A Novel CPR Feedback Device
Meagan Mazurek, Aimee Tomlinson
Advisor: Dr. Mansoor Nasir
Department of Biomedical Engineering, Lawrence Technological University

Project Goal
Develop a comfortable, intuitive, and easy to read CPR feedback device.

Background
- CPR quality mainly determined by compression depth/force, and rate
- In a manikin study, CPR compression quality dropped from 92.9% to 18% from first to fifth minute (1)
- 350,000 out-of-hospital cardiac arrests occur each year
- 24% of U.S. deaths in 2014 result of cardiac arrest
- Less than 12% of people survive cardiac arrest when it occurs outside a hospital (2)
- 15 million people in the U.S. get certified in CPR each year through the American Heart Association
- 400,000 active AHA registered CPR instructors around the world

Current Solutions
CPR feedback devices provide real time data to emergency medical providers

- Zoll PocketCPR
  - Cheapest ($129)
  - Made of hard, bulky plastic
- CPRmeter
  - More expensive ($895)
  - 18% of healthcare providers find uncomfortable
  - $2000 - $5000 by model
  - Confusing display screen
  - Includes AED
- Philips HeartStart MRx
  - More expensive ($895)

Project Design Parameters

<table>
<thead>
<tr>
<th>Desired Feature</th>
<th>How it is achieved</th>
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<tr>
<td>Output indicator of compression force</td>
<td>Bar of 7 Neopixel lights</td>
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<tr>
<td>Output indicator for number of compressions</td>
<td>Grove backlight display</td>
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<td>Flexible and comfortable to use</td>
<td>Pliable polymer, PDMS, used to encase force sensor and lights</td>
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<td>Sterilizable</td>
<td>PDMS can be cleaned with 70% ethanol</td>
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<td>Electrically insulated</td>
<td>PDMS has high resistivity (4x10^13 ohm*m)</td>
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<td>Intuitive to use</td>
<td>Instructions embedded in final product</td>
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<td>Simplified signal processing</td>
<td>Use of A401 Flexiforce pressure sensor</td>
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Instrumentation

Testing and Results
Calibrating Force Sensor with MTS machine

Waterproof Encasement
- Sheets of PDMS plasma treated to stick together
- Water-soluble dye applied to paper and encased
- 3 hours submerged without leaking

Qualitative Feedback from Basic Life Support Instructor
- Instructor Jason Hendrickson, 10+ years experience in CPR, found our prototype significantly more comfortable
- Surveys from other medical professionals planned

Current and Future Work
- Calibrations with the LIFE-STAT CPR compression device
- Molding and assembly
- Creating user instructions
- 3D printing microprocessor case

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References