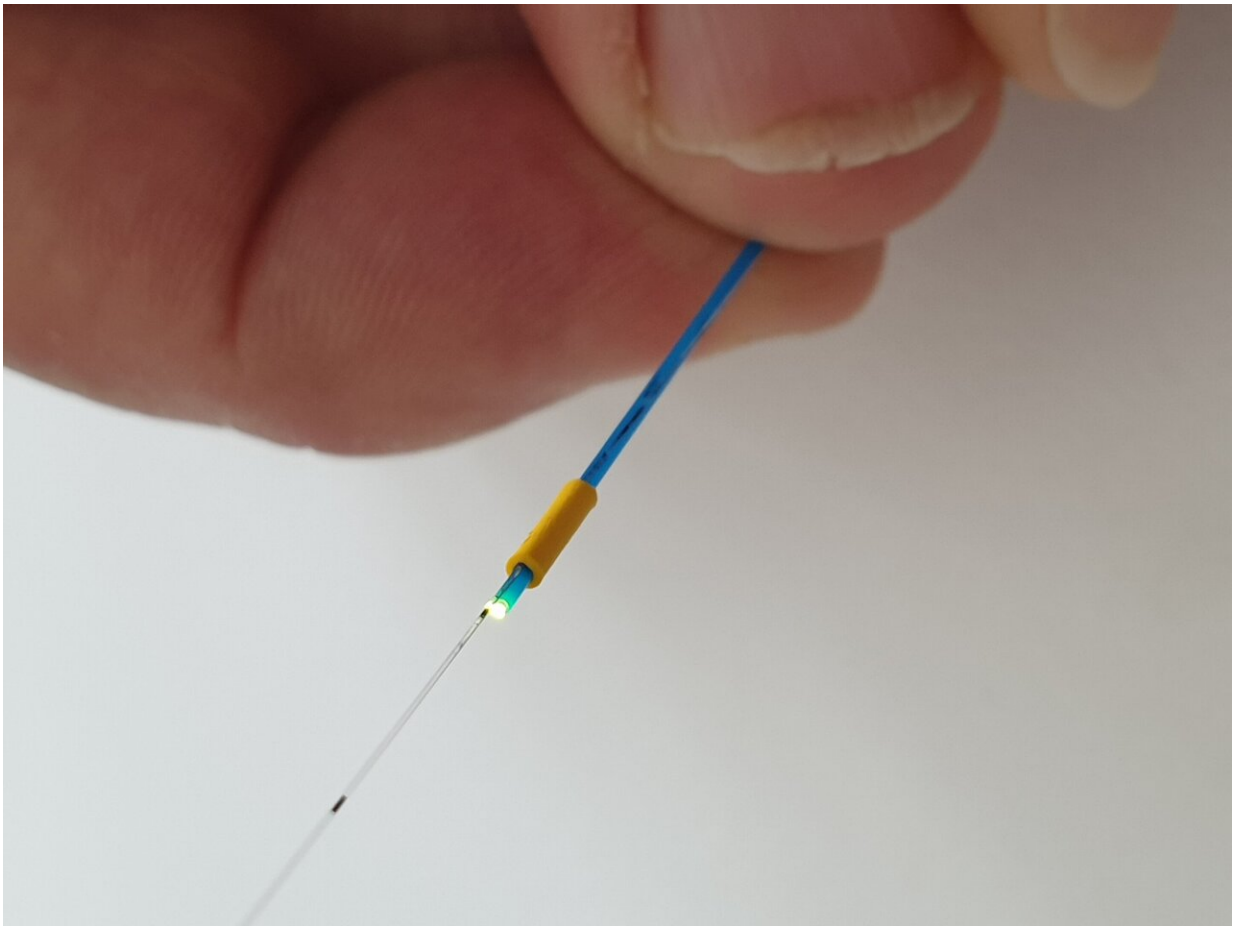
Blood flow monitor could save lives

July 8 2019



The new device can measure continuous and instantaneous blood flow using optical heating at a low power input with an LED light source. Credit: Flinders University

A tiny fibre-optic sensor has the potential to save lives in open heart

surgery, and even during surgery on pre-term babies.

The new micro-medical device could surpass traditional methods used to monitor blood flow through the aorta during prolonged and often dangerous intensive care and surgical procedures—even in the tiniest of patients.

The continuous cardiac flow monitoring probe, under development at Flinders University, is a safe way to give a real-time measurement of blood flow.

"The minimally invasive device is suitable for neonates right through to adults," says research leader Strategic Professor John Arkwright, an expert in using fibre-optic technologies in medical diagnostics.

Professor Arkwright says the device has the potential to be a game-changer—particularly for very young babies, which are particularly susceptible to sudden drops in blood pressure and oxygen delivery to their vital organs.

"It's a far more responsive measurement compared to traditional blood flow monitoring—and without life-threatening delays in the period 'snapshot' provided by current blood flow practices using ultrasound or thermo-dilution."

Neonatal expert and co-investigator Dr. Scott Morris, from the Flinders Medical Centre Neonatal Unit and Flinders University College of Medicine and Public Health, says the new sensor-catheter device promises to deliver accurate blood flow information in critically ill patients, from pre-term babies to cardiac bypass patients.

"This tiny device, which could even be used in pre-term infants, has the potential to be far superior to the intermittent measure of averaged blood

flow delivered by traditional methods which generally only show time averaged flow every 30 minutes or so," Dr. Morris says.

A provision patent has been filed for the device, which is seeking industry partners for further development.

Chief investigator Albert Ruiz-Vargas hopes the device will be picked up for further development, and introduction into regular intensive care and surgical procedures.

"The proof-of-concept prototype is potentially a low-cost device which has passed initial testing in a heart-lung machine," Dr. Ruiz-Vargas says.

"It can be inserted through a small keyhole aperture in the skin into the femoral artery in individuals where heart function is compromised and is so small it can even measure small changes in flow in the tiny blood vessels of infants.

"It's a simple design, which can give readouts similar to a pulsating heartbeat response on a laptop or nearby screen."

For the first time, the Flinders researchers have found an effective model to continuously measure intra-pulse blood flow using a fibre-optic sensor which has the potential to advance monitoring in a medical setting.

They say more research is now required to determine how the sensor will behave under more physiological conditions and to examine different encapsulations tocomply with human safety.

More information: Albert Ruiz-Vargas et al, Optical Flow Sensor for Continuous Invasive Measurement of Blood Flow Velocity, *Journal of Biophotonics* (2019). DOI: 10.1002/jbio.201900139

Medical Xpress

Provided by Flinders University

Citation: Blood flow monitor could save lives (2019, July 8) retrieved 8 May 2024 from https://medicalxpress.com/news/2019-07-blood.html

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