



# Monitoring Acute Compartment Syndrome with Electrical Impedance Tomography

## Background

### What is Acute Compartment Syndrome (ACS)?

ACS occurs with increased pressure within a muscle compartment due to trauma. It causes a lack of blood flow, tissue ischemia, and damage to the affected muscle area and nerves.

### What's happening physiologically?

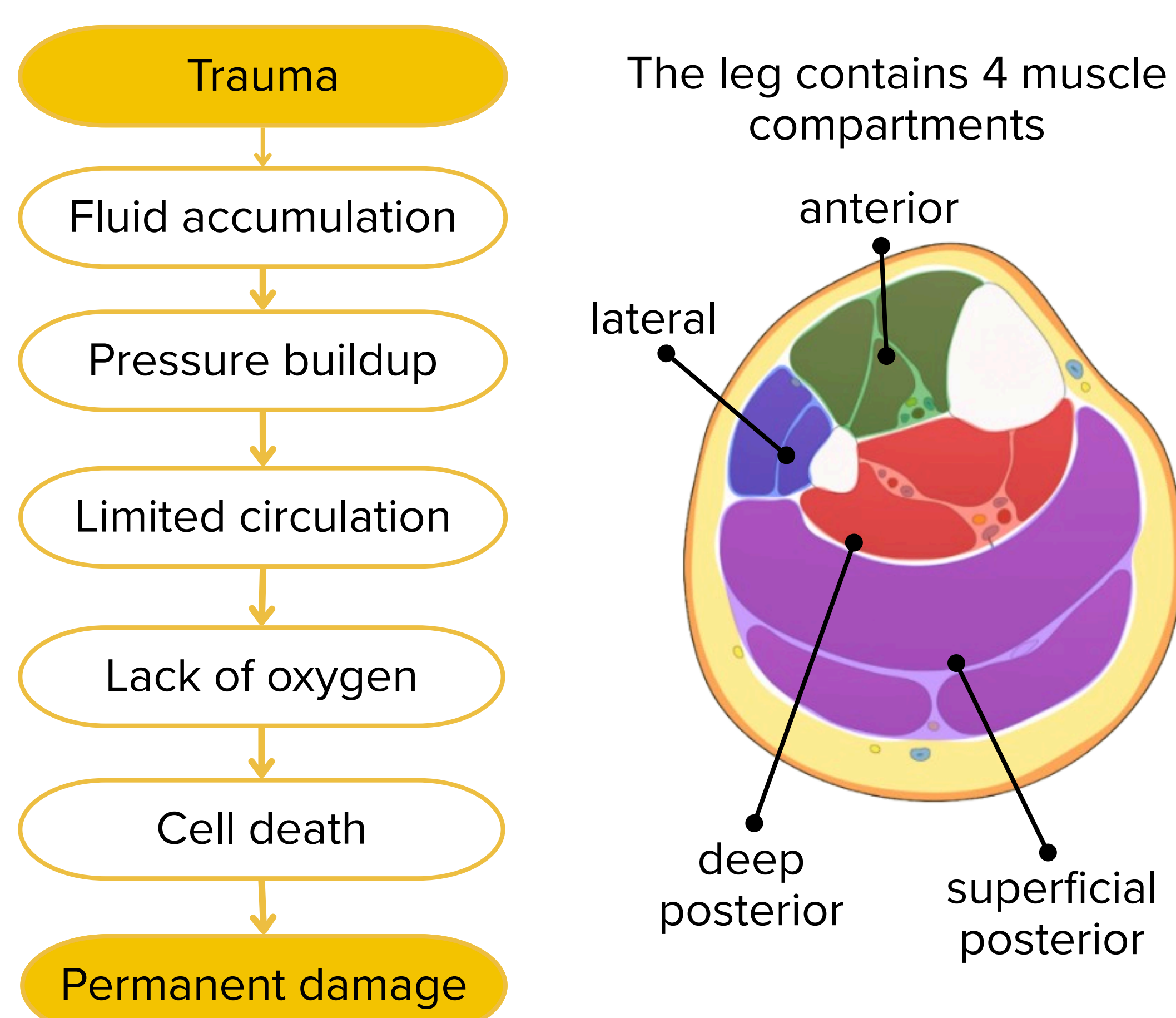


Image from Surgery Student, (n.d.). Acute Compartment Syndrome – Leg. Retrieved from <https://surgerystudent.com/acute-compartment-syndrome-leg/>

## Problem

The Stryker needle is the industry standard for diagnosing ACS by measuring intracompartmental pressure.

