

University of Colorado Anschutz Medical Campus

Developing a Physician Sleep Research App Without Developer Expertise: Insights from Apple's Limited Beta Program

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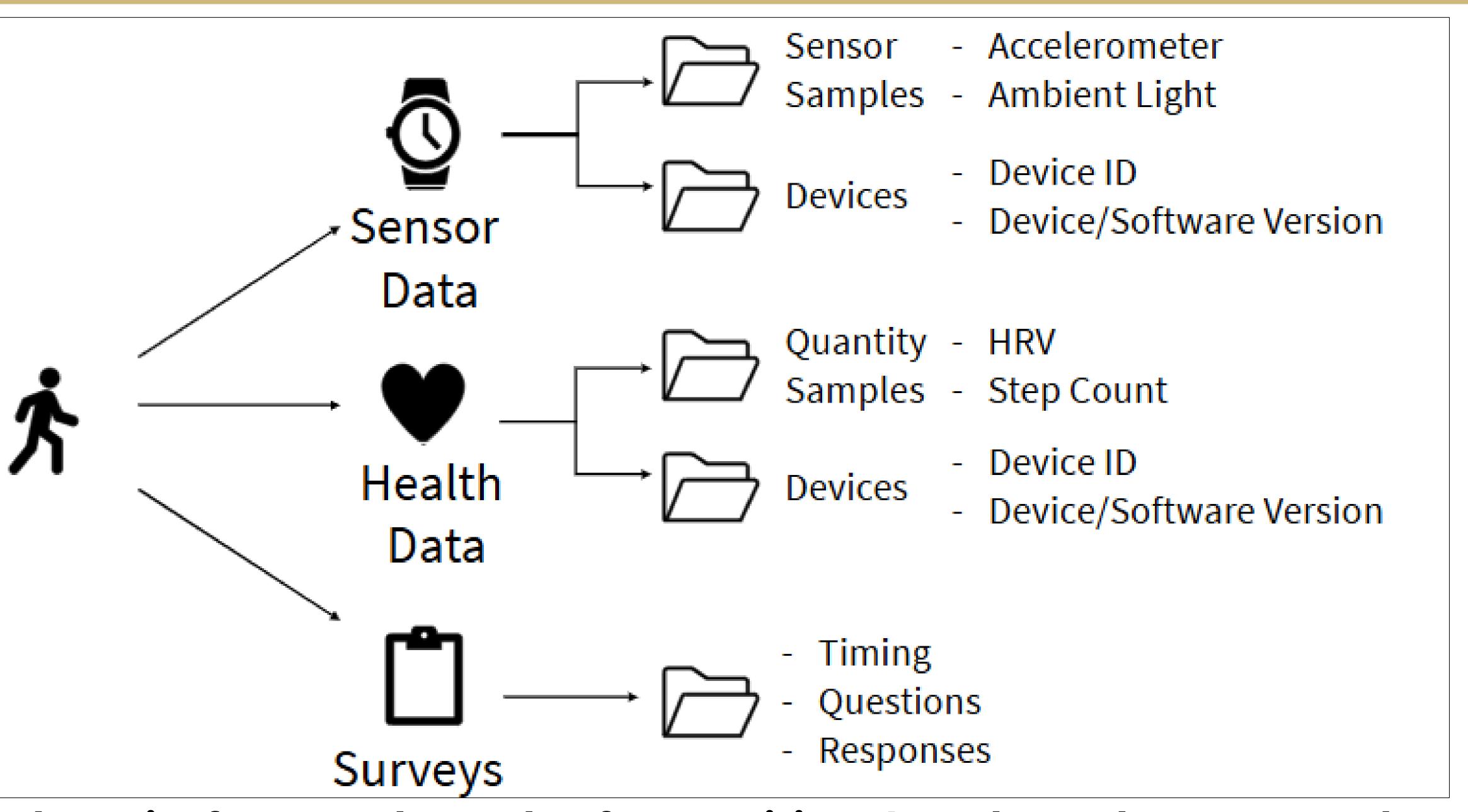
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Apple's Limited Beta Program decreased barriers to integrating wearable sensors into clinical research. Our team's experience highlights the potential of industry-academic partnerships to further innovation and improve application of sensor-based research in clinical environments.



Schematic of Encrypted Data Flow from Participant's Apple Watch to AVS S3 Bucket

APP DEVELOPMENT TIMELINE

Selection for **Limited Beta** Program

Our study team was chosen to join Apple's Limited Beta Program to develop a research app for the REST-EM study

Metric Selection

Selected HealthKit and

SensorKit metrics (sleep, HR,

HRV, VO₂ max, accelerometer,

wrist detection, and ambient

light) relevant to circadian

disruption

Study Design

Designed a study to examine sleep disruption and wellbeing among emergency physicians using Apple Watch data and surveys

App Development in Xcode

Used Apple's Study App template in **Xcode to build core** architecture and customize participant interfaces

Data Architecture

Set up

Configured AWS S3

storage, encryption

keys, and participant-

specific access for

secure data handling

Survey Customization

Adapted templated survey questions and formats to fit study needs using research

Pilot Testing

Tested app

functionality and data

flow using Xcode

simulator and

TestFlight before

launch

Collaboration with Apple Team

Worked with Apple engineers and scientists to troubleshoot and suggest feature improvements

App Submission

Archived and uploaded the app to App Store Connect, completing privacy disclosures and final checks

BACKGROUND

- Wearable sensors are increasingly used in clinical research for continuous, noninvasive data collection¹⁻²
- Building custom apps to captures this data often requires technical expertise and resources^{1,3,4}
- Apple launched the Limited Beta Program to provide a templated framework for researchers without formal software development training

PURPOSE

Share the experience of a physician-scientist led team using Apple's Limited Beta Program to develop and deploy a research app for REST-EM, a physician sleep and wellbeing study

METHODS

- Participated in Apple's Limited Beta Program in 2024
- Used the Study App Template in Xcode to create an app for the REST-EM study
- Collected HealthKit data (e.g., sleep duration, HRV, body temperature) and SensorKit data (accelerometer), and administered validated surveys via ResearchKit
- Securely stored data on AWS and integrated with REDCap

RESULTS

- Built and launched the app within six months at no cost despite no prior app development experience
- Enrolled 164 participants as of November 2025
- Challenges: survey customization, app publishing, user permission settings
- Solutions: collaboration with Apple engineers, workarounds for unsupported features, remote participant support.

CLINICAL RELEVANCE

- Demonstrates that clinician-led teams can develop research apps without software developers
- Highlights a pathway for integrating wearable technology into clinical research and care
- Supporters broader access to personalized health insights and innovation in clinical research