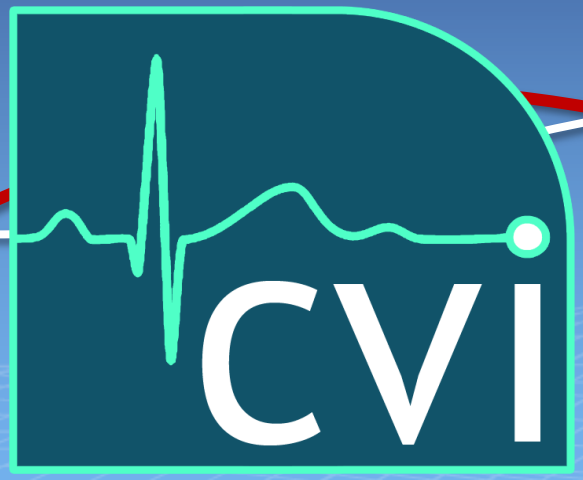
Cardiovascular Instrumentation, Ltd.

Wireless Auscultation with Decision Support



Scott Greene, Kevin McNiece, Andrew Oudjin, Amir Siddiqui, Dianna Yee
Simon Fraser University, Burnaby, BC

Overview

- Background
  - Introduction to CVI Team
  - Project Motivation
- Product Functionality
  - Product Overview
  - Hardware Design
  - Data Communications Channel
  - Software Design
- Conclusion and Questions
- Live Demonstration

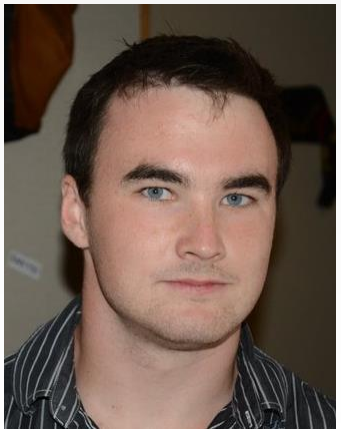
CVI Team

Scott Greene, CEO

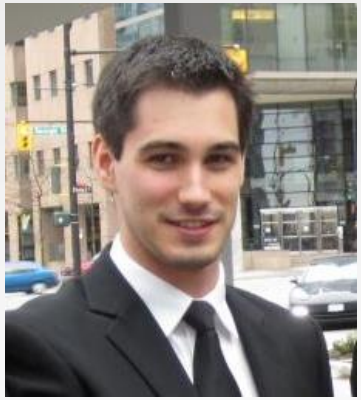
- CVI Team Lead and CEO
- Hardware Development Focus

Kevin McNiece, COO

- CVI Document Control and Communications
- Data Analysis and Representation Focus



CVI Team



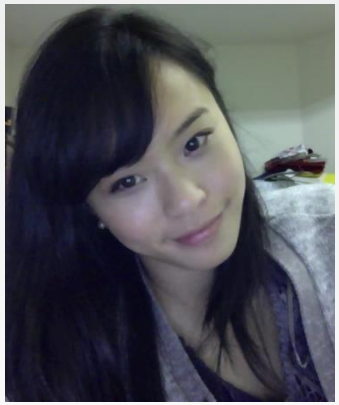
Andrew Oudjin, Hardware Lead

- Amplifier and Analog Signal Processing Focus

Amir Siddiqui, CFO

- Financial Management
- Communications Software Development

CVI Team



Dianna Yee, Software Team Lead

- Software Development Structure
- User Interface and Software Structure Design

Project Motivation

Project Motivation: Main Objectives

Provide easy-to-use stethoscope that assists in medical decisions

Provide medical staff with a remote database of patient information

Motivation: Stethoscope Use

I. Heart Sounds

II. Heart murmurs, irregular heart beats, valve problems

II. Lung Sounds

- Congestion, wheezing

III. Abdominal Sounds

Bowel sounds, obstructions

What is the problem with current stethoscopes?

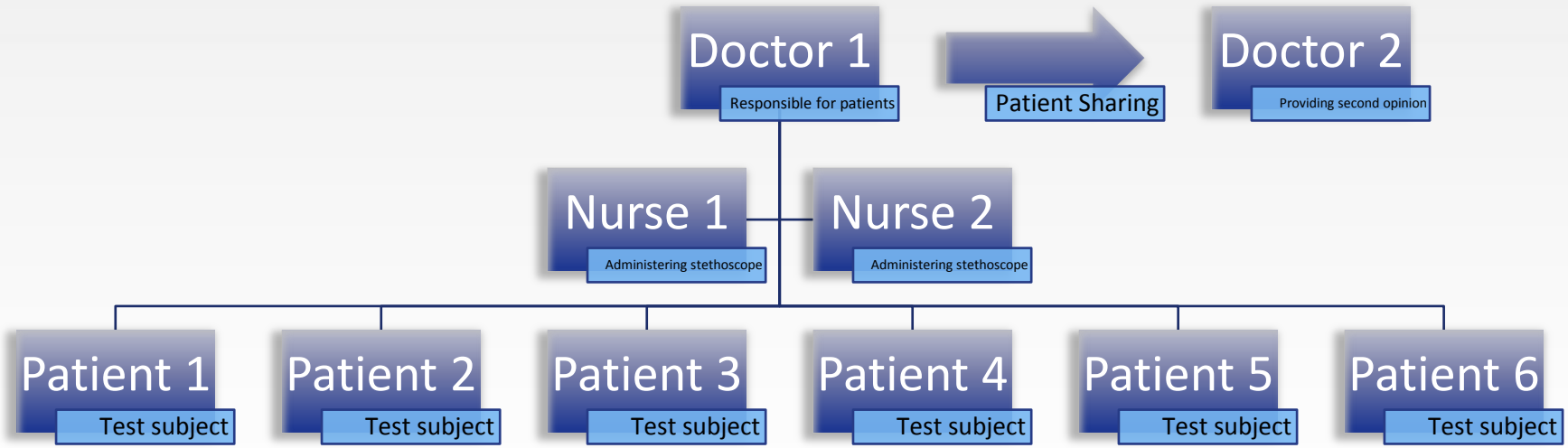
@#%$!!!

