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# Cardiovascular Instrumentation, Ltd. Wireless Auscultation with Decision Support



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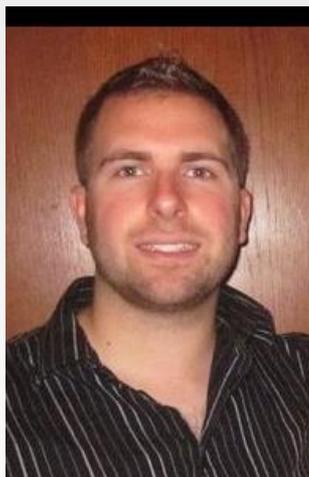
# Overview



- 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

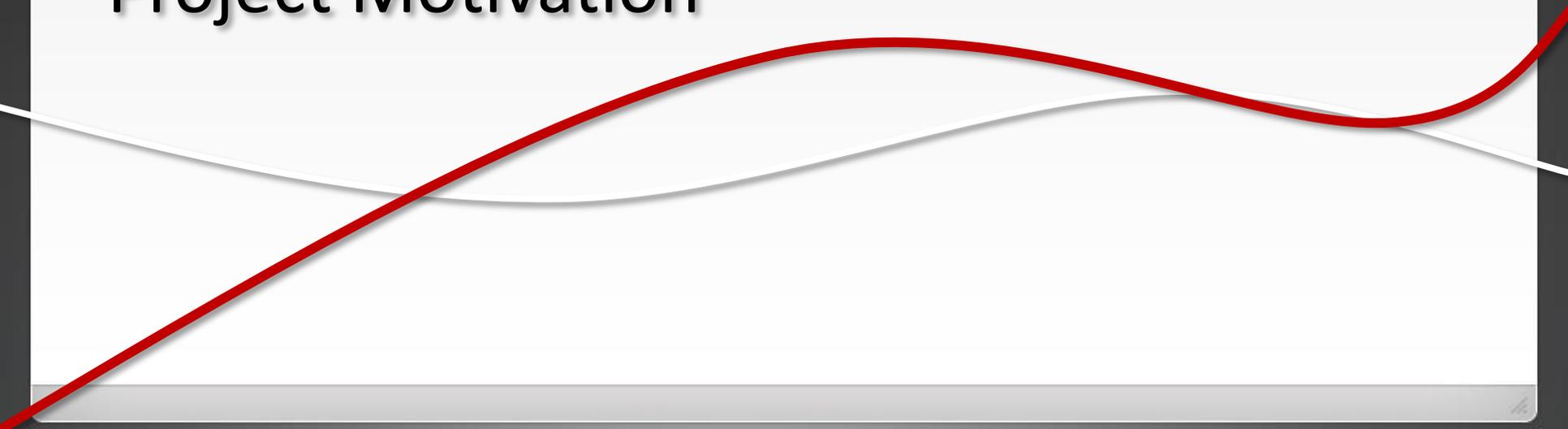


