Monitoring SpO2 at a Site Close to the Injury of Larger Limbs

BIOE486 Capstone II Final Abstract
May 3, 2021

Team 6:
Tara Cecil, Katherine Dapkus, Michael McCreary, Juliana Pitzer, Gabriella Shahine

Project Mentor: Dr. Li-Qun Zhang
Faculty Advisor: Dr. William E. Bentley

While current pulse oximeters perform well, they are limited in which areas of the body they can fit to and measure through. They can currently only detect SpO2 levels on small limbs like the fingertips and earlobes, with recent advancements allowing wrist measurements as well. Readings from these areas of the body provide general information about SpO2 levels, but are unable to provide localized SpO2 readings from large limbs like the arms and legs. Our team has designed a device for measuring SpO2 in these larger limbs using reflective pulse oximetry, in which red and infrared light are projected through the skin, reflected off of the hemoglobin present in the arteries beneath the skin, and measured by photodiodes present on our device. The measurement of reflected light is then used by the associated device software to calculate the oxygen saturation of that specific region of the body. Additionally, our device is used with an adjustable band that allows it to fit around many body sizes. The cost of producing this device (less than $600) also makes it affordable for use in clinics and hospitals, including those in lower socioeconomic areas. These improvements to SpO2 technology will be useful for early detection of musculoskeletal injury or conditions that prevent proper oxygen distribution throughout the body. One such disease, called compartment syndrome, is common in military personnel and athletes due to their intense physical training. Use of this device could allow for early detection of associated reduced blood flow such that patients may avoid long-term effects of the disease, including needing amputation of the affected limb.