- 1 Hard to use and get trained on
- 2 Non-Continuous
- 3 Highly invasive and Painful
- 4 Inaccurate - Clinicians don't trust it

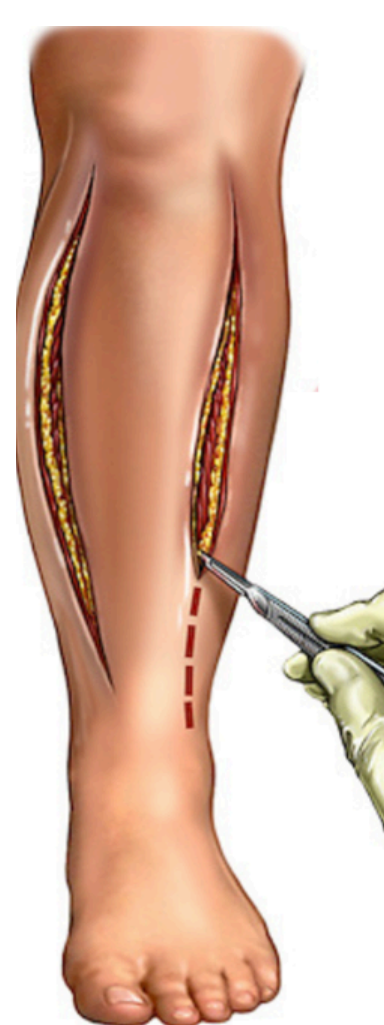


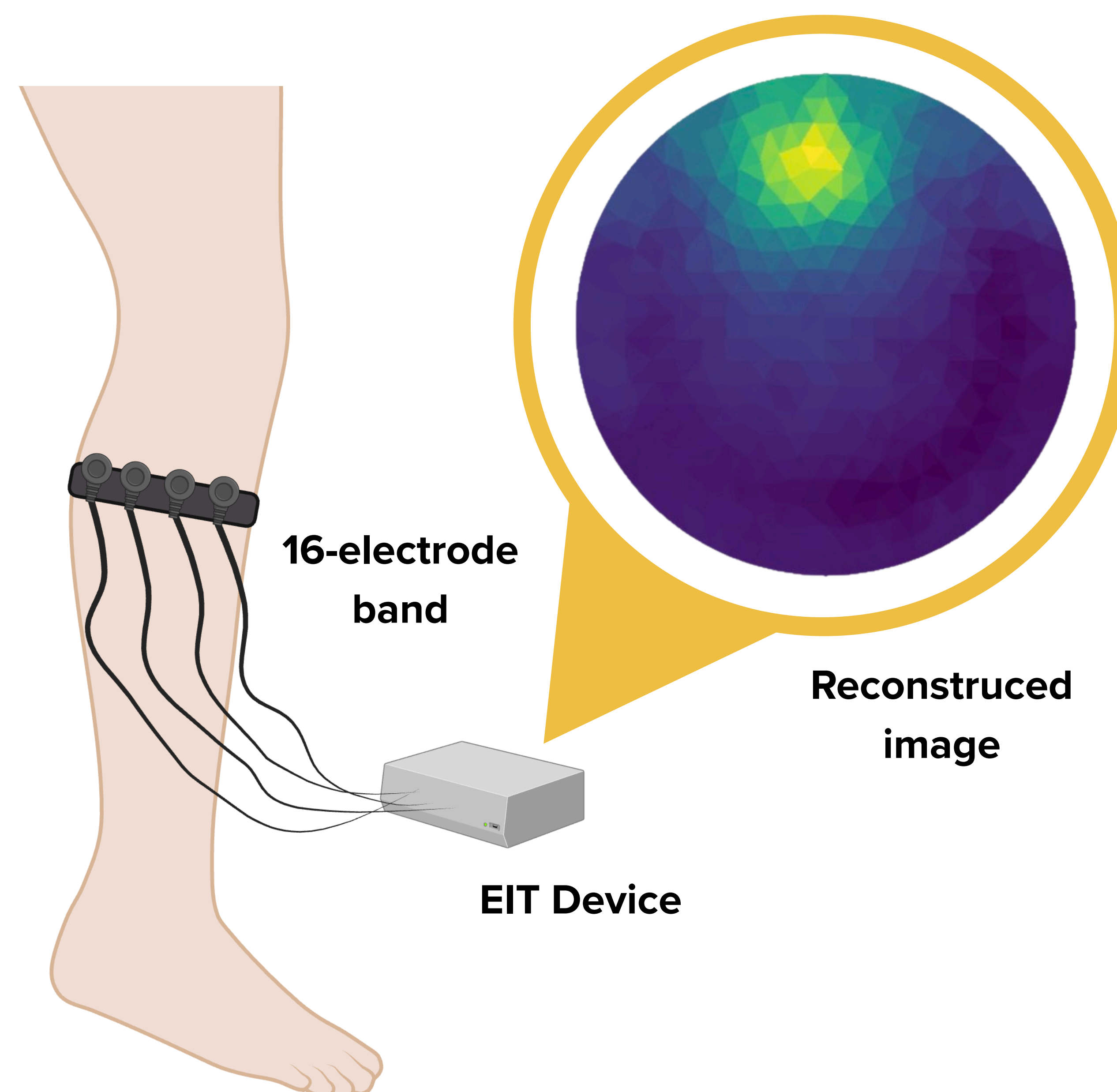
Image from Doctor Stock, (n.d.). Fasciotomy incision – leg. Retrieved from <https://www.doctorstock.com/image/0000trUdwuuyX3Y/>

