CLAIMS

Claim 1. An apparatus comprising:

a support having a first side and a second side opposite the first side, the support configured to be removably adhered to a skin of a human adjacent a target region of tissue;

an optical sensor secured to the support at the second side of the support to detect an absorption of light by blood flowing through the target region for determining a blood oxygenation percentage of the blood flowing through the target region;

a magnetic sensor secured to the support at the second side of the support to detect changes in a magnetic field in the target region for determining a volume flow rate of the blood flowing through the target region; and

a processor secured to the support and coupled to at least one of the optical sensor and the magnetic sensor for determining the blood oxygenation percentage and the volume flow rate and calculating a volume flow rate of oxygenated blood flowing through the target region based on the blood oxygenation percentage and the volume flow rate.

Claim 2. The apparatus of claim 1, further comprising a power supply electrically connected to at least one of the optical sensor and the magnetic sensor, the power supply configured to supply power to the at least one of the optical sensor and the magnetic sensor.

Claim 3. The apparatus of claim 1, wherein the optical sensor comprises:

a light source configured to emit light at two different wavelengths in a direction away from the second side; and

a receiver configured to measure the absorption of light by the blood flowing through the target region.

Claim 4. The apparatus of claim 1, wherein the magnetic sensor comprises:

a magnet configured to induce the magnetic field; and

at least two magnetic detectors configured to detect the changes in the magnetic field at the target region.

Claim 5. The apparatus of claim 1 further comprising an indicator secured to the support at the second side and coupled to the processor, the indicator configured to generate a notification based on the volume flow rate of oxygenated blood.

Claim 6. The apparatus of claim 1, wherein the notification comprises one or more of: an auditory signal and a visual signal.

Claim 7. The apparatus of claim 1, wherein the indicator is configured to:

emit a first signal when the volume flow rate of oxygenated blood is above a threshold;

emit a second signal when the volume flow rate of oxygenated blood is below the threshold, and the volume flow rate is below a second threshold; and

emit a third signal when the volume flow rate of oxygenated blood is below the threshold, and the volume flow rate is above the second threshold.

Claim 8. The apparatus of claim 1, further comprising a communications interface secured to the support and coupled to at least one of the optical sensor, the magnetic sensor, and the processor, the communications interface configured to communicate at least one of the blood oxygenation percentage, the volume flow rate, and the volume flow rate of oxygenated blood to an external processor.

Claim 9. The apparatus of claim 1, further comprising an adhesive layer secured to the first side of the support to removably adhere the support to the skin of the human adjacent the target region.

Claim 10. The apparatus of claim 1, wherein the target region is at least partially in a neck of the human.

Claim 11. A method comprising:

detecting, at an optical sensor secured to a second side of a support of an apparatus, an absorption of light by blood flowing through a target region of tissue of a human, the absorption of light for determining a blood oxygenation percentage of the blood flowing through the target region;

detecting, at a magnetic sensor secured to the second side of the support, changes in a magnetic field in the target region for determining a volume flow rate of the blood flowing through the target region; and

at a processor secured to the support, calculating, based on the blood oxygenation percentage and the flow rate, a volume flow rate of oxygenated blood flowing through the target region.

Claim 12. The method of claim 11, further comprising supplying power to at least one of the optical sensor and the magnetic sensor by a power supply electrically connected to the at least one of the optical sensor and the magnetic sensor.

Claim 13. The method of claim 11, wherein the detecting, at the optical sensor, the blood oxygenation percentage comprises:

emitting, by a light source, light at two different wavelengths in a direction away from the support; and

measuring, by a receiver, the absorption of light by the blood flowing through the target region.

Claim 14. The method of claim 11, wherein the detecting, at the magnetic sensor, the flow rate comprises:

inducing, by a magnet, the magnetic field in the target region; and

detecting, by at least two magnetic detectors, the changes in the magnetic field at the target region.

Claim 15. The method of claim 11, further comprising generating a notification based on the volume flow rate of oxygenated blood.

Claim 16. The method of claim 15, wherein the notification comprises one or more of: an auditory signal and a visual signal.

Claim 17. The method of claim 15, wherein generating the notification comprises:

emitting a first signal when the volume flow rate of oxygenated blood is above a first threshold;

emitting a second signal when the volume flow rate of oxygenated blood is below the first threshold, and the flow rate is below a second threshold; and

emitting a third signal when the volume flow rate of oxygenated blood is below the first threshold, and the flow rate is above the second threshold.

Claim 18. The method of claim 11, further comprising communicating, via a Bluetooth transmitter, the blood oxygenation percentage and the flow rate to a second processor housed external to the apparatus to calculate the volume flow rate of oxygenated blood.

Claim 19. The method of claim 11, further comprising adhering the support to a skin of the human at the target region.

Claim 20. The method of claim 11, wherein the target region is a neck of the human.

Claim 21. An apparatus comprising:

a support having a first side and a second side opposite the first side, the support configured to be removably adhered to a skin of a human adjacent a target region of tissue

an optical sensor secured to the support at the second side of the support to detect an absorption of light by blood flowing through the target region for determining a blood oxygenation percentage of the blood flowing through the target region;

a magnetic sensor secured to the support at the second side of the support to detect changes in a magnetic field in the target region for determining a volume flow rate of the blood flowing through the target region; and

a communications interface coupled to at least one of the optical sensor and the magnetic sensor, the communications interface configured to communicate the absorption of light and the changes in the magnetic field to an external processor for determining the blood oxygenation percentage and the volume flow rate and calculating a volume flow rate of oxygenated blood flowing through the target region based on the blood oxygenation percentage and the volume flow rate.