## **Dianna Yee, Software Team Lead**

- 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**



## 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

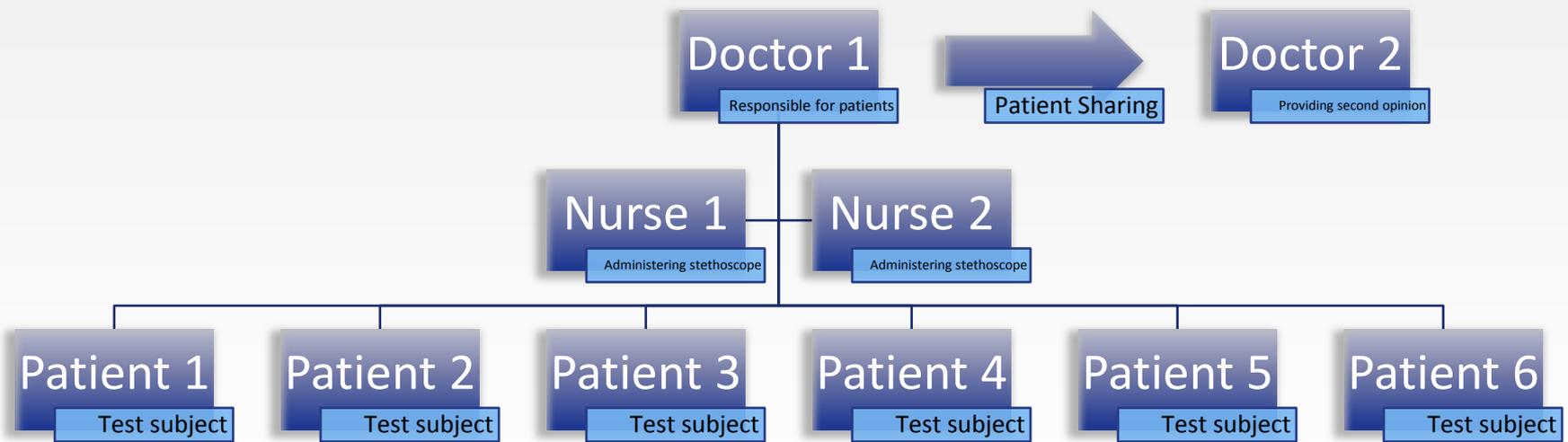


# Operation Diagram





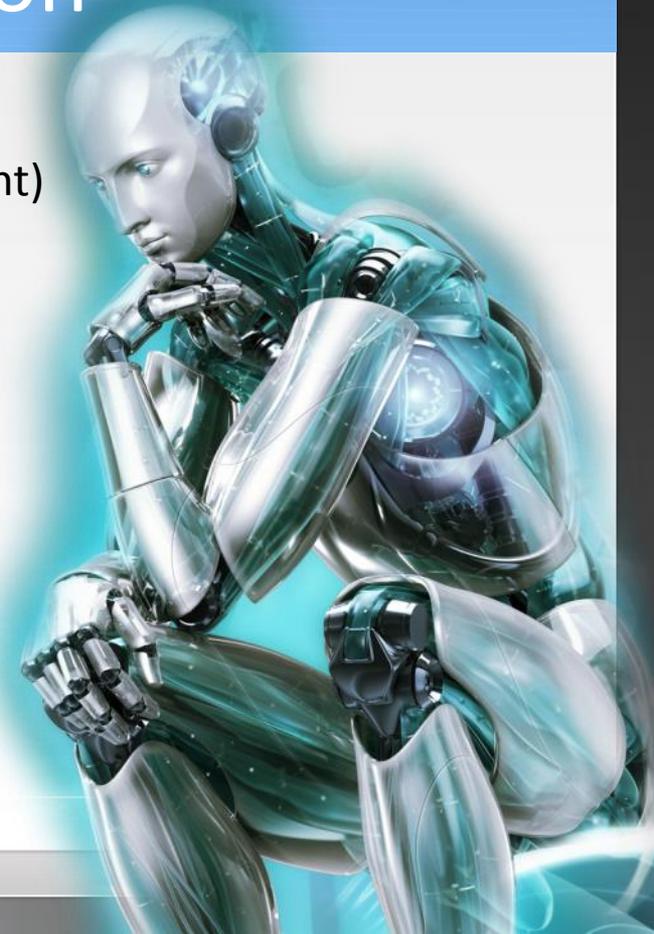
# Motivation: Patient Sharing and Access





