Building the Anti-Phylax Pen

Applying Arduino and Touch Technology to a Button Injector

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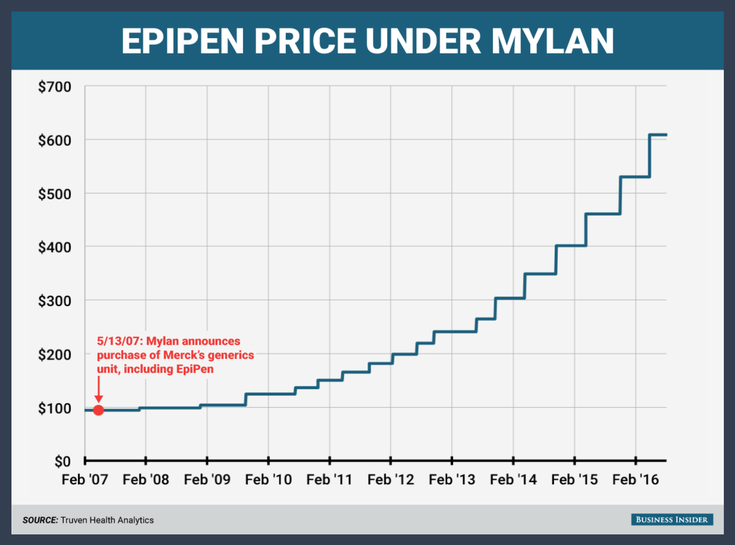
Abstract

An EpiPen is a one-use, costly mechanism that still poses many flaws in the product. Our goal is to address these issues that EpiPen users are having while using the product, such as its accessibility, size, and costs. The specific complaint of bruising from EpiPen injection is resolved with the substitution of the auto-inject with a self inject that allow for those who suffer from anaphylactic allergies to inject epinephrine in a safe manner without unnecessary bruising. With our product, we will be able to compete with the unfair prices of the EpiPen, and bring awareness to the importance of having an affordable and accessible product for everyone.

Introduction

Epinephrine in the form of an auto-injector, such as the EpiPen, is commonly used to treat severe allergic reactions. A two-pack EpiPen is normally around $600, and the EpiPen has one dose of epinephrine, about 0.3 mg, in each pen. From purchase date, the EpiPen is only available for use for about 6-12 months before it expires. These prices are outrageous and expensive for the average person.

Mylan, the company under EpiPen, has claimed to invest billions in the product. However, looking at the materials needed to build such a pen, it is rather inexpensive to create an EpiPen from scratch. The EpiPen with its outer casing is also too big and heavy for one to carry in a pocket. Our goal is to address the shortcomings of the EpiPen by creating an epinephrine pen that is affordable and portable, so that children and adults in the United States with mild to severe allergies are able to have easy access to live-saving drugs.



Methods

Epinephrine injector comprised of:

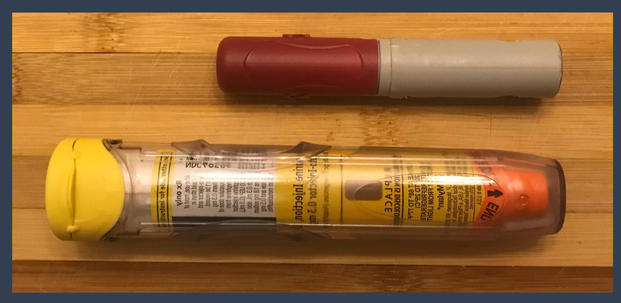
(1) Plastic casing (4) spring (7) safety cap
(2) syringe (5) plunge
(3) needle (6) button

Instructions for use:

(1) In order to use device, place device on outer thigh with needle pointing down toward leg.
(2) Press top button in order to inject needle and epinephrine into blood stream.
(3) Hold device and needle in leg until LED light attached to the Arduino * turns off.
(4) Release and take out needle from leg, and immediately go to the hospital.
* A touch sensor attached to the pen that is wired to an Arduino that turns on the LED and after a couple seconds, the LED will turn off. When the LED turns off, this lets the user know it has finished injecting. This will prevent incorrect dosage of epinephrine, a flaw the EpiPen has experienced.

Results

We reduced the size of the bulky EpiPen, and also made the Anti-Phylax into a keychain, so that it would be more portable and accessible. The EpiPen is about 6 inches in length and an inch in diameter, while the Anti-Phylax is 4.25 inches in length and 0.75 inches in diameter. We also have designed a way to deliver epinephrine to one's system in a more efficient way. If someone could not apply enough force in the middle of an allergic reaction, it may cause an incorrect dose of epinephrine and other further problems we need to prevent. With the push of an injection button, it will inject the epinephrine, without requiring a strong force from the user.



Discussion/Conclusion

Given the materials we used to create our epinephrine injector, it is plausible to say that our new design could save hundreds of lives each year. Fatalities caused by anaphylaxis are usually due to inability to obtain and injection of Epinephrine in time; however, with our new product, people will no longer have to worry about the difficulties associated with carrying around an auto-injecting device.

The World Allergy Organization determined that epinephrine autoinjectors were only available in about half of their surveyed countries, and that the cost of an autoinjector in some countries was equivalent to the monthly salary of an average citizen. With the inexpensive materials used to build the Anti-Phylax , it makes the product easily affordable for everyone.

Future Work

Although our design has minimized the size of the current EpiPen by several inches, if our group had access to professional tools, the size could be cut down even more. The bulkiest aspect of our current design is the length and dimensions of the syringe. If we were able to create a wider and shorter syringe, our design could shrink by 33%.

With more resources, we would be able to develop more iterations of the prototype adding other features, such as the ability to reload doses of epinephrine, while keeping the product compact.

The Food and Drug Administration (FDA) would have to approve of this new design in order for the product to be manufactured and sold throughout the United States. This would require further research showing the design is safe to use.

References

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