

## Alternative Epinephrine Injector to Combat Allergy Induced Anaphylaxis

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**Abstract :** One response during anaphylaxis is reduced blood pressure due to blood vessels relaxing and dilating. Epinephrine causes the blood vessels to constrict, which raises blood pressure to counteract the symptoms. When going through an allergic reaction, an Epinephrine injector is used to administer a shot of epinephrine intramuscularly. Epinephrine injectors have become an integral part of day-to-day life for people with allergies. Current Epinephrine injectors (EpiPen) are completely mechanical and have no sensors to monitor the vital signs of patients or give suggestions the optimal time for the shot. The EpiPens are also large and inconvenient to carry daily. The current price of an EpiPen is roughly 600\$ for a pack of two. This makes carrying an EpiPen very expensive, especially when they need to be switched out when the epinephrine expires. This new design is in the form of a bracelet, which has the ability to inject epinephrine. The bracelet will be equipped with vital signs monitors that can aid the patient to sense the allergic reaction. The vital signs that would be of interest are blood pressure, heart rate and Electrodermal activity (EDA). The heart rate of the patient will be tracked by a photoplethysmograph (PPG) that is incorporated into the sensors. The heart rate is expected to increase during anaphylaxis. Blood pressure will be monitored through a radar sensor, which monitors the phase changes in electromagnetic waves as they reflect off of the blood vessel. EDA is under autonomic control. Allergen-induced anaphylaxis is caused by a release of chemical mediators from mast cells and basophils, thus changes the autonomic activity of the patient. So by measuring EDA, it will give the wearer an alert on how their autonomic nervous system is reacting. After the vital signs are collected, they will be sent to an application on a smartphone to be analyzed, which can then alert an emergency contact if the epinephrine injector on the bracelet is activated. Overall, this design creates a safer system by aiding the user in keeping track of their epinephrine injector, while making it easier to track their vital signs. Also, our design will be more affordable and more convenient to replace. Rather than replacing the entire product, only the needle and drug will be switched out and not the entire design.

**Keywords :** allergy, anaphylaxis, epinephrine, injector, vital signs monitor

**Conference Title :** ICBDEM 2017 : International Conference on Biomedical Device Engineering and Materials

**Conference Location :** Boston, United States

**Conference Dates :** April 24-25, 2017