# 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!





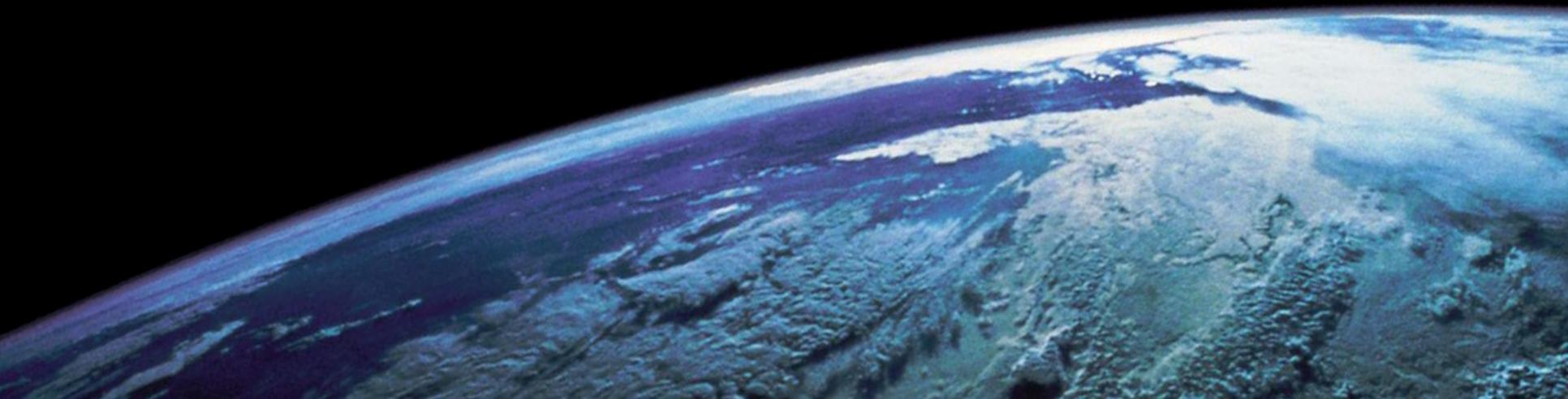
# Clinical Impact

## 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

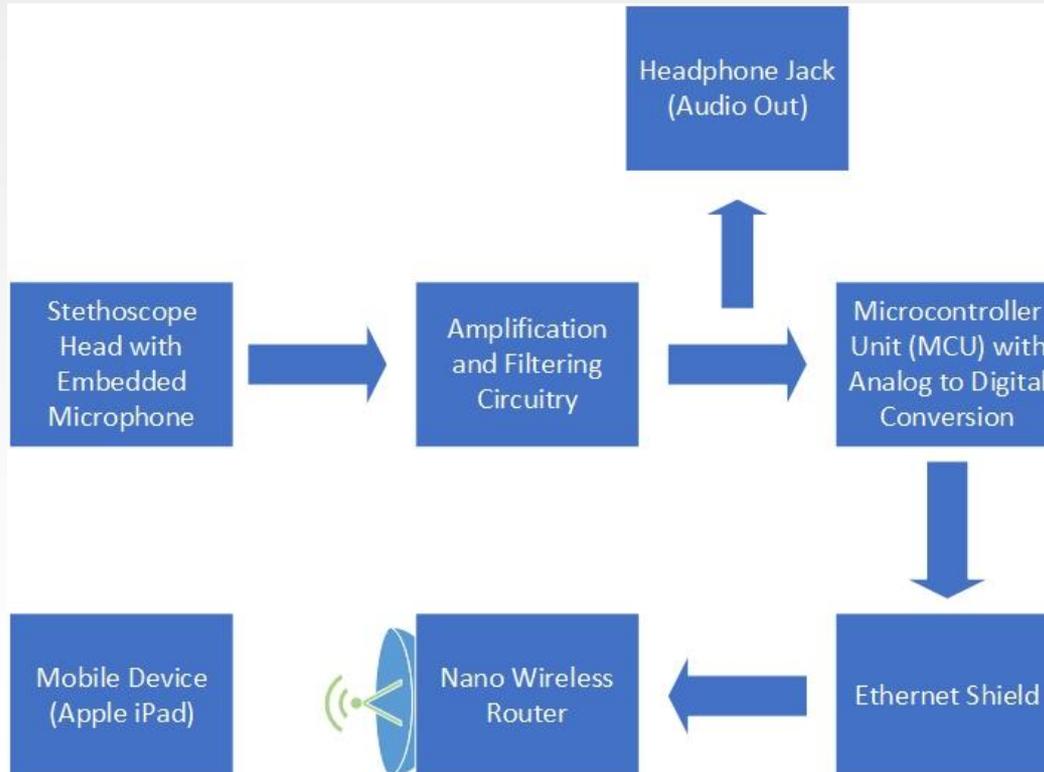
- Electronic Stethoscope capable of wirelessly transmitting to intermediate device
- Listen to audio signal through headphones