- Subjectivity in interpretation
- Long learning curve
- Need physician's validation
- Often weak sound signals

Our Product Solution

Operation Diagram

Motivation: Patient Sharing and Access



Decision Support & Auscultation

- General process:
  1. Gather information (place hearing piece on patient)
  2. Analyze data, apply model
  3. Provide suggestions to doctors, nurses
- Advantages & limitations:
  - Spreads medical expertise
  - Relatively simple
  - Answer is only as good as the input data and model!

Clinical Impact

Direct Advantages:

- Improved quality of care
- Increased capacity to serve patients
- Reduced stress on health care staff
- Reduced subjectivity and error
- Electronic record-keeping

Social & Economic Impact

- Supports Telemedicine
- Reduces guess work of nurses and doctors
  - Serving rural population where shortages exist
  - Spreading knowledge among staff
- Reduces operational costs
  - Save time and money on travels
  - Reduces expenses for supporting rural medical relief

System Overview

System Overview

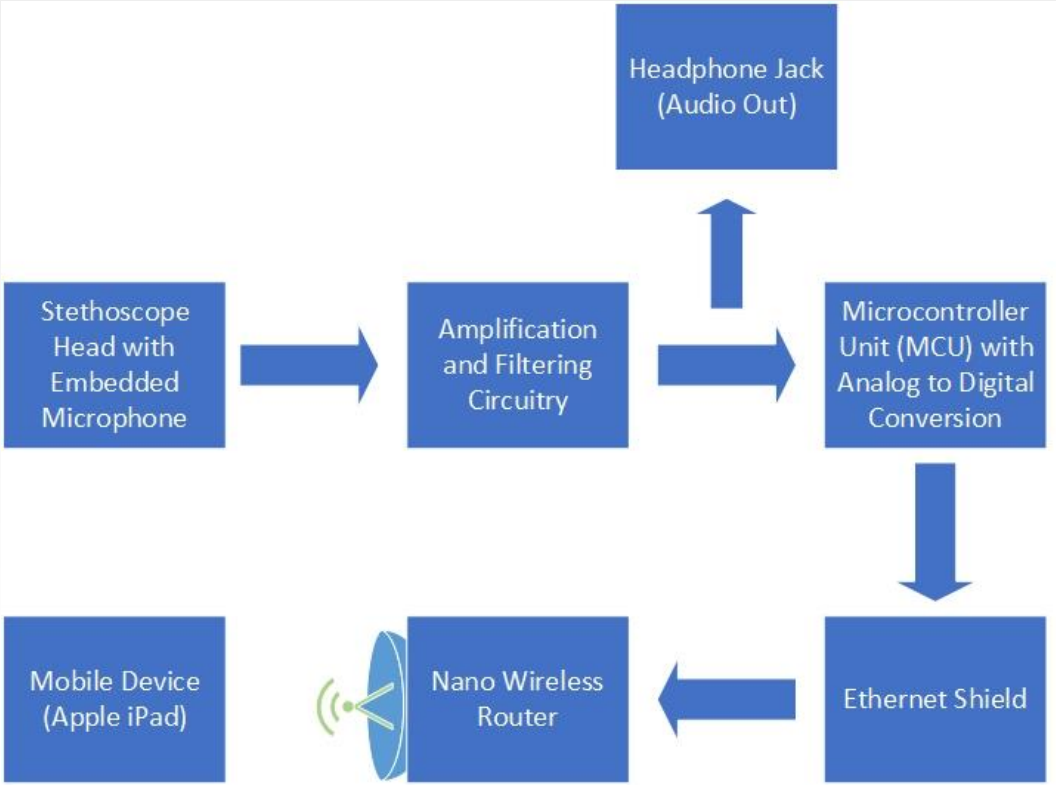
Hardware

- Electronic Stethoscope capable of wirelessly transmitting to intermediate device
- Listen to audio signal through headphones

