



Taking a new view of vital signs

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ABOUT THE LECTURE

Drawing on his unique perspective as a cardiologist, cancer patient and digital health expert, Jay Pandit presented his team's goal to guide the transformation of medicine through the availability and advances in wearable sensor technology. Pandit discussed which of the body's vital signs are considered universal screening tools for signs of illness. He also explained how the current measurement of these vital signs in the clinic is significantly limited and why longer-term, remote monitoring of these biomarkers is the path forward to individualized healthcare.

TOP TAKEAWAY POINTS

1. **Body temperature** has a long history of being used to indicate infection. When pathogens invade, our immune cells release chemicals to tell the brain to raise the body's temperature set point, which we experience as fever. Digital innovation has enabled this response to be measured with sensors as small as patch tattoos. With continuous temperature monitoring over a specific population and geographical area, fever hot spots could be identified as an early warning sign of viral outbreak.
2. **Heart rate** is the most commonly measured vital sign. The latest miniaturized devices can detect heart rate from a wrist-worn fitness tracker using optical sensors at the skin's surface. Researchers have used these devices to show that changes in heart rate are reliable initial signs of SARS-CoV-2 infection, as well as long-haul COVID. Newer measurements of **heart rate variability**, or the time in between beats, are also being linked to long-term sleep patterns and mental health.
3. **Respiratory rate**—the number of breaths per minute—was historically gauged by listening directly or observing the chest expand. Now, chest-worn accelerometers more accurately detect movement patterns, while novel acoustic sensors recognize subtle respiratory sounds. Based on distinguishable acoustic signatures, scientists are beginning to use the audio data to accurately discern pneumonia or asthma from just snoring or talking.
4. **Blood pressure** is the only vital sign that translates directly into a medical condition—hypertension—which is a primary risk factor for a host of chronic diseases and the second biggest reason for clinical visits. Pandit and colleagues helped pioneer new optical sensors that are making unobtrusive, continuous wrist-based blood pressure monitoring a reality. This approach provides longitudinal data and circumvents the uncomfortable cuff-based measurements traditionally taken in the clinic.
5. **Pandit's team is paving the way for remote patient monitoring**, where individuals and providers can closely monitor health changes in a real-life setting, outside of isolated clinical visits. Scientists are evaluating how to combine and analyze different data streams from an ever-growing number of devices, while carefully considering how these technologies should be managed in the context of regulation, insurance reimbursement and health equity.

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