

Epidetect

The problem

Epilepsy is a chronic noncommunicable disease of the brain that affects around 50 million people worldwide, making it one of the most common neurological diseases globally. Epileptic patients suffer from unpredictable seizures due to sudden bursts of abnormal brain energy, which have the potential to cause a Sudden Unexpected Death in Epilepsy (SUDEP). The primary issue we are addressing is the inability of epilepsy patients to seek assistance during a seizure. Paralyzed and voiceless, they are trapped in a silent struggle. This challenge is exacerbated when the patient is isolated from others: no one is aware that a seizure is happening. Through our 20 patient interviews, we have proved this consistent trend of the patients' quiet desperation for help during a seizure. Therefore, with the aid of technology, we hope to detect the seizure and notify the parent or caretaker when one takes place. Although there is an existing market of seizure detection devices, it is fairly small and mostly consists of devices made for adults. This results in a gap in the market for devices made specifically for toddlers and children, despite the high demand: 3.5 million¹ children are afflicted by the disease around the world each year. They are currently an underserved demographic and are deprived of specific assistance, as current models do not fit them nor are tailored towards their needs. The quality of life of both young epileptic patients and their families is dramatically altered with the apprehension of a seizure arising. Parents can only hope that they will coincidentally be there to support their children. Hence, our detection device significantly reduces their worries and substantially enhances the safeguarding of their loved ones.

Our solution

Following a combination of both primary and secondary research, such as by interviewing epileptic patients and by undertaking market research, we propose our solution to the monitoring of epilepsy in infants and toddlers: a low-cost, comfortable anklet that monitors vital signs of the patient in real-time,

¹ *The Medical Minute: What you need to know about epilepsy | Penn State University.* (n.d.).
Www.psu.edu. Retrieved January 14, 2024, from
<https://www.psu.edu/news/hershey/story/medical-minute-what-you-need-know-about-epilepsy/>

detecting seizures when they happen. By leveraging advanced technology, we intend to monitor the patient's electrodermal activity (EDA), heart rate using photoplethysmography (PPG), as well as motion using an accelerometer². Through our designed algorithm, our anklet will detect any unusual data lasting for 15 seconds or more, and notify the designated caretaker through our app instantly. Furthermore, our app also offers data insights that can assist doctors in understanding the frequency, triggers and patterns of seizures, leading to better treatment and management.

Based on our interviews conducted with epileptic patients, who have experienced seizures firsthand, they shared the fear and unpredictability that come with this disease with us, and how they would be helpless during a seizure. Research has also shown that this group of people will be at higher risk and more susceptible to mental health issues like depression³. This impact will be amplified within epileptic young children, and one can only imagine how hard and stressful it is for both them and their caretakers to monitor them at all times to ensure their safety. Our proposal of the anklet will detect convulsive seizures not only during the daytime but at night as well, when it is most likely to be missed.

Our device presents itself as a solution to alleviate the stress and enhance the quality of life of both parties, allowing them to rest peacefully at night, without panicking if they had missed a seizure. Through real-time monitoring and accurate seizure detection, the device has the potential to address one of the many challenges faced by this vulnerable population. With more research, development and clinical trials further on in this project, we are confident and eager to bring this seizure-monitoring anklet to the market.

Target customers

Epidetect aims to introduce a cost-effective seizure detection anklet catering specifically to the parents of infants and toddlers suffering from epilepsy, where instant detection is crucial for reducing the probability

² Böttcher, S., Bruno, E., Manyakov, N. V., Epitashvili, N., Claes, K., Glasstetter, M., Thorpe, S., Lees, S., Dämpelmann, M., Laerhoven, K. V., Richardson, M. P., Schulze-Bonhage, A., & Consortium, T. R.-C. (2021). Detecting Tonic-Clonic Seizures in Multimodal Biosignal Data From Wearables: Methodology Design and Validation. *JMIR MHealth and UHealth*, 9(11), e27674. <https://doi.org/10.2196/27674>

³ Kanner, A. M. (2006). Depression and Epilepsy: A New Perspective on Two Closely Related Disorders. *Epilepsy Currents*, 6(5), 141–146. <https://doi.org/10.1111/j.1535-7511.2006.00125.x>

of SUDEP⁴ in this vulnerable demographic. Our primary distribution strategy lies in collaboration with hospitals and clinics, such as Chulalongkorn Hospital; additionally, non-governmental organizations, namely Thai Red Cross Society, are considered for wider reach. Our approach prioritizes affordability and accessibility irrespective of socio-economic background, thus qualifying our product as a viable solution for families with financial constraints, ensuring its widespread availability through established healthcare networks.

Unique value

Currently, a plethora of detection devices exist for adults - but we must not forget that epilepsy affects people of all ages, young and old. It affects up to half a million children in the US alone, clearly demonstrating the demand, should a device aimed at young children exist. As such, we hope to tailor our product towards this gap in the market: infants and children, which is currently being overlooked. The few products we discovered were not epilepsy-specific, and other epilepsy-specific products may be too large for a child or toddler to wear. Our product will therefore stand out amidst considerable competition that is already in existence.

Moreover, our product will be in the form of an anklet, more subtle than other forms, and protect the patient from insensitive comments that other children may potentially say. To make our product as accessible as possible, we hope to keep production and market prices low, considering that 80% of those suffering from epilepsy are from a low-income or middle-income country. This is highly achievable with our chosen target customers of infants and toddlers, who won't require more complex functions such as a display or clock face. We are also aiming for our device to be supported by both Android and iOS users to allow for a wider demographic of users. Epidetect will soothe parents' burdened minds, ensuring a sense of security when they retire to bed, knowing that our anklet is vigilant, knowing that a seizure won't go undetected.

⁴ Buchanan, G. F. (2019). Impaired CO₂-Induced Arousal in SIDS and SUDEP. *Trends in Neurosciences*, 42(4), 242–250. <https://doi.org/10.1016/j.tins.2019.02.002>

Revenue model

Our revenue model is set at 70 USD per device, with the cost of production of one Epidetect device being less than 40 USD. We plan to keep our costs as low as possible while also providing the necessary functions for the device to properly detect whether the baby is having a seizure. From our network within the Thai Healthcare industry, we have fostered connections with esteemed doctors and senior figures at the Thai Red Cross Society. This not only grants us access to funding and distribution, but also establishes avenues for science research. The financial aid obtained will be used for producing a prototype, followed by the production of the anklets. By constantly adapting and refining Epidetect, we are determined to eliminate false alarms and improve accuracy, guaranteeing the best quality for our users. To focus on bringing our product to the millions of children with epilepsy worldwide, funds will also be directed towards advertisement through social media, the licensing and patent of the product and getting the product to retailers for distribution.

Team capabilities

As a team of young individuals, our passion lies in supporting those who lack a voice in innovation—the younger population—stemming from a desire to address the significant gap in healthcare products that are predominantly adult-centric.

Preeyanun Atikarnbodee- As the team leader, Preeyanun has the natural instinct to take charge and effectively oversee individuals. Possessing an entrepreneurial mindset, she is passionate about turning scientific innovations into profitable business ventures. From her ongoing internship at the Thai Red Cross Society, Preeyanun possesses a well-established network within the Thai Healthcare industry, where she has fostered connections with esteemed doctors and senior figures. This provides us with invaluable mentorship and networking opportunities, filled with insights for the growth of Epidetect. Furthermore, she has created ties with numerous prominent corporations in Bangkok, presenting us with a promising opportunity for potential investments for our innovation. Her interdisciplinary interests,

ranging from the field of the sciences to the humanities, makes her the linchpin unifying the team, equipping her with the knowledge to adeptly manage the varied tasks at hand.

Magdalene Chan is an aspiring medical student who thrives in solving challenging problems. With a keen interest in STEM, she is eager to drive the scientific aspect of Epidetect, bridging together biological knowledge with cutting-edge technology. Her past internship, during which she worked with post-graduate biochemistry students, allowed her to finetune her critical analysis and thinking, which would undoubtedly prove useful in this innovation. However, more significantly, this internship has reminded Magdalene of the importance of her genuine enthusiasm and passion in innovation and biotechnology, which she hopes to bring to this project.

In Kongamnuaysuk is responsible for technological advances in the project, excelling in Design Technology and 3D modeling, the basis of prototyping and bringing our vision alive. Previously interned with a well-established electrical engineering company, it exposed him to industry-leading technologies and also honed his problem-solving skills in a fast-paced and demanding environment. Moreover, as well as offering strong connections with reputable engineers, the challenges overcome at his internship cultivated his adaptive nature, allowing him to integrate effectively in an interdisciplinary setting, a quality crucial in navigating the complex development of Epidetect.

Clement Tsoi hopes to contribute positively to the lives of those dealing with epilepsy through Epidetect. His extensive knowledge in markets and finance ensures the finances of the project runs smoothly and that the product can be marketed to children with epilepsy worldwide. Furthermore, with excellent leadership, communication and interpersonal skills, he contributes effectively to team projects by fostering open dialogue, facilitating collaboration, and ensuring seamless interaction among team members to achieve shared goals.