Seizure Detection Design Review 1

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Problem Significance

- Estimated **50 million** people worldwide have epilepsy (WHO)
- In a study of 188 patients and over 1100 seizures, 20% occurred during sleep (Epilepsy Foundation)
- User Needs Survey
 - 14 of 25 experience seizures while asleep or have taken care of another person who has nocturnal seizures
 - Of the 14, 9 replied that they were either **unaware** of seizures while asleep or mentioned that it was more **difficult to detect** compared to while awake
 - Among those, 3 were parents of young children that emphasized needing to closely/actively monitor for seizures during night

Market Statistics

In 2019, average annual health care spending for epilepsy and seizures was **\$24.5 billion** in the United States

Seizure costs: **\$19 billion**

Epilepsy costs: **\$5.4 billion** (CDC)

Survey Summary

Key takeaways:

- Seizure types vary and affect people indiscriminately
- The most common symptoms during an episode was related to involuntary movement
 - Seizures at night are commonly silent and thus difficult to detect
- Even distribution between a desire for **monitoring** and **alerting**
 - Notable features: Event history, exclusion of rhythmic activities, firmly attached
- There is **no definitive treatment** for a seizure; the first priority is the individual's safety, then record of the event and assess if rescue medication is needed

User Needs

Requirements:

- **Functional:** Motor detection and alerting systems
 - Accuracy is important avoid false positives
- **Compatibility:** Adjustable (ages) and non-irritating
- **Affordability:** Reasonable price for consumers
 - 1 time purchase

Needs Statement

An accurate method of detecting seizures as they occur and alerting nearby caretakers while users are asleep.

Users (stakeholders): people (all ages) that experience motor seizures, epilepsy, or nocturnal seizures while sleeping

Problem: undetected seizures while asleep, patient/caretakers may be unaware and health suffers

Outcome: detecting the seizure while the user is asleep and alerting others to the seizure for further actions to ensure safety

Potential Concepts

Device to detect motor symptoms

- Glove/ring
- Wrist attachment
- Mouth piece

Two part detection+alert systems

- Send alert to caretaker's phone/pager
- Device makes noise/visual change/vibrates

Tracking/record history

- Log of # of seizures, duration, timepoints
- Monitor vitals (pulse/O2)

References

- 1. <u>https://www.who.int/news-room/fact-sheets/detail/epilepsy#:~:text=Over</u> <u>view-,Epilepsy%20is%20a%20chronic%20noncommunicable%20disease%</u> <u>20of%20the%20brain,around%2050%20million%20people%20worldwide</u>.
- 2. <u>https://www.epilepsy.com/stories/sleep-and-epilepsy</u>
- 3. <u>https://www.cdc.gov/epilepsy/data-research/facts-stats/index.html</u>