

HeartShield: A Wearable Defibrillator

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Fall 2014

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Background: A wearable, automated defibrillator would protect patients at high risk of developing life-threatening ventricular arrhythmias leading to sudden cardiac arrest (SCA). SCA, which is characterized by a sudden, unexpected loss of heart function, can be reversed if an electrical shock is delivered to the heart muscle immediately to restore its normal rhythm. Survivors of acute myocardial infarction with significant ventricular dysfunction are at a high risk of SCA within the first 40 days after their initial event. Following this unprotected evaluation period, patient risk is substantially lowered as those eligible are fitted with life-long implantable cardioverter defibrillators (ICD). Due to the high morbidity associated with SCA, a non-invasive solution capable of providing protection to survivors of acute myocardial infarction during this 40-day period—in the form of continuous monitoring for arrhythmias and appropriate administration of defibrillative shock—is in order.

Solution & Product Description: HeartShield, a wearable defibrillator-integrated shirt, is designed for patients at high risk for sudden cardiac arrest (SCA). In these individuals, the severity of permanent infarction-induced ventricular dysfunction has not yet been assessed, and no long-term solution has been prescribed.

The HeartShield has the following 3 merits:

1. A unified **arrhythmia detection and defibrillation administration mechanism**, which consists currently of a lead I electrocardiogram (ECG) and a scalable high-voltage charging and discharging circuit
2. An **ultra-thin and flexible defibrillation pad design** featuring a novel mechanism of heat-activated gel release to reduce skin/electrode interface impedance
3. A **focus on form factor optimization** with an emphasis on comfort, convenience, and the distribution of component bulk and weight

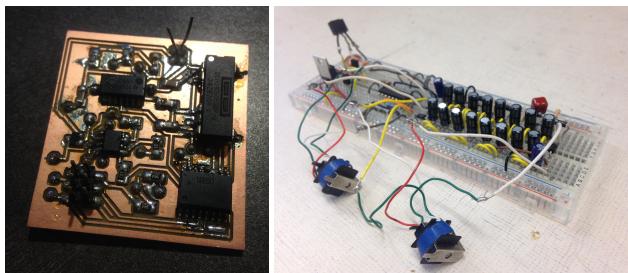


Fig 1. ECG PCB (L); defibrillation circuit (R).

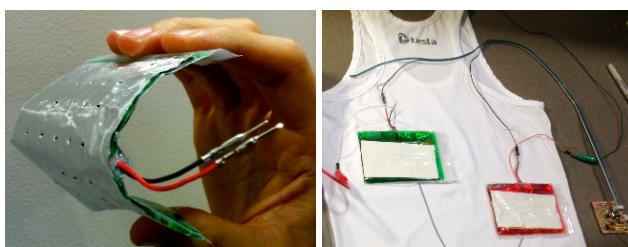


Fig 2. Heat-activated gel release defibrillation pad.



Fig 3. ECG PCB and electrodes, batteries, and defibrillation pads seamlessly integrate into a streamlined compression shirt design.

Conclusion: HeartShield allows a patient's physician time to assess their long-term arrhythmic risks and make appropriate plans. The novel design of the defibrillation pads and defibrillation circuit make HeartShield lightweight and easy to wear, allowing patients to return to their daily activities while having the peace of mind that they are protected from SCA. HeartShield continuously monitors the patient's heart for life-threatening arrhythmias and delivers a treatment shock to restore normal heart rhythm when appropriate.