The doctor can see you now

August 13 2014, by Kathleen Masterson

How much does that fitness wristband or sleep app really tell you about your health? From a medical perspective, not much. Silicon Valley is partnering with doctors to develop a next generation of devices that could make check-ups a real-time occurrence.

We've all seen ads for Fitbits, Jawbones, Gearfits – perhaps even tracked our own health with a specialized home glucometer or blood pressure cuff.

These devices can help collect data that can help motivate an individual and track progress, but they don't tell us much beyond that. The next wave of wearable health technology has far more advanced biosensors

that can collect new data, teach us what data is most valuable – and maybe even change the way we practice medicine.

Wearable health devices are just one niche in the rapidly growing field of digital health. Future wearable biosensors may be as small as a patch worn on the skin or an ear bud or even a tiny fiber sewn into clothing – and these tools can gather new data in real-time with patients in the real world, tracking things we couldn't accurately measure outside a hospital until now.

This data not only will provide useful information for the patient and his or her doctor, but could also lead to huge gains in precision medicine, an emerging field that aims to integrate data from molecular, clinical, population and other research to create treatments that are more predictive, preventive and precise.

"We need to get to a world where individuals are using digital health devices to collect accurate, detailed data about themselves and that data is available for clinical trials as well as to their clinicians for helping them maintain wellness or managing disease," says Michael Blum, MD, director of UCSF's Center for Digital Health Innovation, which collaborates across health care and industry to create, implement and validate digital health technologies. One of its biggest collaborations is with Samsung, a partnership that's launched the UCSF-Samsung Digital Health Innovation Lab at Mission Bay.

Blum, who also serves as chief medical information officer of the UCSF Medical Center, says the goal is for wearables being developed now to someday be able to seamlessly "provide patient data into larger databases that can be accessed for clinical care and that multiple researchers can have access to in order to create new understandings.

"When we have access to these large, rich data sources, we will likely see

new patterns and relationships that will lead to the development of new, non-traditional 'vital signs.'"

For all of the wearable health devices being developed, Blum says, it's vital that they are validated: Do the sensors accurately measure the things they're designed to measure? Does wearing the device and knowing this information lead to changes in treatment or behavior? Does it generate better outcomes for the patients? Did we uncover new health data points that could be more important to measure for a certain disease?

For example, Aenor Sawyer, MD, an orthopaedic surgeon and associate director of CDHI, says one key area where monitoring could really help inform doctors – and patients – is when a patient is released from the ICU or after a serious surgery.

"Imagine a patient who's been closely monitored, then when he's discharged, we don't have any oversight, and we don't have any vital signs being taken. These patients might benefit from some closer scrutiny. We know that certain things can happen in those windows that would be nice to have some way to track it," says Sawyer.

A number of wearable health devices being developed now could help close that critical loophole. And the data that future wearables gather will teach us new key indicators for health we haven't even thought of yet, Sawyer says.

Here are five exciting new wearable health gadgets on the horizon:

Track what gets you stressed.

The next generation of wristbands will have far more accurate biosensors that can measure specific health indicators such as blood pressure, heart rate, oxygen saturation and body temperature. The devices will be able to

send data to your doctor, and could help researchers measure how different medicines or behavior changes are affecting patient health. For example, Samsung has partnered with UCSF to develop the Simband, which will measure heart rate, blood pressure, temperature, oxygen level and even signs of stress. Simband is also a reference platform that allows other companies to develop sensors that will integrate into it, allowing for a community of developers to create the eco-system of sensors and products that will be critical to this nascent market.

Take part in a sleep study – in the comfort of your own bed.

In the sleep lab, researchers hook patients up to complex machines and sensors to measure motion, heart rate and rhythm, respiratory rate and rhythm, and oxygen and carbon dioxide saturation. Soon tiny, non-invasive biosensors could gather this data while you sleep in your own bed, and transmit the information to a central database.

Know how your elderly mother is doing from hundreds of miles away.

A combination of biosensors can measure movement and heart and respiration rates. They could be calibrated to an individual's patterns to alert caretakers when something is amiss. Knowing that an elderly relative is not going to the refrigerator, leaving the house, or calling friends and family could provide early clues to a brewing illness that could be easily managed with early intervention, but might be devastating if left unchecked.

Let the doctor monitor your heart in real time.

For anyone who has worn a holter monitor to check for irregular heart

rhythms, a Vital Connect patch is a big upgrade. Instead of having to go in to the doctor's office to pick up a cumbersome device, wear it for weeks, then go back to the doctor's office to return it and wait for it to be analyzed, the data from the patch is uploaded to the cloud-based system via the Internet, and the doctor can be alerted if there are any signs of danger.

Measure your vitals while listening to music.

The ear is an excellent spot on the body to measure physical signals such as motion, heart rate and blood pressure. Several companies are exploring making a new high-tech ear bud that can measure heart rate, temperature and respiration rate using photoplethysmography, or PPG, which measures changes in blood flow by shining a light on the skin and measuring how it scatters off blood vessels (this is often done in hospitals with a device that fits over your fingertip).

Provided by University of California, San Francisco