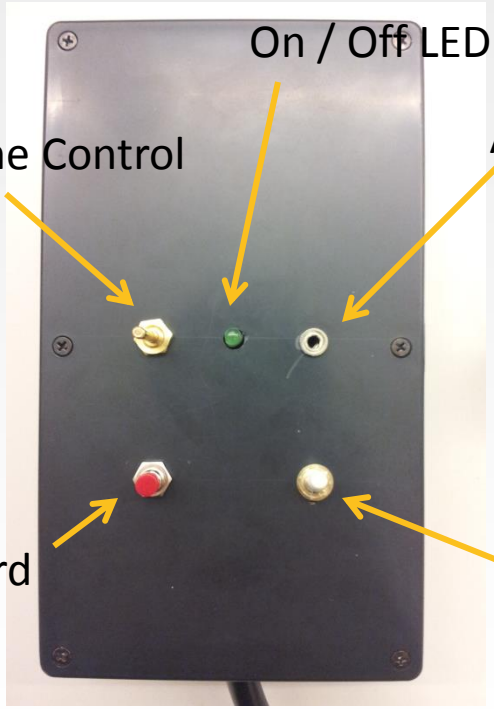
Software

- Intermediate device to interface to patient database and perform data processing
- Mobile device interface access

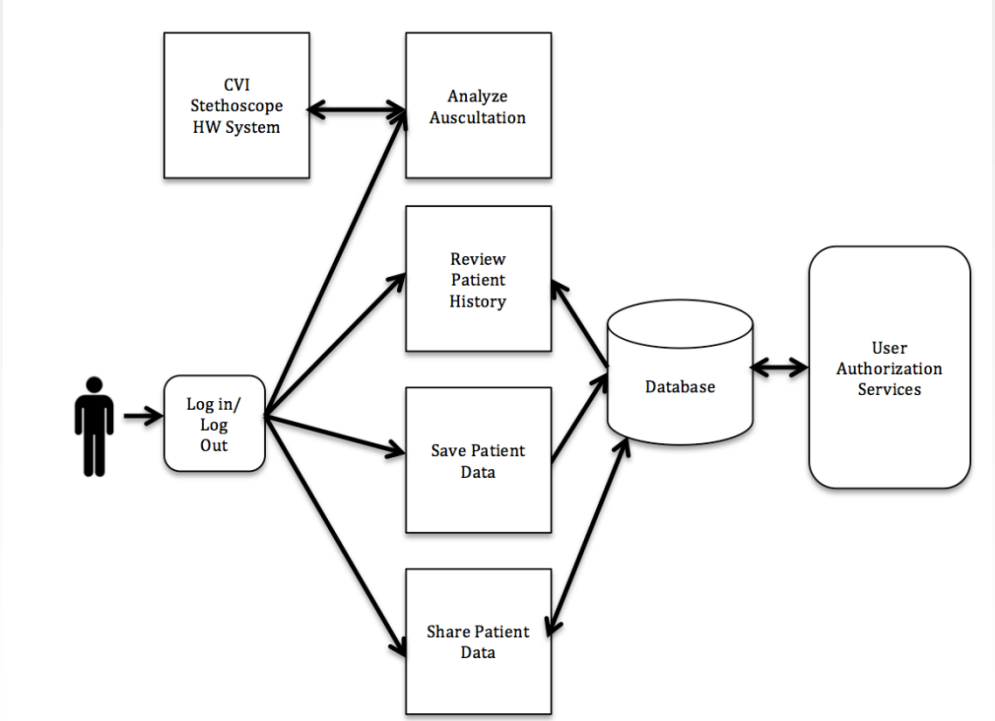
Hardware Overview



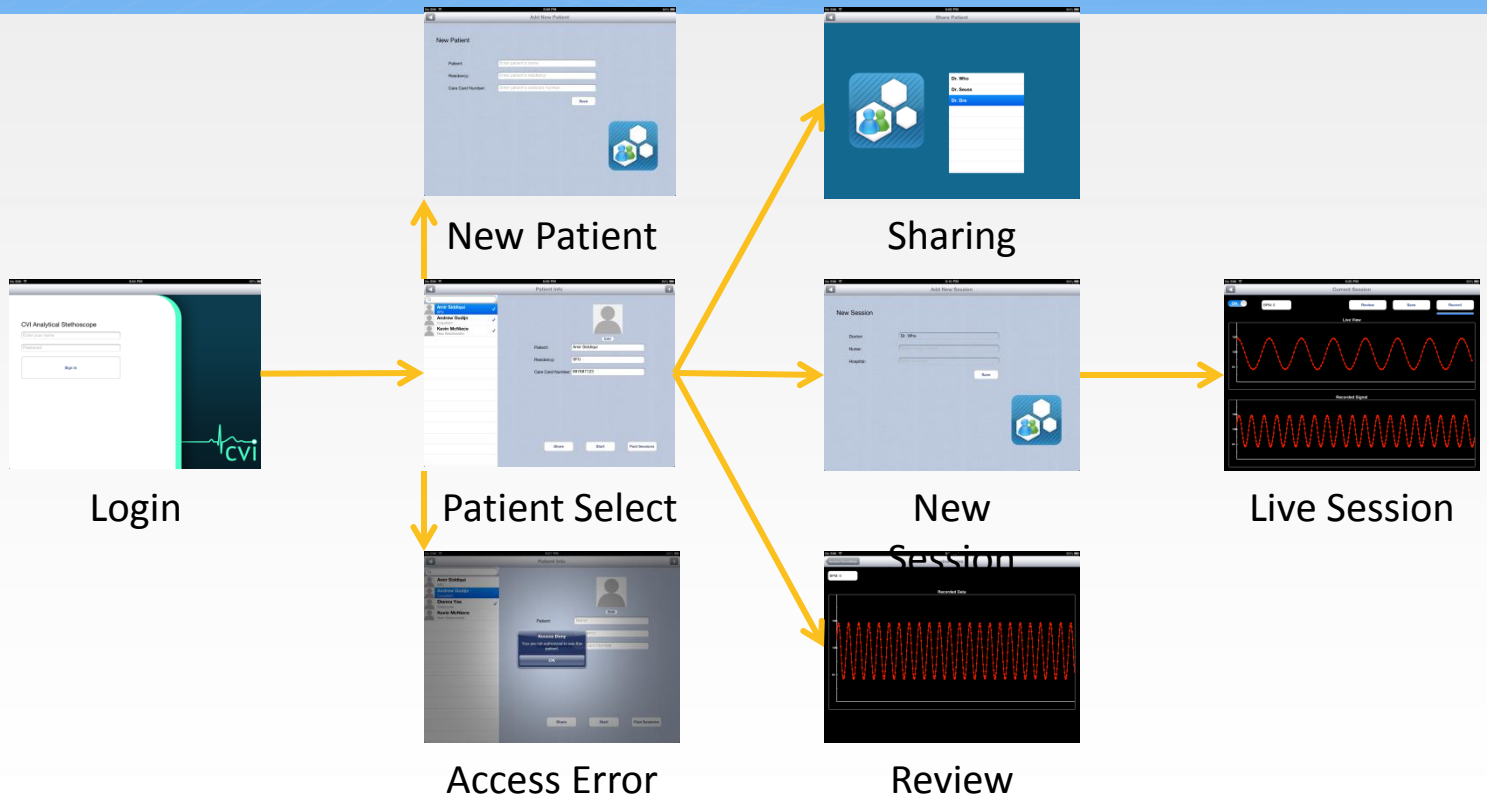
Hardware Overview



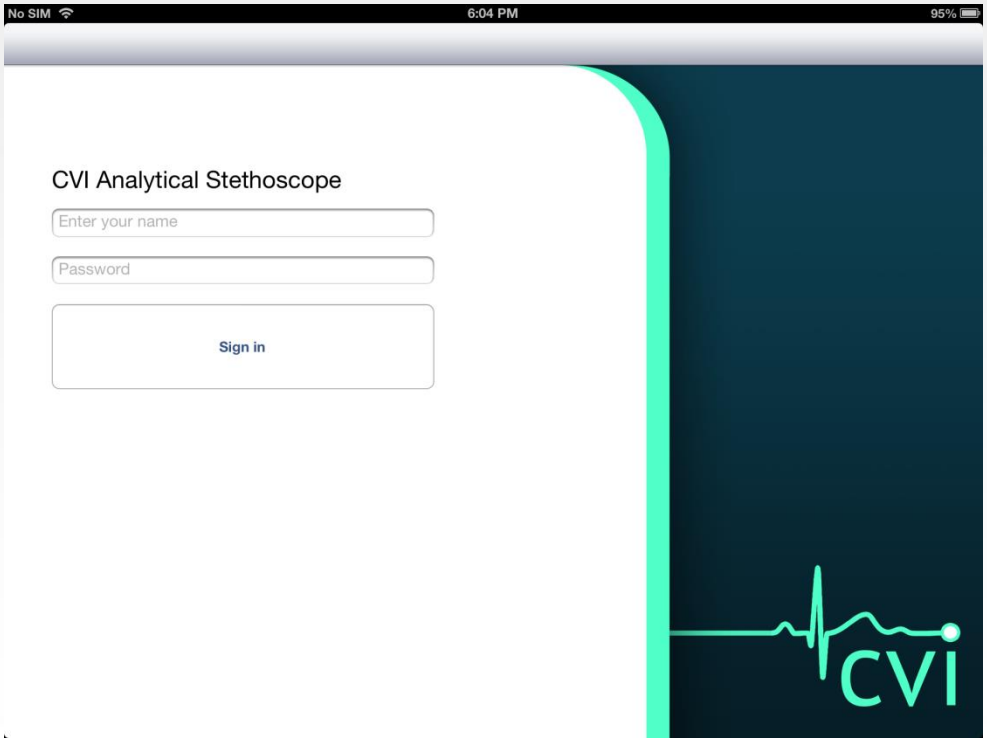
Software Overview