## Software

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

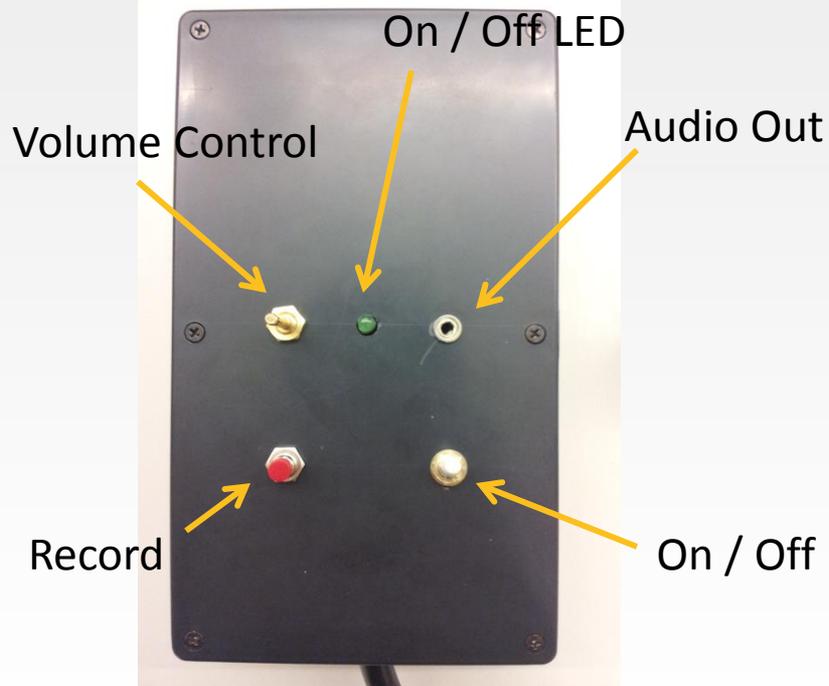


# Hardware Overview



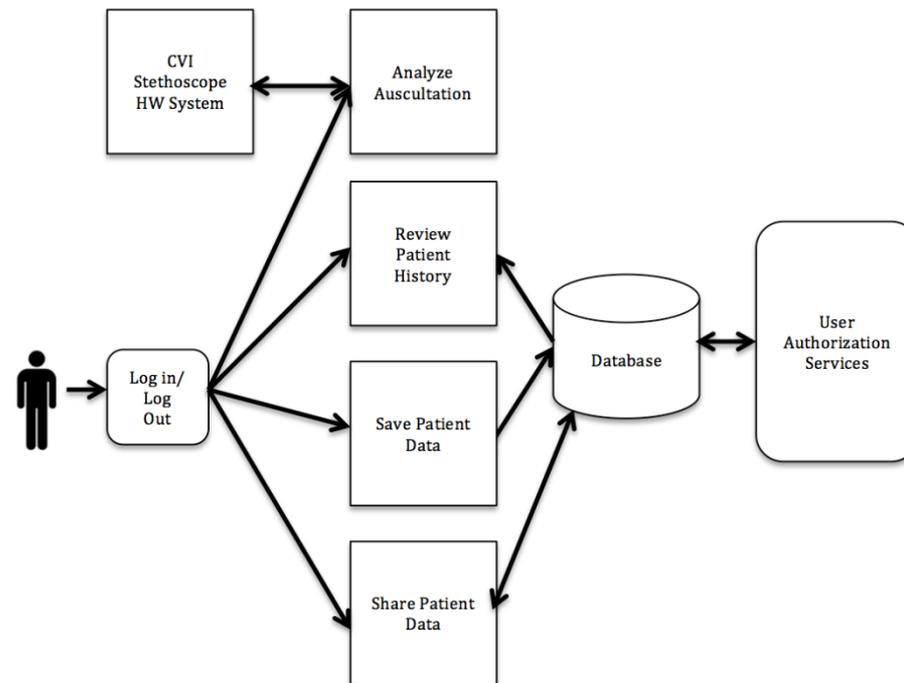


# Hardware Overview



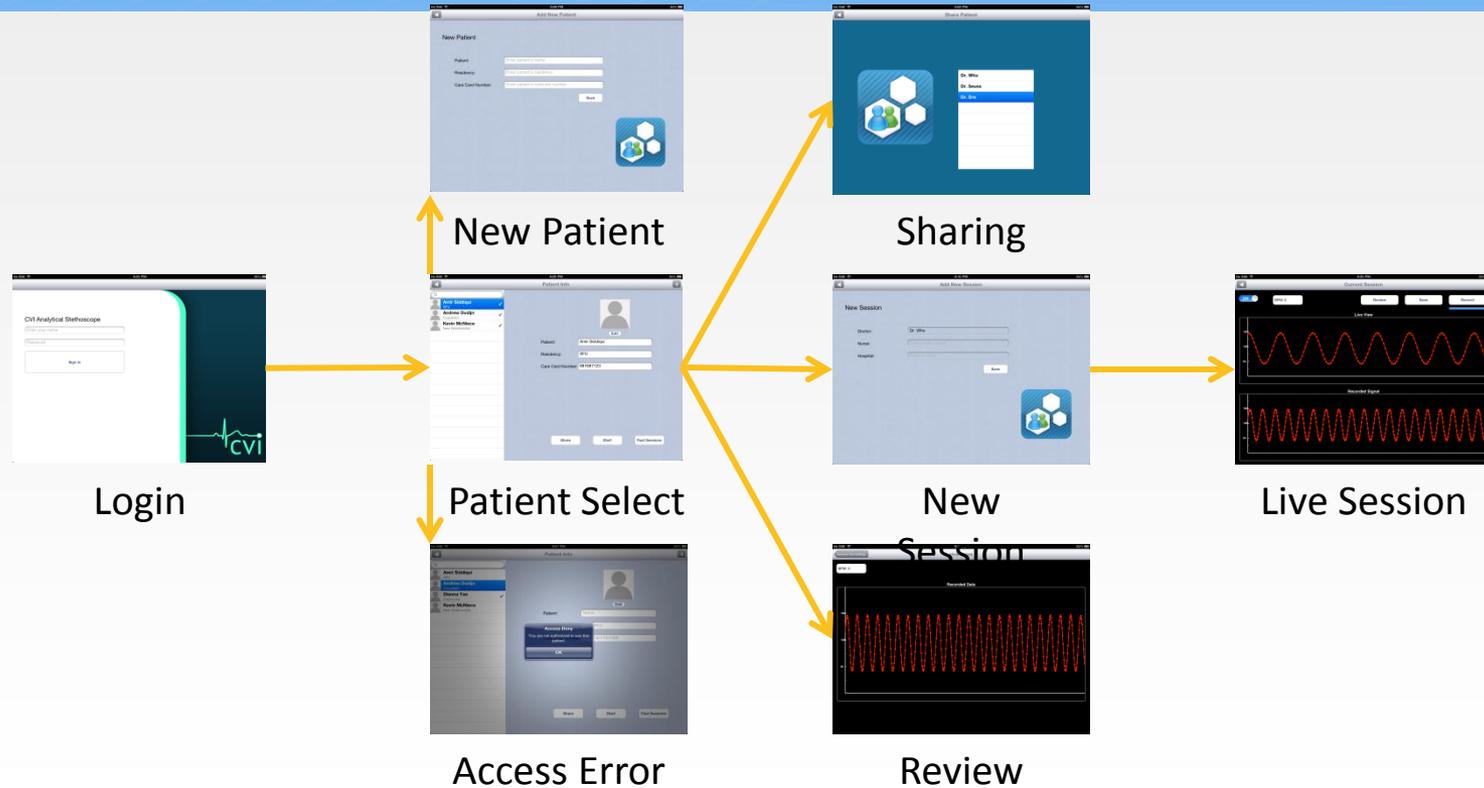


# Software Overview



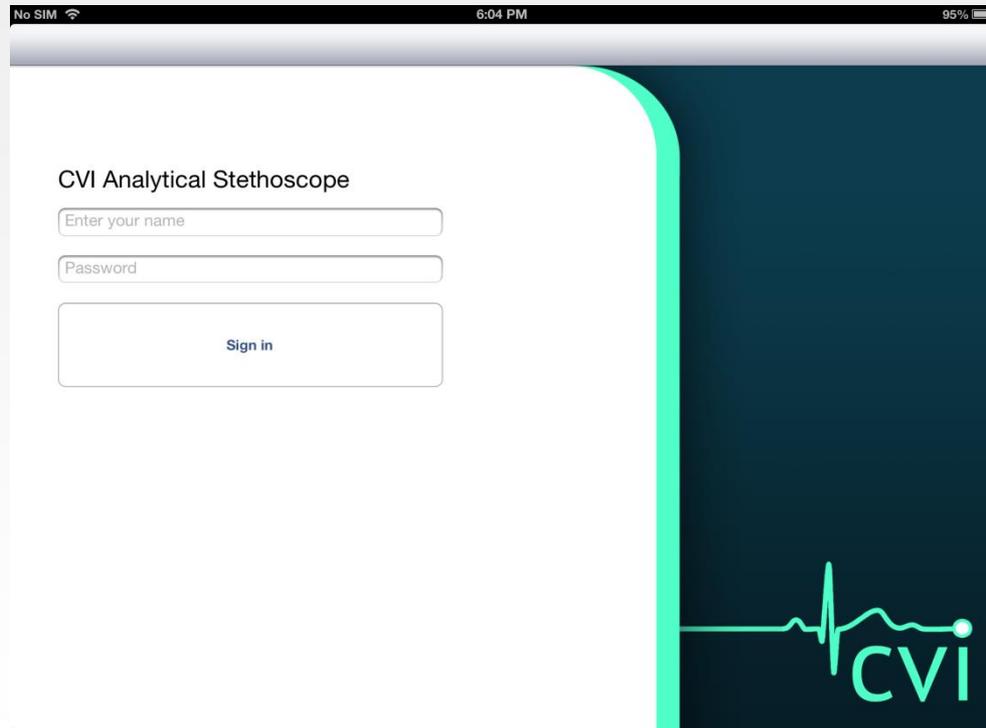


# User Interface Overview





# Login

A screenshot of a mobile application login screen. The status bar at the top shows 'No SIM', signal strength, Wi-Fi, '6:04 PM', and '95%' battery. The app title 'CVI Analytical Stethoscope' is displayed. Below it are three input fields: 'Enter your name', 'Password', and a 'Sign in' button. The right side of the screen features a dark teal background with a white ECG line and the 'CVI' logo at the bottom.