**Fasciotomies**, invasive follow-up surgeries to relieve pressure, are often performed without definitive proof of ACS.

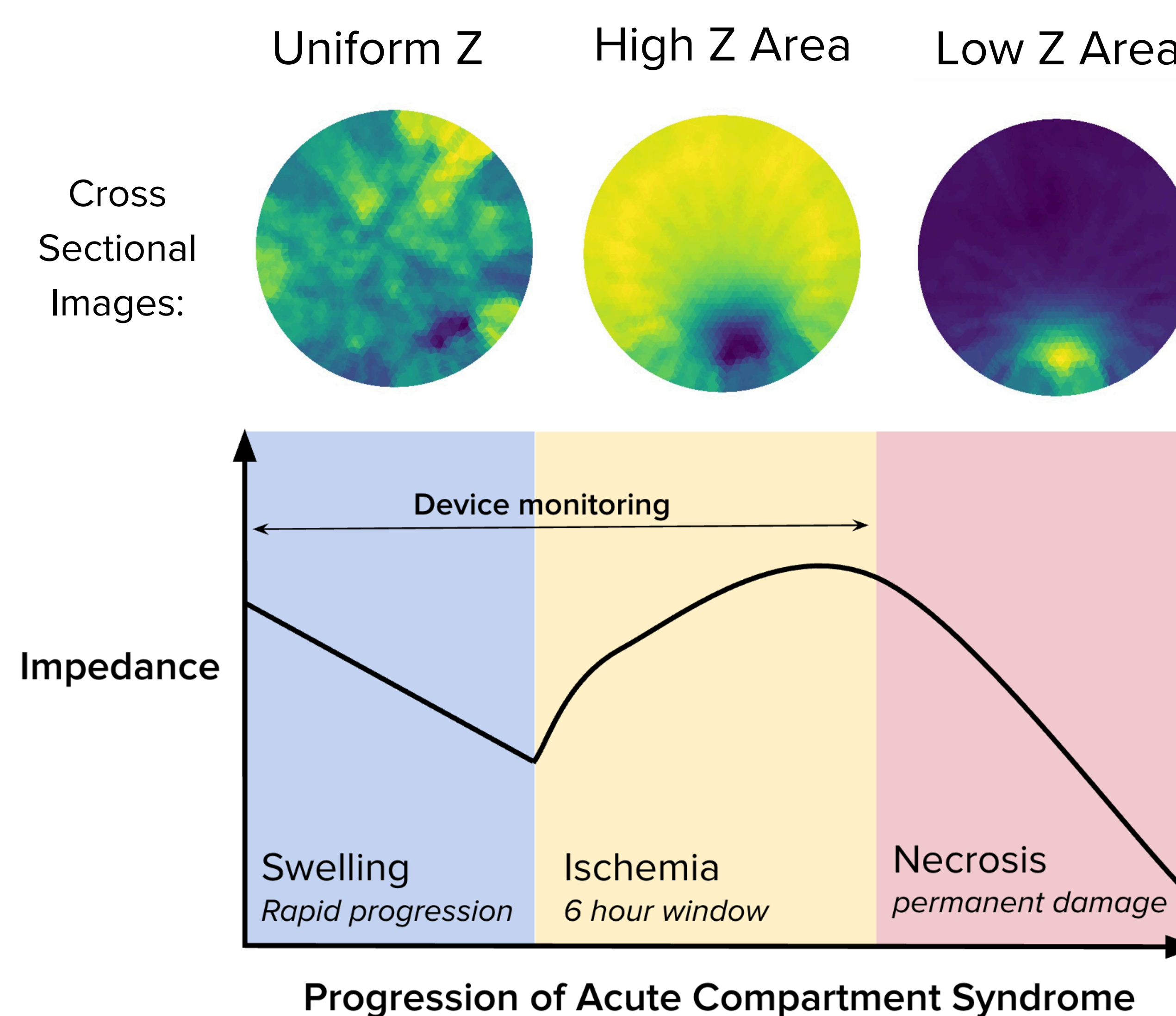
**Clinicians** need a way to effectively diagnose ACS in a continuous, noninvasive manner, to **reduce the number of unnecessary fasciotomies**.

