A Low-Cost Portable Electrography Monitoring System for Rapid Diagnosis of Coagulopathy

Prabhakar, Nikita (School: Bob Jones High School)

Coagulopathy defined as abnormal blood coagulation can cause thrombosis (hypercoagulation) or hemorrhage (hypocoagulation) leading to death. Current assays that provide a complete assessment of coagulopathy rely on centralized laboratories with expensive and complex equipment, require skilled operators, have long turnaround time limiting routine use, and finally are not amenable for patients in resource limited settings including emergency situations. In this project, I designed, developed, and demonstrated a portable low cost system for rapid diagnosis of coagulopathy. The system comprises of a custom disposable sensor (<$0.02) in communication with an open source electronics platform for control, acquisition and real-time analysis of the electrography signal to diagnose coagulopathy. The entire system (<$100) assembled in a 3D printed enclosure can distinguish between normal and abnormal (both hyper and hypo coagulation) blood clot formation providing quantitative information on the clotting rate, clotting time, and magnitude changes compared to a reference standard within 10 minutes. The portable and easy to use system requires low power, does not require special skills, and can be used in any environment thereby enabling rapid diagnosis, monitoring, and management of blood coagulation while providing support for clinical decision by emergency personnel and doctors leading to better patient outcomes.

Awards Won: