What is the IMPACT of epilepsy?

50,000,000
More than 50 million people are living with epilepsy globally

80%
live in low- and middle-income countries

75%
do not receive treatment

3-6 times greater risk of premature death

CAUSES OF TREATMENT GAP:
- lack of trained staff
- poor access to anti-epileptic medicines
- societal misconceptions

Detecting and Tracking Seizures
BY
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Overview

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Problem Description

- More than 50 million people worldwide have epilepsy
- Which makes it the most common neurological disease in the world.
- There needs to be a tool that can potentially detect seizures while they occur
- We will focus on detecting generalized seizures
- There also needs to be a tool that can help users track seizures
Customers and End - Users

- **Customers**: Medical Providers
- **End-users**: Individuals who have these types of generalized seizures:
  1. Tonic-clonic
  2. Clonic
  3. Tonic
  4. Atonic
  5. Myoclonic

![Projected prevalence of epilepsy through 2020](image)
Characteristics of Generalized Seizures

- Most focal seizures cause an increase in heart rate
- Increase in heart rate
- Their limbs and face will appear to jerk rapidly as their muscles convulse.
- Loose consciousness
Solution: Technical Approach

Smart Watch

- Accelerometer values
- Gyroscope values
- Heart Rate values

Care Providers

- Log seizures

Collected Data for analysis and research

Database

Collected Data about the user and environment

End User

- Accelerometer values
- Gyroscope values
- Heart Rate values
User turns on seizure detection on smartwatch and has smart watch paired with smart phone

Seizure is detected and an alert is sent to the user and is given 30 seconds to respond to the alert

User responds to the alert in the given amount of time

Data such as seizure time, length, heart rate and the changes in acceleration taken as input from the user and are recorded to a database

User does not respond to the alert in the given amount of time

An alert is sent to the users emergency contact with current location

Users emergency contacts responds and helps

Concept / flow

Case 1
User turns on seizure detection on smartwatch and has smart watch paired with smart phone

Seizure is detected and an alert is sent to the user and is given 30 seconds to respond to the alert

User responds to the alert in the given amount of time

Case 2
User does not respond to the alert in the given amount of time

An alert is sent to the users emergency contact with current location

Users emergency contacts responds and helps

Emergency Phase

Case 2

7
## Potential Competitors

<table>
<thead>
<tr>
<th>Features</th>
<th>Track it and Detect it!</th>
<th>Epilepsy Journal</th>
<th>track it!</th>
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<tbody>
<tr>
<td>Detect Seizures</td>
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<tr>
<td>Track Seizures</td>
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<td>Report Collected Data to care providers</td>
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<tr>
<td>Paired with a smart watch</td>
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Challenges to Overcome

- Tuning the threshold values that determine when a seizure is taking place to make it unique to each individual user
- Convincing Medical team to use data collected
- Finding the best way to send data collected from the device to care providers
Conclusion

- Detect seizures while they occur
- It will use the sensors available on smart watches and smart phones to determine if a seizure is taking place
- Track seizures
- Distribute collected data to care providers
- 100% accuracy is not anticipated when detecting seizures but can potentially be life saving
References

- “Epilepsy-Projections-Table.” Cheef Botanicals, cheefbotanicals.com/using-cbd-oil-for-seizures-and-epilepsy/epilepsy-projections-table/.
- https://www.google.com/search?q=generic+smartphone&rlz=1C5CHFA_enUS702US702&source=lnms&tbm=isch&sa=X&ved=0ahUKEwjT38GkwPjgAhVILwVkJKMcqDUsQ_AUIDigB&biw=1280&bih=721&dpr=2#imgrc=lMECEHv_pQVJKM:
- https://www.researchgate.net/figure/Smartwatch-accelerometer-axes_fig2_317150667
- https://www.j-epilepsy.org/upload//thumbnails/er-6-1-16f1.gif
References continued

- https://www.google.com/search?q=end+user&rlz=1C5CHFA_enUS702US702&source=lnms&tbm=isch&sa=X&ved=0ahUKEwjR1fbqwqPgAhWLxVvkKHVX7AlsQ_AUIDigB&biw=1280&bih=721#imgrc=udfQqgFXEfp40M:
- https://www.google.com/search?q=prevalence+of+epilepsy&rlz=1C5CHFA_enUS702US702&source=lnms&tbm=isch&sa=X&ved=0ahUKEwj_2uOw6PgAhVFw1kKHY0lCEkQ_AUIECgD&biw=1280&bih=721#imgrc=QR8FOVaM7TX-nM:
- https://www.google.com/search?q=epilepsy&rlz=1C5CHFA_enUS702US702&source=lnms&tbm=isch&sa=X&ved=0ahUKEwij2-uOw6PgAhVFw1kKHY0lCEkQ_AUIECgD&biw=1280&bih=721#imgrc=R4zYopDMTQxD7M:
References continued