Every year, half of the 460,000 heart attack deaths in the United States are due to a lack of prompt medical attention\(^1\). Currently, most consumer-accessible processes which could detect an oncoming myocardial infarction (MI) simply take too long to be effective solutions. Either the biomarkers tracked spike in delayed reactions or the device is not capable of automatically monitoring the body and reading signs before physical symptoms evolve. This results in permanent damage to the heart muscle. Our product provides a new perspective and strategy at tackling the leading cause of death in the country.

### Need Statement
A way to rapidly detect an MI at its earliest stage through an accurate consumer device to notify users and paramedics of abnormal heart activity.

### Market Analysis
The two viable technologies that match our need specs in accuracy and acceleration are the **electrocardiogram (EKG)** and the Doppler **echocardiogram**\(^2\). But while the former field is extremely saturated with products such as AliveCor’s EKG phone case, HealthWatch’s EKG shirt, and the Zio Patch, echocardiography has much more room for innovation and is therefore a better market option.

### Concept Analysis
During a heart attack, the left ventricle of the heart is not able to contract with as much force as normal due to a lack of oxygen from the blocked artery. Our continuous wave **Doppler ultrasound patch**\(^3\) would automatically scan the heart every 30 minutes for a quantifiable measure of the heart’s contractility called the dp/dt (rate of change of ventricular pressure)\(^4\).

### Prototype
Our prototype serves as a 3D representative diagram to illustrate how we envision the ultrasound technology integrating into a wearable device...

**The Patch** is 4x3x1 in. of domed, hollow plastic with Sugru (rubber) casing and adhesive on bottom.

**The Wristband** is an improvised Pivotal Tracker with a vibrator used as an alert system.

### Conclusions
In theory, our concept is the first ultrasound device that can independently interpret data to diagnose a heart attack. To continue the biodesign process, the concept could be made more affordable through refining the processing circuitry. If resources are available, the blueprint could then be implemented into a functional prototype to bring the concept to reality. Once the echocardiogram technology is integrated into the physical structure, we would perform tests to make sure our design fulfills all necessary need specs. If brought to the pharmaceutical market, the device could have a profound impact on how millions live and perceive their day to day lives.

### References
1. http://www.heart.org/HEARTORG/Conditions/HeartAttack/AboutHeartAttacks_UCM_002038_Article.jsp

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