

MouthLab: Patients' vital signs are just a breath away

August 24 2015



Gene Fridman, Ph.D., with MouthLab. Credit: Yuankui Zhu: Johns Hopkins Medicine

Engineers and physicians at the Johns Hopkins University School of Medicine have developed a hand-held, battery-powered device that quickly picks up vital signs from a patient's lips and fingertip. Updated versions of the prototype, called MouthLab, could replace the bulky, restrictive monitors now used to display patients' vital signs in hospitals and gather more data than is typically collected during a medical assessment in an ambulance, emergency room, doctor's office or patient's home.

In a study published in the September issue of the *Annals of Biomedical Engineering*, the MouthLab prototype's measurements of heart rate,

[blood pressure](#), temperature, breathing rate and [blood](#) oxygen from 52 volunteers compared well with vital signs measured by standard hospital monitors. The [device](#) also takes a basic electrocardiogram.

"We see it as a 'check-engine' light for humans," says the device's lead engineer, Gene Fridman, Ph.D., an assistant professor of [biomedical engineering](#) and of otolaryngology-head and neck surgery at Johns Hopkins. "It can be used by people without special training at home or in the field." He expects the device may be able to detect early signs of medical emergencies, such as heart attacks, or avoid unnecessary ambulance trips and [emergency room](#) visits when a patient's vital signs are good.

Because it monitors vital signs by mouth, future versions of the device will be able to detect chemical cues in blood, saliva and breath that act as markers for serious health conditions. "We envision the detection of a wide range of disorders," Fridman says, "from [blood glucose levels](#) for diabetics, to kidney failure, to oral, lung and breast cancers."

The MouthLab prototype consists of a small, flexible mouthpiece like those that scuba divers use, connected to a hand-held unit about the size of a telephone receiver. The mouthpiece holds a temperature sensor and a blood volume sensor. The thumb pad on the hand-held unit has a miniaturized pulse oximeter—a smaller version of the finger-gripping device used in hospitals, which uses beams of light to measure [blood oxygen](#) levels. Other sensors measure breathing from the nose and mouth.

MouthLab also has three electrodes for ECGs—one on the thumb pad, one on the upper lip of the mouthpiece and one on the lower lip—that work about as well as the chest and ankle electrodes used on basic ECG equipment in many ambulances or clinics. That ECG signal is the basis for MouthLab's novel way of recording blood pressure. When the signal

shows the heart is contracting, the device optically measures changes in the volume of blood reaching the thumb and upper lip. Unique software converts the blood flow data into systolic and diastolic pressure readings. The study found that MouthLab [blood pressure readings](#) effectively match those taken with standard, arm-squeezing cuffs.

The hand unit relays data by Wi-Fi to a nearby laptop or smart device, where graphs display real-time results. The next generation of the device will display its own data readouts with no need for a laptop, says Fridman. Ultimately, he explains, patients will be able to send results to their doctors via cellphone, and an app will let physicians add them to patients' electronic medical records.

A 3-D printer made the parts for the prototype, "which looks a lot like a hand-held taser," Fridman says. "Our final version will be smaller, more ergonomic, more user-friendly and faster. Our goal is to obtain all vital signs in under 10 seconds."

More information: *Annals of Biomedical Engineering*,
[dx.doi.org/10.1007/s10439-015-1247-1](https://doi.org/10.1007/s10439-015-1247-1)

Provided by Johns Hopkins University School of Medicine

Citation: MouthLab: Patients' vital signs are just a breath away (2015, August 24) retrieved 27 April 2024 from <https://phys.org/news/2015-08-mouthlab-patients-vital.html>

<p>This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.</p>
--