## Solution

Our solution utilizes **Electrical Impedance Tomography**, a non-invasive imaging technique that uses electrical current and voltage measurements on the skin's surface to generate images of the impedance distribution within the leg.



### The model detects changes in impedance (Z)



The system provides clinicians with a qualitative image to map the progression of fluid buildup in the leg and will pinpoint the onset of ischemia.

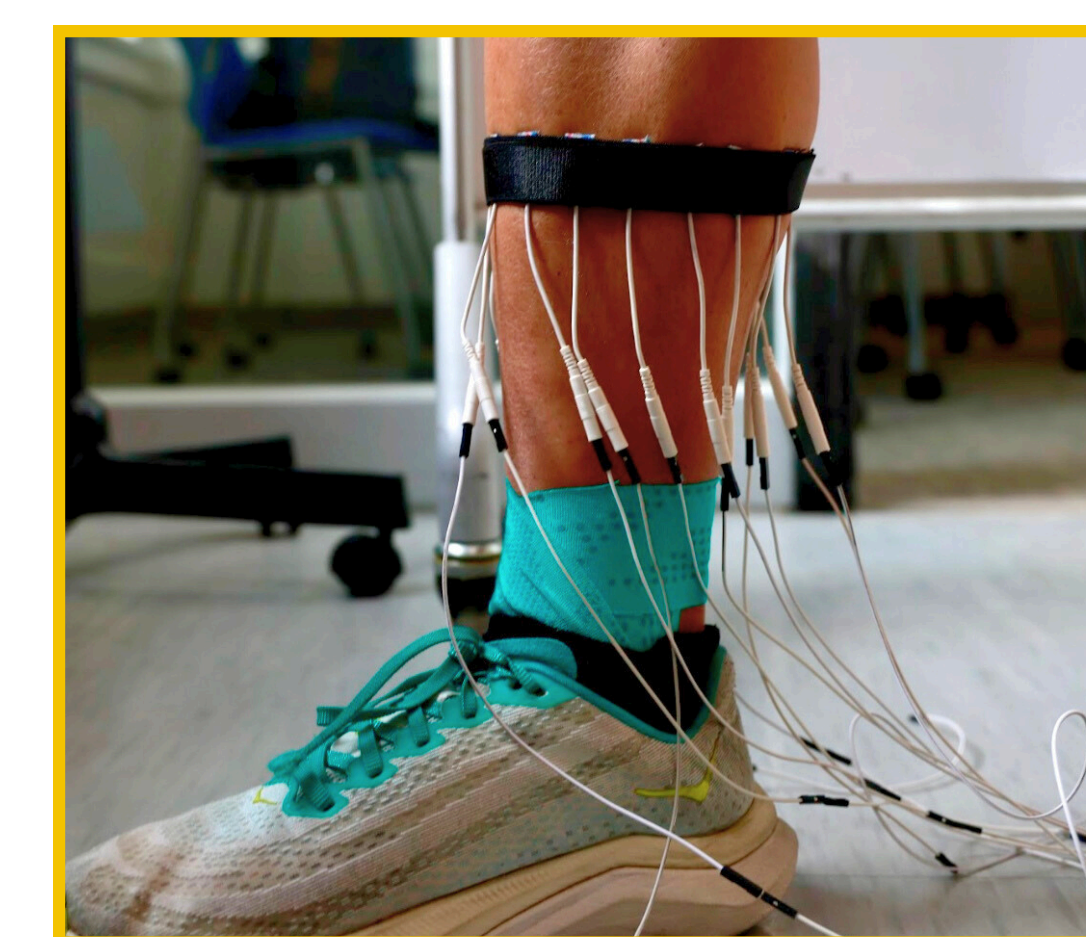
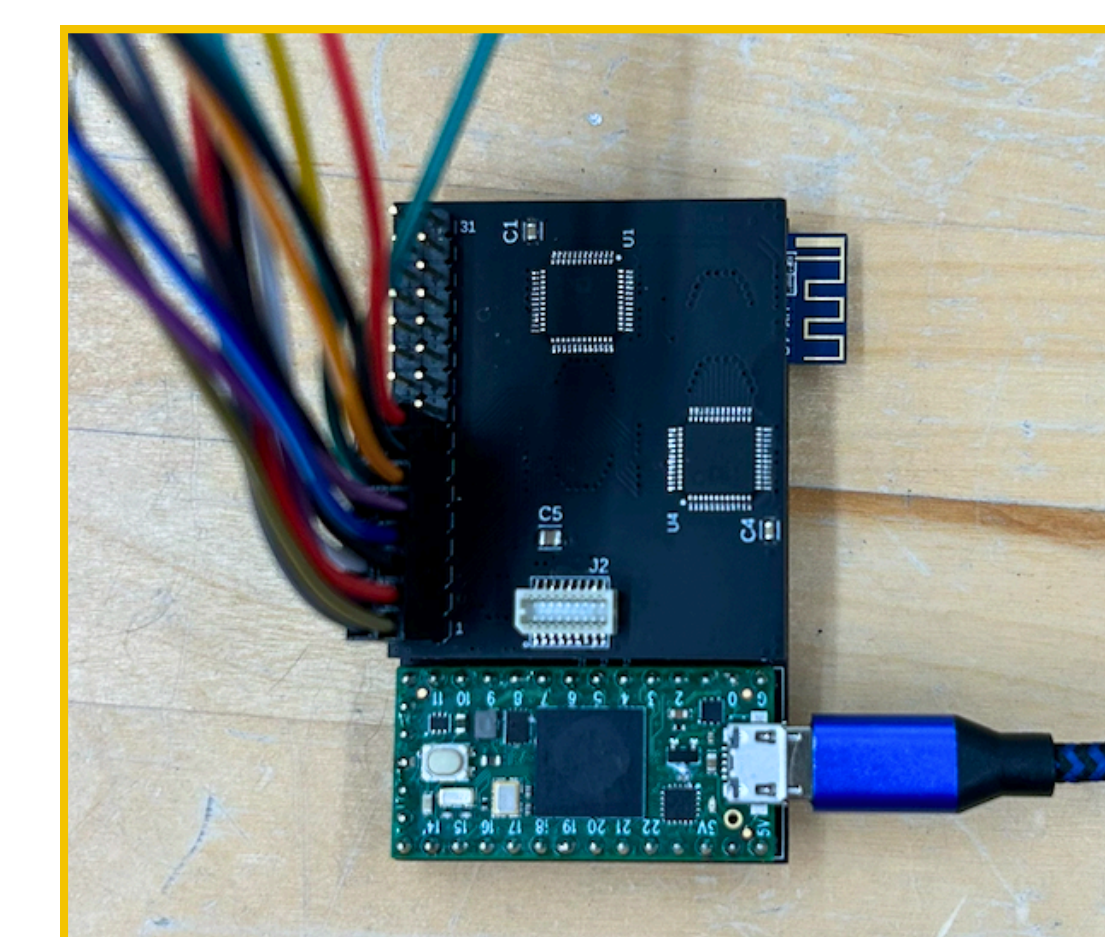
## Development & Testing