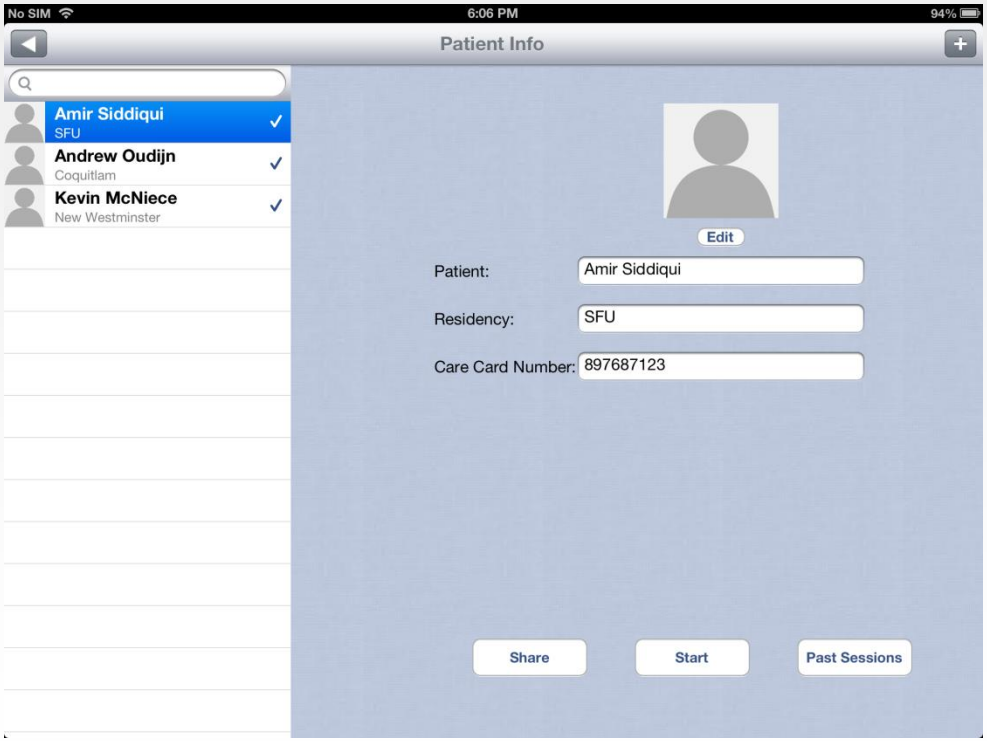
User Interface Overview



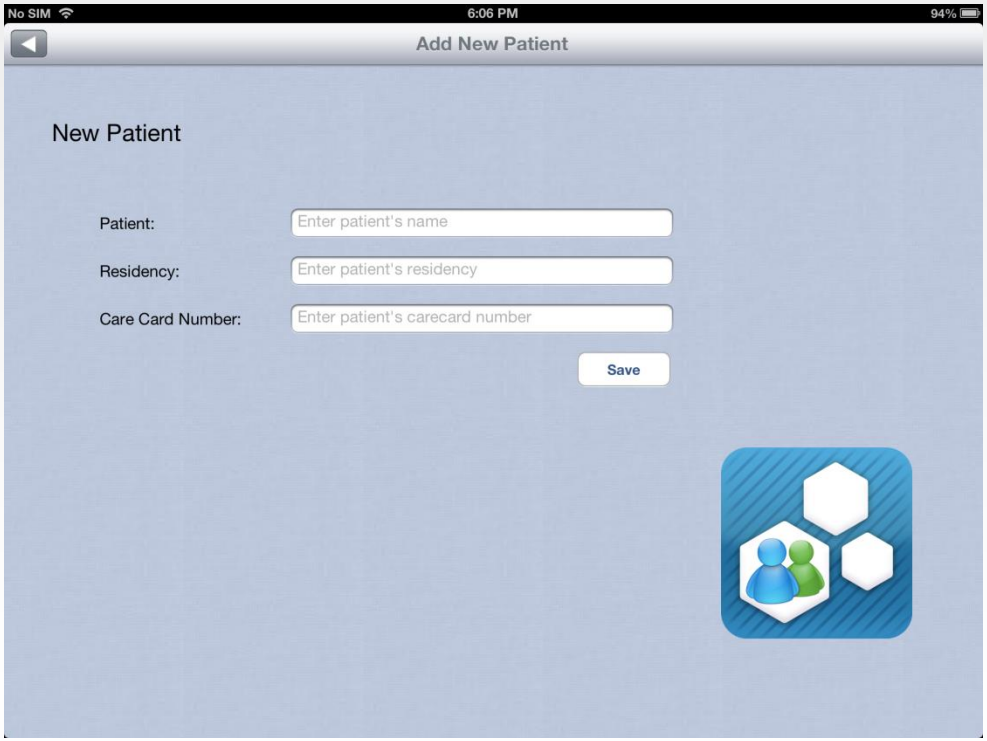
Login


No SIM
6:04 PM
95%
CVI Analytical Stethoscope
Enter your name
Password
Sign in
CVI

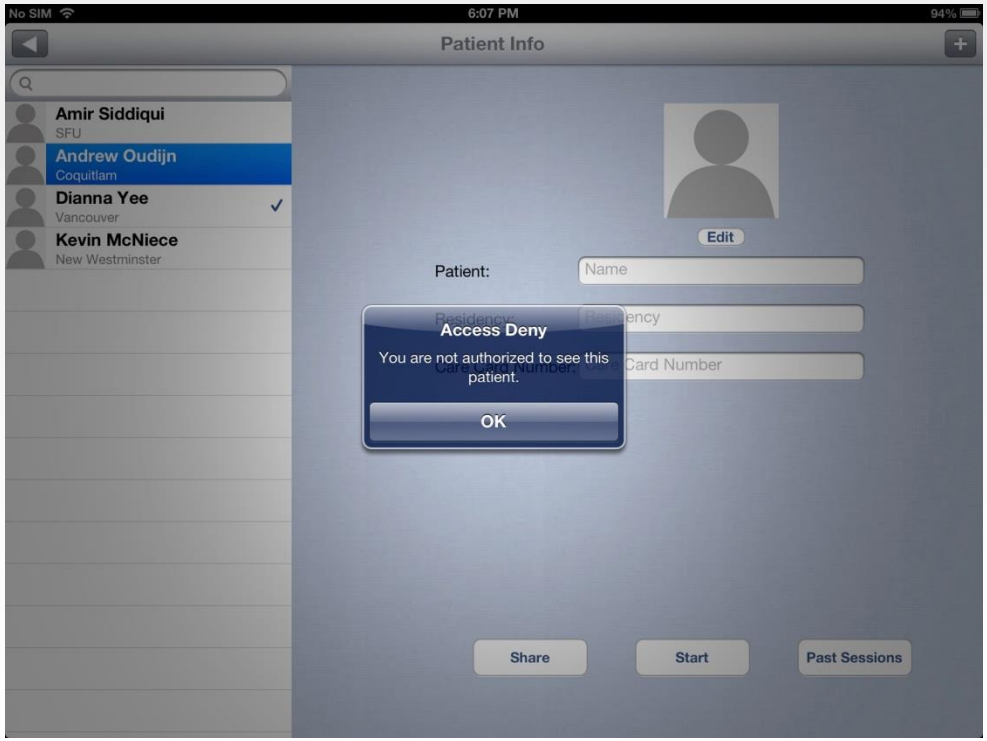
Patient Select



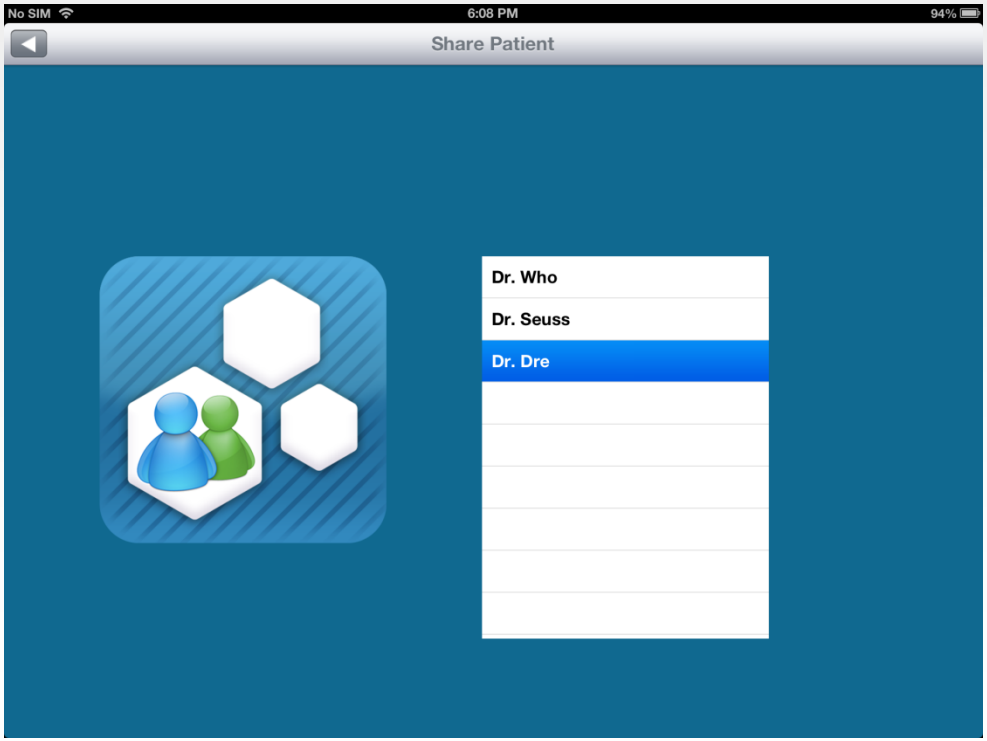
New Patient


No SIM
6:06 PM
94%
Add New Patient
New Patient
Patient:
Enter patient's name
Residency:
Enter patient's residency
Care Card Number:
Enter patient's carecard number
Save

