IPRO 319

Development of Solutions to Improve Survival Rate of Cardiac Arrest Patients
The Problem

- Sudden Cardiac Arrest is a leading cause of death in the United States, accounting for an estimated 325,000 deaths each year.
  - Cardiac arrest occurs when a patient’s heart completely stops beating.
  - When this happens, oxygen ceases to flow into the brain.
  - Brain injury is likely if cardiac arrest is untreated for more than 5 minutes.
  - When circulation is restored, oxygen rich blood rushes back into the brain, which further damages the brain.
  - Current procedures dictate that 100% oxygen be given to cardiac arrest victim.
Goals

To prevent the brain damage from occurring when the heart is restarted
Design device to be used within first 10 minutes of the arrest
○ Simple, cost-effective design that eliminates potential for human error
○ Design device that can be integrated into existing AED devices
Research

- **Cooling**
  - Used to lower the temperature of the brain to reduce swelling after resuscitation, which leads to brain damage

- **Shaking**
  - Pigs and mice were shaken and found to benefit from this treatment after cardiac arrest

- **Breathing**
  - H$_2$S gas used in mice to induce hibernation
    - Found to be toxic to larger animals
  - Can still reduce oxygen amounts during the initial breathing time after resuscitation
    - Shown in studies to improve chances of survival
Obstacles and Resolutions

- Research on Hydrogen Sulfide has not been tested on humans to see if it will induce hibernation
- Many oxygen sensors cannot read oxygen levels lower than 70%
- EMP are reluctant to change the way heart attack victims are treated
- Human testing is not possible by the team
# Project Plan Timeline

<table>
<thead>
<tr>
<th>Task</th>
<th>Week 1</th>
<th>Week 2</th>
<th>Week 3</th>
<th>Week 4</th>
<th>Week 5</th>
<th>Week 6</th>
<th>Week 7</th>
<th>Week 8</th>
<th>Week 9</th>
</tr>
</thead>
<tbody>
<tr>
<td>Build Prototype</td>
<td>Design</td>
<td></td>
<td></td>
<td>Buy</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Test</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Improve</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IPRO DAY Prep</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>