1. Need and Objective

Provide Brain Perfusion Monitoring during CPR

Clinical Need
- Persistently poor neurological outcomes from cardiac arrest*
- Insufficient brain perfusion monitoring**

Objective
Develop an optical probe to measure carotid artery blood flow (BF) during in-hospital pediatric CPR.

Key Requirements
- Maintain photon counts (50k - 400k counts/second) for adequate signal-to-noise ratio
- Show statistical significance (p-value < 0.001) between baseline motion and CPR motion measurements

2. Solution

Noninvasive Carotid Artery Blood Flow Monitor

Accelerometer
Measures motion

3D Printed Housing
Holds embedded sensors and optic ends

CPR Emergency
Monitor perfusion to the brain

Deployed on the neck

Contact Sensor
Ensure proper contact

DCS Optics
Diffuse correlation spectroscopy (DCS) measures BF through a light and detector

Prototype in use during pre-clinical CPR study

3. Testing/Results

Optical Signal and Acceleration Correlate with Motion

Prototype optical signal measures BF while accelerometer tracks motion.

With adequate signal-to-noise ratio, blood flow index (BFI) captures arterial pulsatility when there is no motion (baseline).

4. Conclusion

Novel Measurement Tool to Aid in Pre-Clinical CPR Research

Significance
- Novel pre-clinical measurement to study effects of chest compressions
- Provide surrogate for cerebral perfusion during CPR

Potential Impact
Future generations of our device may supply real-time measurements of perfusion to guide rescuer compression mechanics.