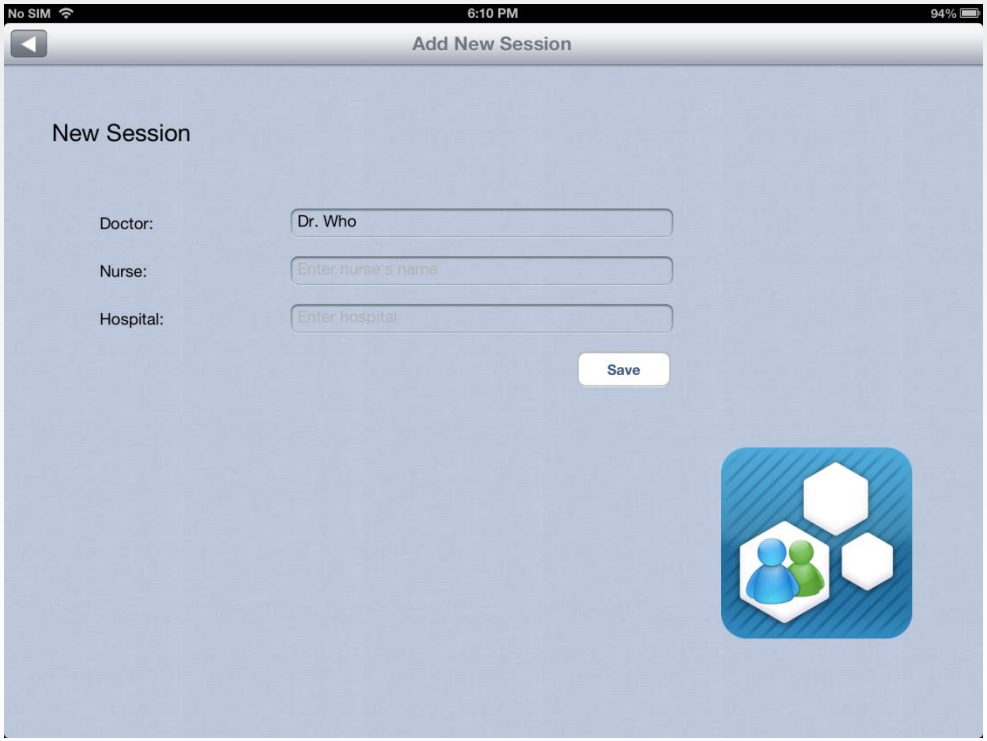
Access Restrictions



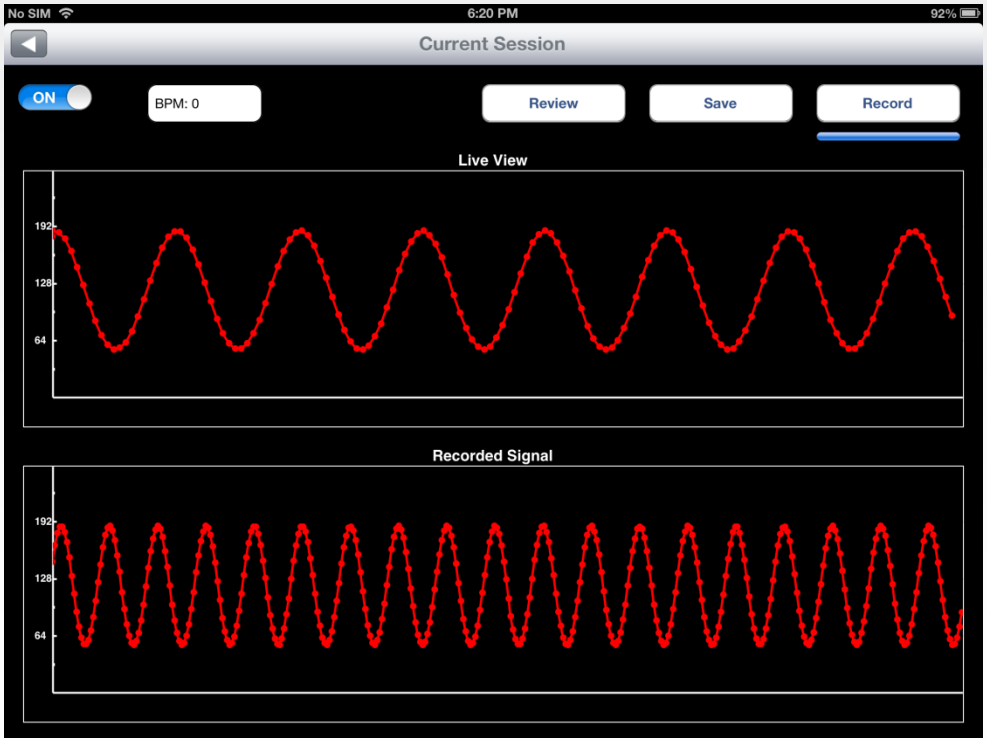
Sharing



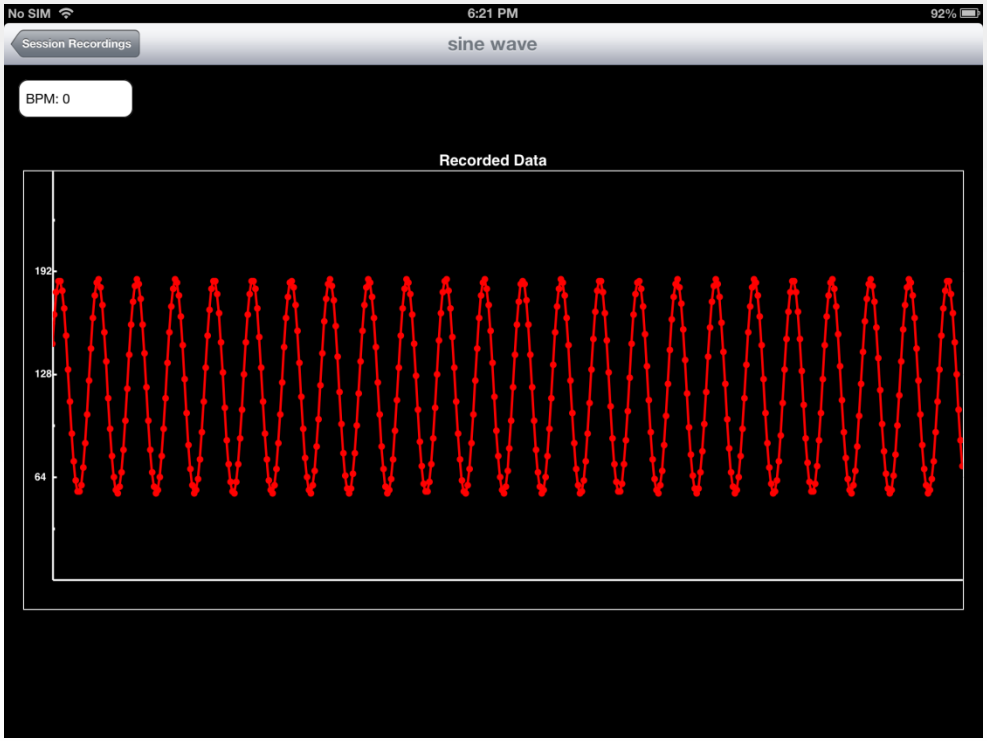
New Session


No SIM
6:10 PM
94%
Add New Session
New Session
Doctor:
Dr. Who
Nurse:
Enter nurse's name
Hospital:
Enter hospital
Save

Live Session



Review Session



Finances

Budget Breakdown

Projected	
Materials Needed	**Cost**
Headphones	$75
Microphone	$50
Wireless Transceivers	$50
Microcontroller	$250
Amplification and transmission circuitry/fabrication	$160
Wireless Networking Hardware	$50
Contingency	$100
Total Cost	**$735**

Actual Costs	
Materials Needed	**Cost**
Ethernet Shield	$68.77
Battery	$29.99
Case	$20.00
Software License	$110.88
Amplification and transmission circuitry/fabrication	$258.99
Wireless Networking Hardware	$20.37
Total Cost	**$509**
Contingency Remaining	$291

Scheduling

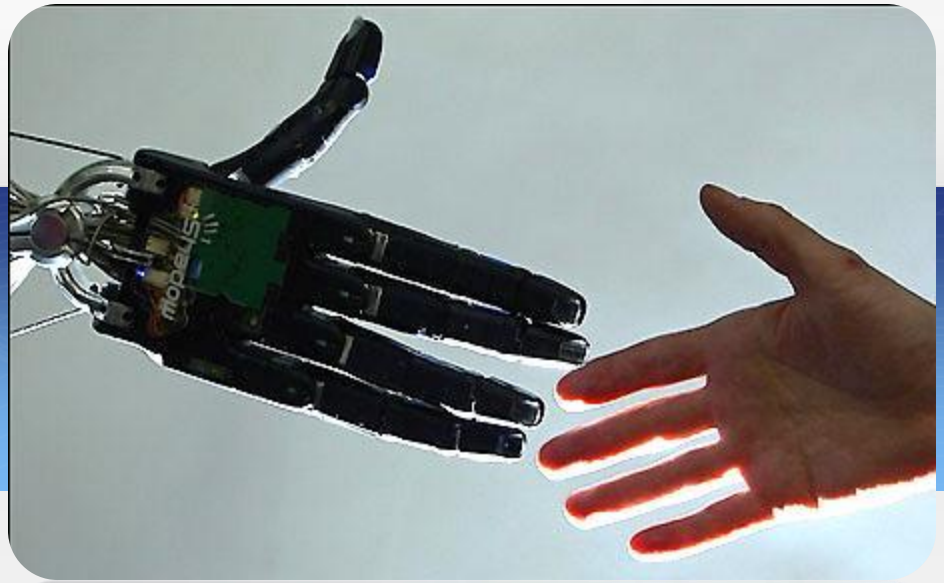
Milestone	Projected Milestone Date	Realized Milestone Date
Project Planning/Proposal	January 21	January 21
Design	February 14	March 11
Coding, Development, and Unit Test	March 17	April 3
Integration and Assembly Test	March 31	April 20
Project Closure	April 3	April 23

Learning Achievements

- Hardware:
  - Implementation of Circuit Knowledge
  - PCB Design and Fabrication
  - System Integration
  - Microcontroller Programming
- Software
  - Knowledge of Objective C
  - Communications Protocols and Data Integrity
  - Data Representation and Processing
  - Database Access

Conclusion

- Our System Accomplishes:
  - Improved quality of treatment
  - Improved working conditions for medical staff
  - Greater accessibility to treatment
  - Reduced impact of physician shortages
  - Reduced costs



We do not plan to replace doctors but help them to perform to the highest standards.

Reference Slide and Acknowledgments

- **Special Thanks To:**
  - **Ash Parameswaran**
  - **Mike Phang**
  - **Steve Rickards**
  - **Maylene Fong**
  - **Sarah Upton**

www.StackOverflow.com – Software Development

www.Instructables.com - Hardware Development

Questions?