleep.

“If a system tells you night after night that your sleep score is low, it actually isn’t very helpful, because it makes you more anxious about the fact that you’re not sleeping well. It could potentially make your sleep worse,” Prof. Maes says. “I think just measuring all this data and then giving it to people isn’t enough. It’s important to also think about interventions.”

Such devices for immediate treatments could be developed to treat various ailments, she says. They could measure data on your physical and mental health and help you live at your optimal level.

Prof. Maes sees treatment for anxiety as a theoretical application. “Maybe they will have a device that based on their physiological readings tells [people]—or may not even tell them—that they are getting anxious, but that somehow stimulates them to breathe in a different way or [do] something to be able to deal with that anxiety moment better,” she says.

This doesn't mean we won't need doctors any more, she says. "I think that doctors will be involved in maybe prescribing these types of digital solutions."

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