Sourced Printed-Circuit Board from Dr. Zhu

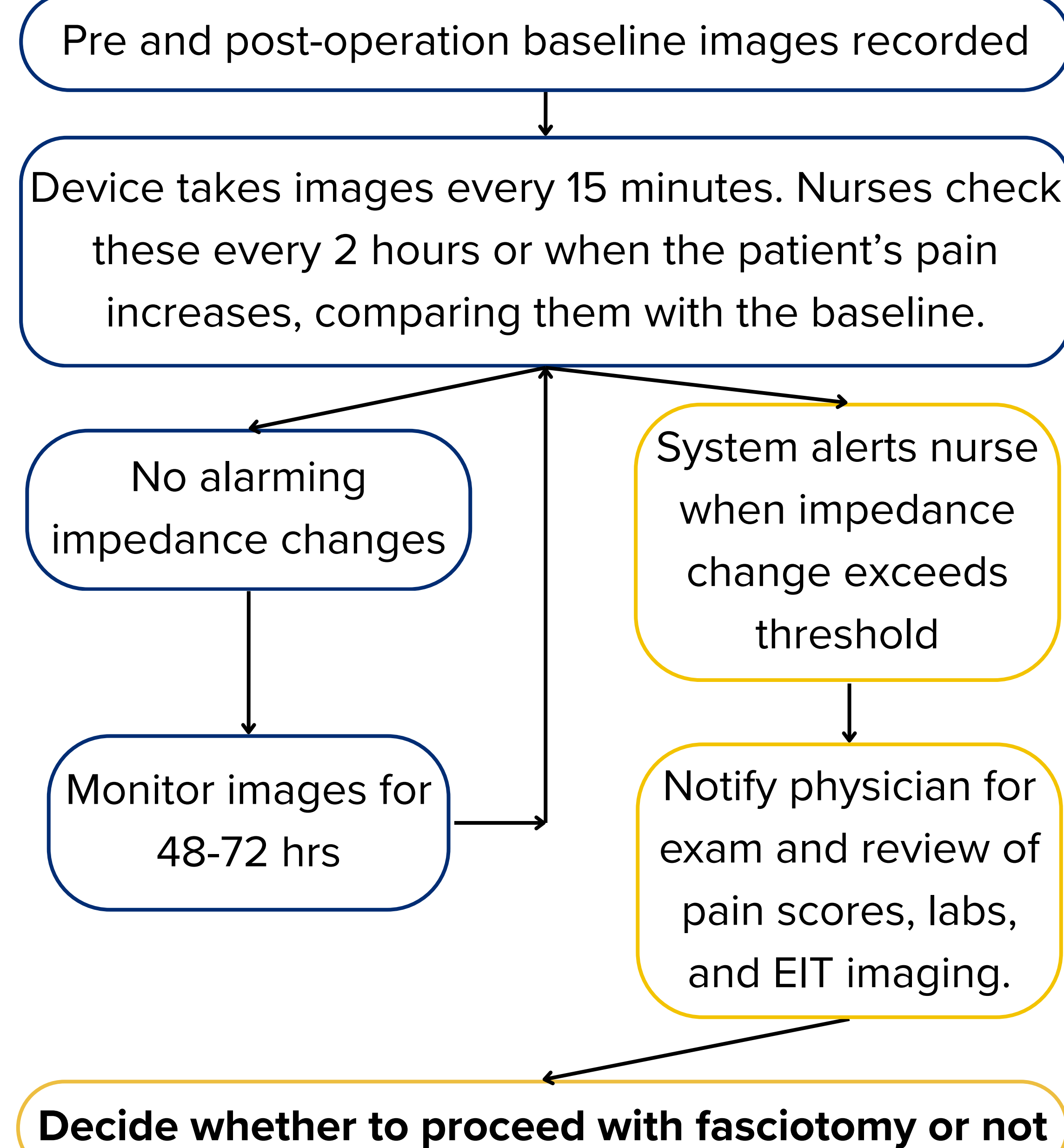
Incorporated time difference imaging and mesh configuration

Validated algorithm to detect ischemic changes

Designed wearable band and user-interface



## Clinical Diagnosis Workflow



## Acknowledgements

**Team:** Harrsha Kumar, Elle Marine, Yash Permalla, Izzak Ramirez, Kalysa Wong  
**Sponsor:** Dr. Phillip McClure - LBH  
**Faculty Mentor:** Alissa Burkholder Murphy  
**Technical Mentors:** Dr. Buccafusca, Dr. Zhu, Dr. Santosa