How pulse oximeters work, and why they sometimes do not

(0:04 - 0:25)

Pulse oximeters are one of the most widely used medical tools. They are clipped onto a fingertip to measure blood oxygen levels, which are critical to health and considered the fifth vital sign. Before pulse oximeters became widely used a few decades ago, doctors had to draw blood from arteries to measure oxygen levels, something that could be quite painful.

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Pulse oximeters are simple, affordable, and critically important, but they have a major flaw. Numerous studies show they are less accurate for people with darker skin. Pulse oximeters work by shining two types of light, infrared and red, through your finger and measuring how much of both types of light are absorbed.

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Because oxygenated blood absorbs more infrared light and deoxygenated blood absorbs more red light, comparing how much of each type of light is absorbed provides an indirect measure of how much oxygen is in the blood. A reading above 95% is considered healthy. Pulse oximeters are not perfect.

(1:04 - 1:32)

Many factors can affect these readings, including if a patient is moving, if their fingers are cold, if they have anaemia, if they have poor circulation, or if they are wearing nail polish. Melanin in the skin can also impact readings by interfering with light absorption. The poor performance of the devices on darker skin was detected in studies decades ago, but not widely known until recently, when new studies done during the pandemic brought the issue to light.

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The FDA issued a safety alert about the devices in February of 2021 after studies showed less accurate readings in patients with darker skin could lead to hidden hypoxemia, or people having oxygen levels that were lower than what was indicated on their pulse oximeters. False oxygen readings and hidden hypoxemia can lead to organ failure and death, and in the case of COVID, people not getting the treatment they may need. As a result, many people are calling for improvements, so pulse oximeter readings are accurate for everyone.