

A brain powered addiction intervention

Details

My role	Tools	Methods
I acted as both designer and developer on this project.	Adobe Premier, XD and Illustrator as well as a GoPro for POV filming	Literature review, expert exploration, unstructured interviews
	Competition	Timeline
	Cheng Wu Innovation Challenge (Finalist)	February '20 - April '20

Resources

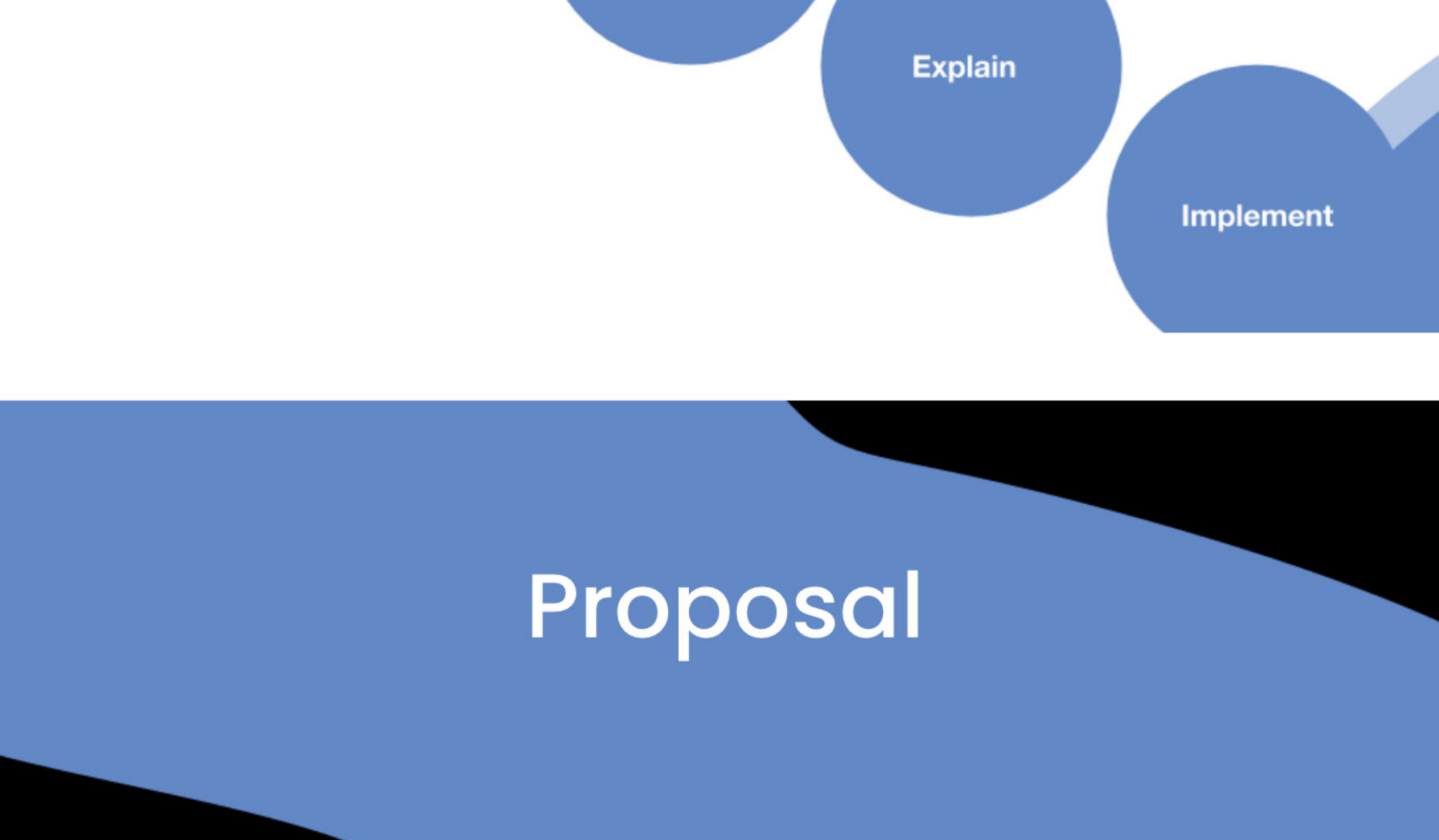
Full length video presentation

Slide deck

Design Challenge

We were told to design something that would help people, but were also told we did not need to take into account profitability. However, it still needed to be something that could be implemented with the technology that we have today.

Road Map



Proposal

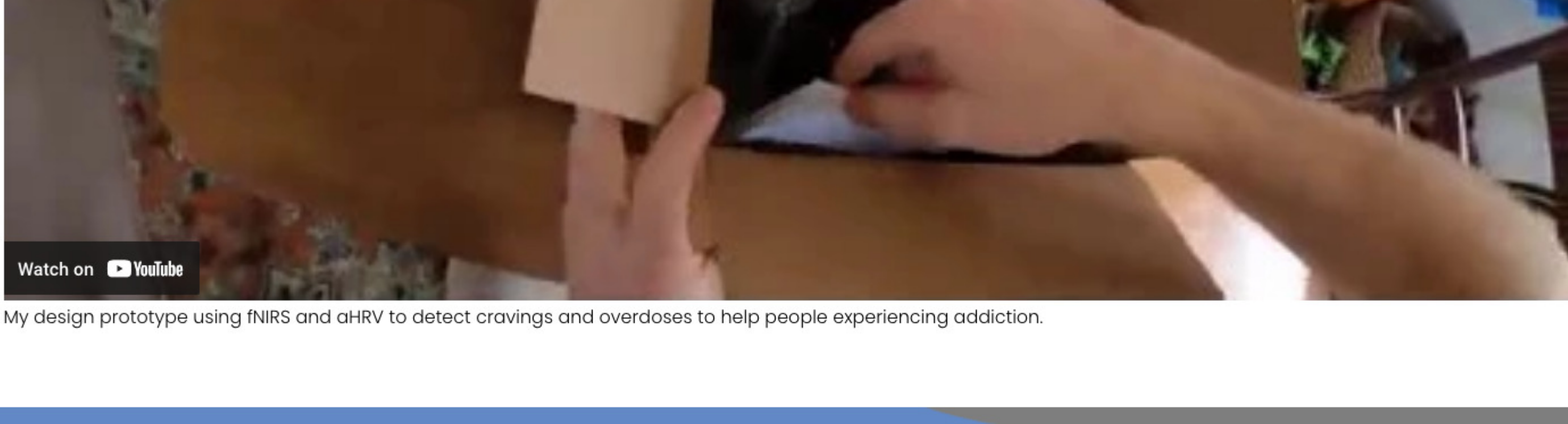
Story Time

Logan has been struggling with opioid addiction for the past few years. He has quit and relapsed a few times, but now he is determined to quit for good. He heard about pre-empt from a friend who used pre-empt to satisfy a court ordered drug treatment.

Once pre-empt arrives he is prompted to set up the system so that it can get a baseline reading. It goes on to tell him about how it uses the smart cap along with the smart watch to determine when he is experiencing an addiction.

Later that week Logan has a rough day at work and after ignoring pre-emts prompts to think long term and step away from the situation, he relapses. What he doesn't know is that this batch was cut with fentanyl and he overdoses. Luckily pre-empt's built in emergency alert mechanism kicks in and his emergency contacts as well as an ambulance is contacted.

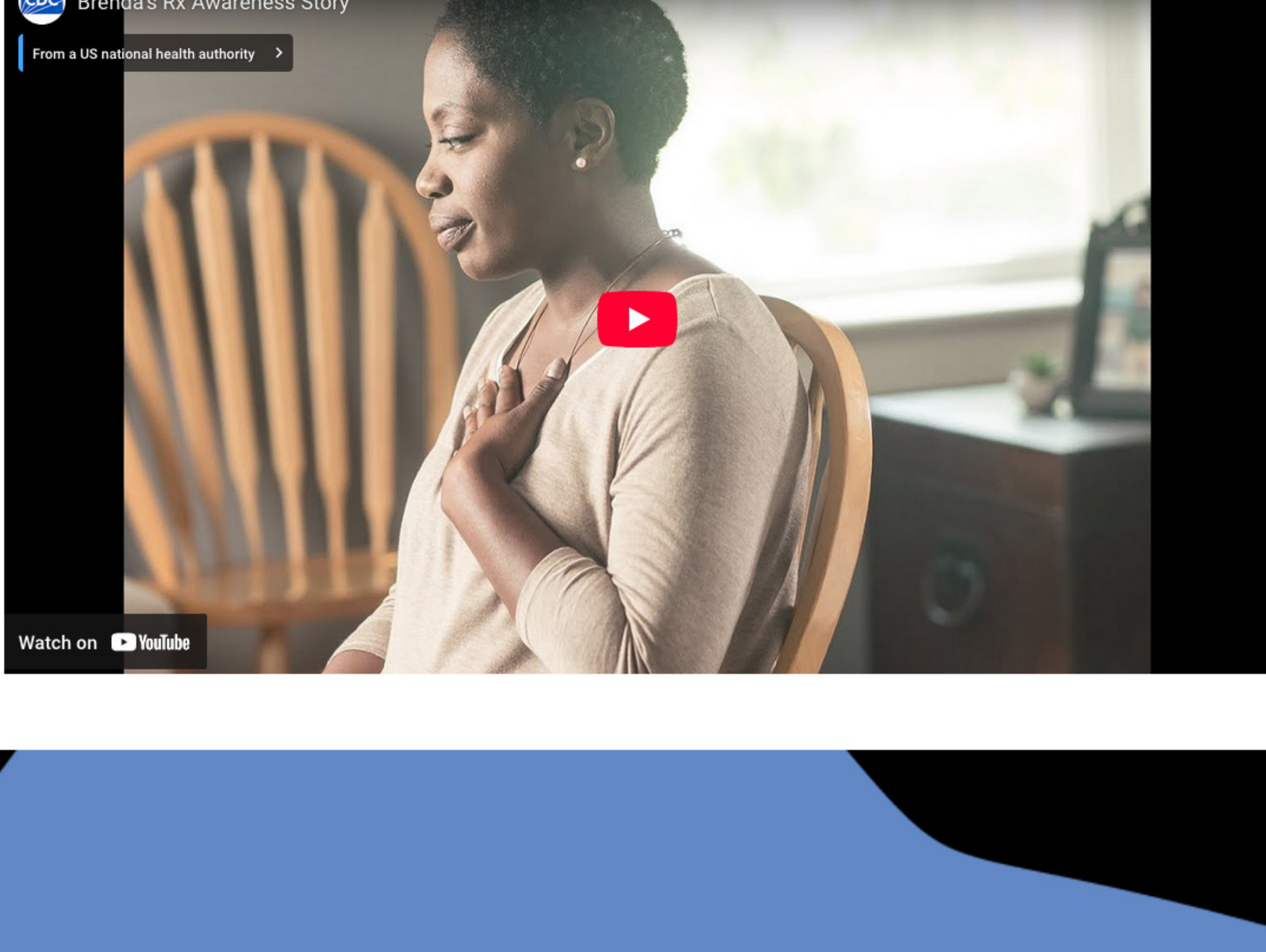
A few weeks of pre-empt preventing a few lower level urges Logan passes and gets rid of his pipe. Then over a month later Logan passes a big milestone and earns a badge and an amazon gift card for staying clean.



My design prototype using NIRS and aHRV to detect cravings and overdoses to help people experiencing addiction.

Problem

Brenda's story



"Part of me wanted to keep using, but more of me wanted to stop."
— Brenda

Research and reasoning

Leveraging existing government programs and plans

The US Department of Health and Human Services 5-Point Strategy To Combat the Opioid Crisis
Goal Statement: Reduce opioid-related morbidity and mortality

1) Improve access to prevention, treatment and recovery support services

Treatment
"Support broader adoption of Assisted Outpatient Treatment and Assertive Community Treatment models and provide technical assistance to states and tribes."

Recovery
"Identify innovative ways to expand and fund recovery services as part of a continuum of services to support stable and long-term recovery."

Public Communications Division, Roadmap (M.D.), Assisted Recovery for Health, "5-Point Strategy To Combat the Opioid Crisis" (HHS) (Nov. 7, Jan. 2018).

The third aspect of report called for improving public health data collection, specifically real time actionable data, which is exactly what I had in mind when I created the overdose response feature in PreEmt. Overall PreEmt fits perfectly into the larger government strategy and thus will hopefully be a great candidate for grant funding.

The US Department of Health and Human Services 5-Point Strategy To Combat the Opioid Crisis
Goal Statement: Reduce opioid-related morbidity and mortality

1) Improve access to prevention, treatment and recovery support services

2) Targeting the availability and distribution of overdose-reversing drugs

3) Strengthen public health data and reporting
"Collect and disseminate as close to "real-time" as possible, actionable data that can be used to target interventions."

4) Supporting cutting-edge research

5) Advancing the practice of pain management.

Public Communications Division, Roadmap (M.D.), Assisted Recovery for Health, "5-Point Strategy To Combat the Opioid Crisis" (HHS) (Nov. 7, Jan. 2018).

Expert and user interviews

During the design process I also took the time to ask community stakeholders what they thought about the idea. One counselor at Limestone health here in Bloomington stated that a tool like PreEmt would be invaluable for their practice. While one of her patients stated that she tries to use the behavioral strategies her counselor has taught her, but sometimes they just aren't enough.

Having a way to monitor our clients in the field and get real time updates on their progression, would be an invaluable tool for us as counselors.

- Limestone Health Counselor, Bloomington Indiana

Currently I carry around a list of reasons why I decided to get sober and try to look at them whenever I get cravings, but sometimes in the heat of things I forget.

- Limestone Health Patient, Bloomington Indiana

Explanation of technologies

Behavioral therapy + Rewards

Functional near infrared spectroscopy which will be what is in the pre-empt cap, works by shining a near infrared beam of light into the brain and measuring the amount of oxygenated blood that it comes in contact with. This is useful because the amount of blood in a given brain region is directly correlated to the amount of neuronal activation. Thus, we can measure which parts of the brain are active at any given time. Furthermore, it allows us if we have sufficient baseline testing to detect an addiction related craving or an overdose.

fNIRS (functional near infrared spectroscopy)

The two most effective psychological treatments for opioid addiction are Cognitive Behavioral therapy and Contingency management. CBT urges patients to evaluate their thoughts to encourage behavior change. While CM reinforces positive behaviors with tangible rewards.

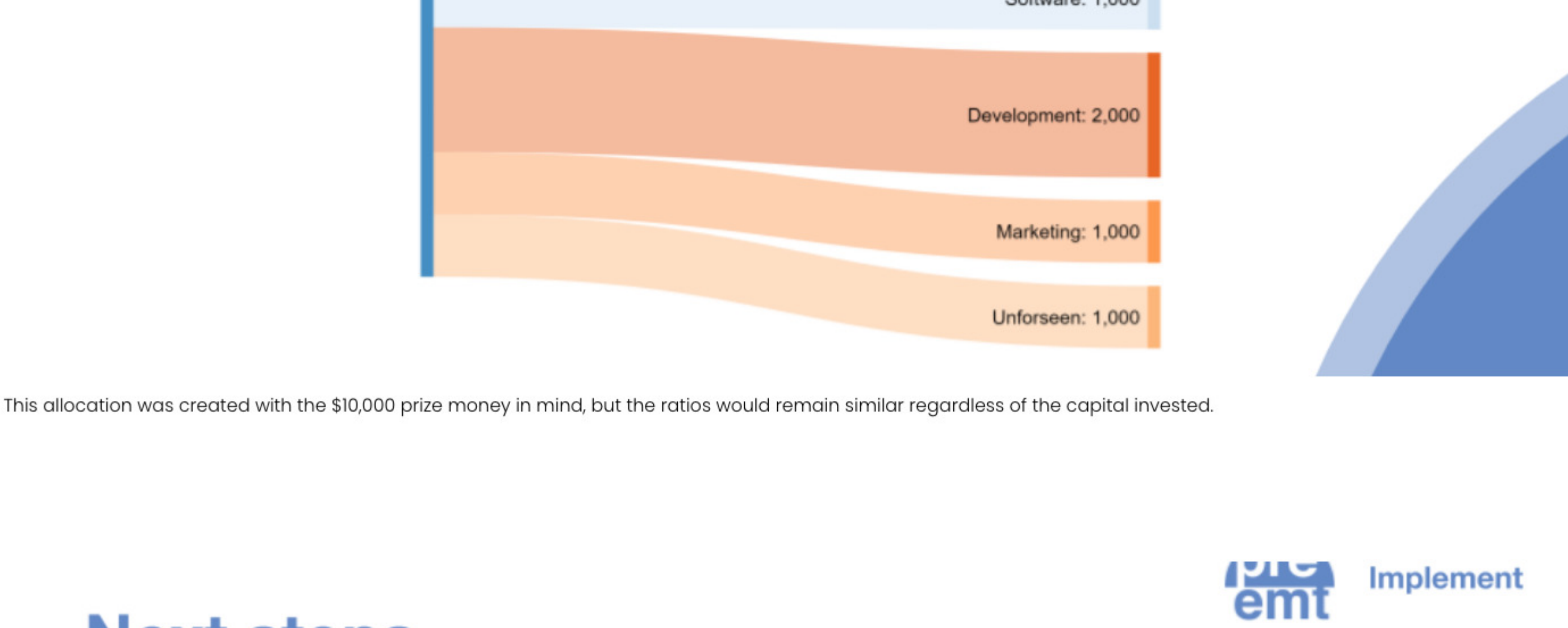
aHRV (average heart rate variability)

Heart rate was significantly greater 30 minutes before and after participants reported craving heroin than when they did not.

PPG (photoplethysmography)

Amputatory heart rate variability is just a fancy way of saying average pulse over time. The pre-empt watch will be measuring this at all times and will alert the cap any time an irregularity is detected. As shown by Dr. Kennedy and associates average heart rate can be a very good predictor of opioid related cravings.

Implementation



This allocation was created with the \$10,000 prize money in mind, but the ratios would remain similar regardless of the capital invested.

Next steps

Refine Algorithms	
Production Blueprint	
Order Hardware	
User Testing	
Legal Testing	
Field Testing	
Final Changes to Model 1.0	

I removed the exact dates because they are no longer relevant, but the timeline could be implemented at any time.