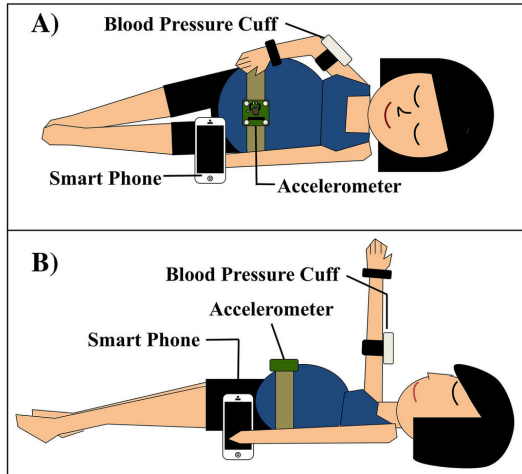


Wearable technology could help pregnant women detect health complications, improve outcomes

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Purdue University researchers are developing an app and wearable technology that will allow pregnant women to use a smartphone to detect whether they have or are susceptible to a preeclampsia, a complication caused by high blood pressure that can cause organ damage and premature birth. The device uses the supine pressor test, which measures whether a woman's blood pressure increases when she changes position from lying on her left side to lying on her back. If the diastolic pressure increases enough, it is a warning sign that a woman is susceptible to preeclampsia. Credit: Purdue University

Pregnant women could use a "wearable" app to detect whether they have or are susceptible to a condition that leads to serious health complications for them or their unborn child.

A Purdue University research team, led by Craig Goergen, an assistant professor in Purdue's Weldon School of Biomedical Engineering, is developing a low-cost automated early detection sensor of preeclampsia, a pregnancy complication that can lead to [high blood pressure](#) and cause

both organ damage and premature birth.

"We hope this will allow us to predict and prevent preeclampsia and reduce the number of children born prematurely each year. This could also reduce the long-term [health complications](#) for mothers," Goergen said.

According to the Preeclampsia Foundation, 5 to 8 percent of pregnancies are diagnosed with preeclampsia, affecting nearly 7 million women worldwide. Preeclampsia is the No. 1 reason that doctors decide to deliver a baby prematurely.

"This is a device that women are going to be able to use at home with a minimal amount of training. That is an important aspect to remember as preeclampsia is a worldwide medical concern," Goergen said.

The World Health Organization estimates that nearly 10 percent of all maternal deaths in Africa and Asia are associated with hypertensive disorders during pregnancy, and the figure is 25 percent of all maternal deaths in Latin America. Most of those deaths are avoidable, according to WHO.

"The most innovative aspect to our technology is that it uses a simple supine pressor test that can estimate a patient's risk for developing preeclampsia," Goergen said. "The test assesses blood flow through the kidney, and 90 percent of women with a positive test eventually develop preeclampsia. The early detection enables more effective detection and prevention strategies."

Women using the app can send the results to a doctor's office, a health care system or a centralized network where the results can be reviewed and where they could receive counseling

focused on care management and treatment options as early as possible.

The researchers received a \$100,000 Grand Challenges Explorations grant from the Bill & Melinda Gates Foundation in 2017 to advance the technology. The program is part of a family of initiatives by the foundation fostering innovation to solve key global and health development problems.

"The Gates Foundation is looking for something that's going to have an impact in the immediate future in low- and middle-income countries," Goergen said. "They are interested because the treatment and management of preeclampsia in sub-Saharan Africa, India, China and other developing countries is typically very poor."

Dr. David Reuter of Seattle Children's Hospital, a Purdue alumnus and a member of the research team, said the primary goal of clinicians is to prevent disease.

"Addressing the problem of prematurity and preeclampsia could have profound implications for women and children globally," Reuter said. "Our scientific insights provide an exciting road map to start revolutionizing the care of [pregnant women](#)."

The financial costs are great, as well. The *American Journal of Obstetrics & Gynecology* issued a report in 2017 estimating the costs to the U.S. health care system for preeclampsia at \$2.18 billion for the first 12 months after birth—\$1.03 billion for mothers, and \$1.15 billion for infants.

While the Gates Foundation's goal is to help women in developing countries, Goergen said the device the Purdue researchers are working on also could help women in inner cities and rural areas of the United States and other developed countries. They plan to initially test the device on low- and middle-income pregnant women in and around Indianapolis once the researchers receive the institutional approval.

"It will be a great way to make sure that these patients are not going down a road that is going to lead to problems for both them and their baby," Goergen said.

Other team members include George Wodicka, the Dane A. Miller Head of Biomedical Engineering at Purdue, and Kirk Forster, a senior research engineer at the Weldon School. The team is working to combine available existing technologies such as smartphones, a conventional inflatable blood pressure cuff, and a wireless accelerometer (which measures body position) to build an innovative prototype that will detect [preeclampsia](#) before it develops.

More information: Warren Stevens et al. Short-term costs of preeclampsia to the United States health care system, *American Journal of Obstetrics and Gynecology* (2017). DOI: [10.1016/j.ajog.2017.04.032](https://doi.org/10.1016/j.ajog.2017.04.032)

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