EII-3D: Total Body Surface Area Estimation
Jesse Ahlquist, KJ Krause, Julia Loegering, Kevin Webb, Karen Xu

Modern treatment for burn victims is highly dependent on inaccurate approximations of total body surface area.

Current estimation methods often overestimate or underestimate TBSA and lead to misinformed treatment of fluid resuscitation.

Solution: A functional iOS application that estimates patient TBSA through a combination of research-driven mathematical equations and 3D body scanning.
NeoVitalia: Pulse Oximeter Analyzer for Neonatal CCHD Screening
Aravind Anand, Devi Jayakrishnan, Swathi Subramanian, Pranjali Vadlaputi

The problem: Improving neonatal CCHD screening

- Critical congenital heart disease (CCHD) encompasses several heart defects that occur in newborn infants.
- Current screening methods for CCHD miss a significant number of cases specifically involving systemic obstructive CCHD.
- Perfusion index has been proven to increase detection of CCHD in neonates through recent academic research and clinical studies.
- Solution: A device that digitizes the current screening method and provides statistically significant perfusion index readings.
U-STEP: A Diabetic Foot Monitoring Device

Elaine Cho, Shonit Sharma, Marisa Stubbs, Jacqueline Yee

The problem: Preventing diabetic foot ulcers

- Diabetic patients are at increased risk for foot ulcer development because they often suffer from diabetic neuropathy
- If undetected and untreated, they can become severe and potentially life-threatening, necessitating amputation
- **Solution:** A device coupled with a mobile app enabling patients and clinicians to continuously monitor foot health
Hydrocrit: NMR Relaxometry as a Tool for Measuring Plasma Water Content

Shahab Chizari, John Madsen, Joseph Pourtabib, Johnny Phan

The problem: Preventing diagnostic errors

- Many clinical tests are performed on blood plasma—diagnostic errors impact 12 million patients per year at great expense.
- These tests depend on the volume of water in the plasma (PWC), which is not currently measured.
- Some common conditions affect PWC and can lead to inaccurate results.
- **Solution:** A method using NMR relaxometry to measure the PWC with the potential to be implemented in the clinical laboratory setting.
CardioVision: Non-Contact Heart Rate Monitoring of Burn Patients

Tanishq Abraham, Connor Dougherty, Michelle Mao, Benjamin Price, Sagar Shah

The problem: Monitoring burn patients

- Measuring heart rate in burn patients is challenging since electrodes cannot be adhered to burned skin
- Alternatives are invasive and patients are susceptible to life-threatening infection
- **Solution**: A portable device that uses a non-contact method to continuously monitor the heart rate of burn patients in real-time
StrideSight: Device to Monitor Activity Related to Overuse Injury

Samir Akre, Krishna Basude, Angela Tolwani

The problem: Monitoring overuse injury

- 27% - 70% of runners experience overuse injuries during any 1 year, including Achilles tendinopathy, shin splints, and plantar fasciitis
- Repetitive loads at lower forces are predicted to contribute to these injuries
- There is currently no good way to monitor and predict these injuries
- Solution: A portable device that uses inertial measurements to quantify biomechanical metrics associated with overuse injury in runners
K-wire Alleviating Device

Alex Allaert, Xenia Ivanova, Jeremy Lowen, Sean McCutcheon, Maggie Wang

The problem: Preventing sharps injuries

- Kirschner wires used to fixate bone fragments during orthopaedic surgery
- Cutters produce sharp ends—Risk of sharps injuries to medical personnel, risk of tendonitis, skin irritation, and nerve irritation for patients
- **Solution:** A device compatible with K-wire drivers that smooths sharp ends, consisting of a burr cup and cap to contain debris
The problem: Monitoring graft viability

- Free flap transfer is commonly used in reconstructive surgery
- Post-operatively susceptible to blood clots which impact viability
- Currently no means to remotely monitor flap viability
- Partnership with CS team
- **Solution**: A device to remotely monitor tissue flaps postoperatively in real-time, and alert surgeon if flap becomes compromised
The problem: Accessing lymph nodes

- Biopsy of mediastinal lymph nodes needed for cancer diagnosis
- Access by guiding needle can lead to serious complications
- **Solution:** Bone drill specialized for mediastinal access
Thorafit: A Customized Approach to Chest Wall Reconstruction

Mason Becker, Lauren Damian, Hailey Hinkle, Matthew Kennedy

The problem: Need for customizable implant

- Surgery to remove metastatic breast cancer leads to defects in the chest wall
- Current implants to repair defects are not customizable
- Solution: Process for creating a 3D printed chest wall implant that is customized to the patient's defect
MVD: Metronome Ventilation Device

Peter Burkard, Yimeng Dou, Richard Perez, Sartaj Sangha, Lingyu Zhang

The problem: Maintaining proper ventilation

- Resuscitation procedures with a BVM lack feedback on the desired ventilation rate
- Hyperventilation is common during resuscitation procedures and is associated with poor outcomes
- Solution: A metronome that emits 3 distinct feedback signals to direct medical personnel in ventilating adults at the proper rate
CoagVISTA: Point of Care Bioimpedimetric Thromboelastography

Kevin Leung, Alexander Godbout, Brent Weyers, Victoria Chiu, Jeffrey Le

The problem: Monitoring blood clotting

- Devices used to measure the clotting properties of blood are fragile, bulky, and cannot be used in field hospitals
- This delays their use in guiding therapeutic decisions by up to 24 hrs
- **Solution:** A non-mechanical, robust, point-of-care device that measures time-based properties of blood coagulation, to guide therapeutic decisions in a trauma setting