

Blood Clot Testing Using Smartphones



Blood clots help stop bleeding in case of an injury. However, blood clots in patients with issues like mechanical heart valves or other heart conditions can lead to a stroke or heart attack. That is why millions of people use blood-thinning medications such as warfarin to make it harder for blood to clot.

Patients using warfarin need to be tested frequently to ensure their blood is in the correct range. Blood that clots too easily can lead to a stroke or a heart attack, but blood that doesn't clot can lead to extended bleeding after an injury. That is why patients need to go to a laboratory or use a costly at-home testing system.

Now, researchers at the University of Washington have developed a new blood-clotting test that uses a single drop of blood and a smartphone vibration motor and camera. Their findings are published in *Nature Communications*.

The system includes a plastic attachment that holds a small cup beneath the phone's camera. The patient can simply add a drop of blood into the cup. This cup contains a small copper particle and a chemical that starts the blood-clotting process. The phone's vibration motor shakes the cup, and the smartphone camera monitors the particle's movement, which slows down and stops moving as the clot forms. The method falls within the accuracy range of standard instruments as per the researchers.

According to senior author Shyam Gollakota, UW professor in the Paul G. Allen School of Computer Science & Engineering, this new method demonstrates that by using the vibration motor on a smartphone, the algorithms can do the same thing, with similar accuracy, using a single drop of blood.

Blood-clotting ability is ranked using the time it takes for the clot to form, i.e. prothrombin time (PT) and a ratio calculated from the PT that allows doctors to compare results between different tests or laboratories, i.e. international normalised ratio (INR). The researchers point out that most people are in the desirable range of PT/INR levels only about 64% of the time. In fact, in countries like India or Uganda, where testing is less frequent, this number is much lower - only about 40% of the time. There is thus a need to make it easier for people to test more frequently.

With this new method, patients can test their PT/INR levels using their smartphone and see a clinician if their results are out of the desirable range. The phone collects two timestamps: when the user first inserts the blood and when the particle stops moving. The method has been tested on three different types of blood samples.

The device is still in a proof-of-concept stage, and commercialisation opportunities are being explored. The next step is to work with patients to test this system at home. The researchers also want to see how the system fares in more resource-limited areas and countries.

Source: [Nature Communications](#)

Image Credit: Mark Stone/University of Washington

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