# Patient Select

The screenshot shows a mobile application interface for patient selection and information. The top status bar displays "No SIM", signal strength, "6:06 PM", and "94%" battery. The app title is "Patient Info".

On the left, a search bar is followed by a list of patients:

- Amir Siddiqui (SFU) ✓
- Andrew Oudijn (Coquitlam) ✓
- Kevin McNiece (New Westminster) ✓

The right side of the screen shows a patient profile for Amir Siddiqui. It includes a placeholder for a profile picture with an "Edit" button below it. The profile information is as follows:

Patient: Amir Siddiqui  
Residency: SFU  
Care Card Number: 897687123

At the bottom, there are three buttons: "Share", "Start", and "Past Sessions".

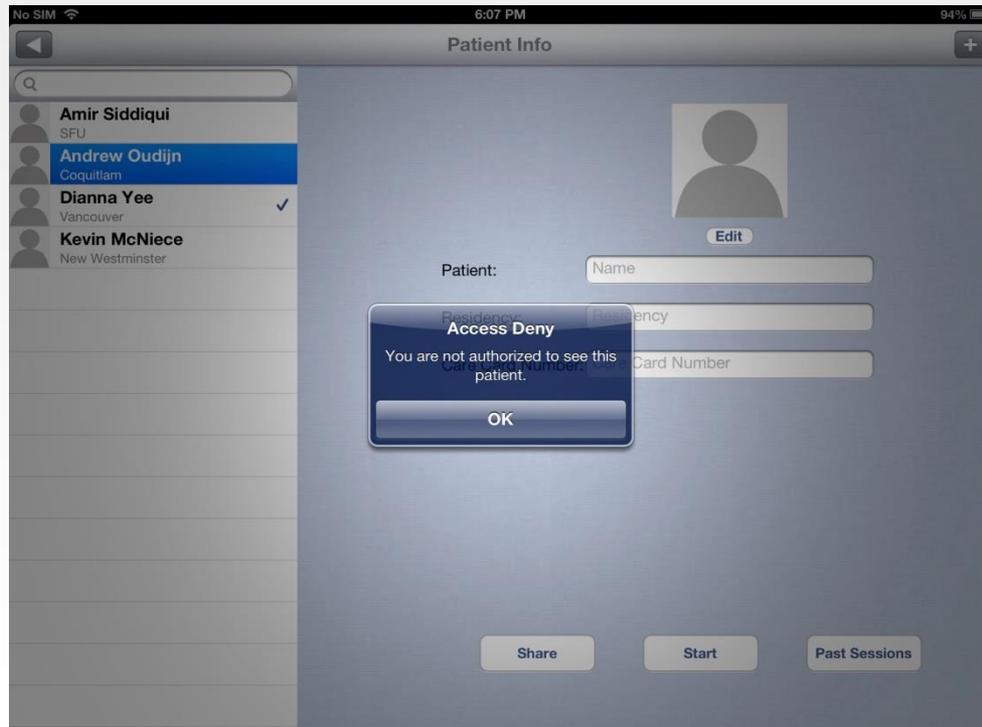


# New Patient

The screenshot shows a mobile application interface for adding a new patient. At the top, the status bar displays 'No SIM', signal strength, '6:06 PM', and '94%' battery. The app's title bar reads 'Add New Patient' with a back arrow on the left. The main content area is titled 'New Patient' and contains three input fields: 'Patient:' with the placeholder 'Enter patient's name', 'Residency:' with 'Enter patient's residency', and 'Care Card Number:' with 'Enter patient's carecard number'. A 'Save' button is positioned below the third field. In the bottom right corner, there is a blue square icon with a white background, containing three stylized human figures (one blue, one green, one white) and three white hexagons.

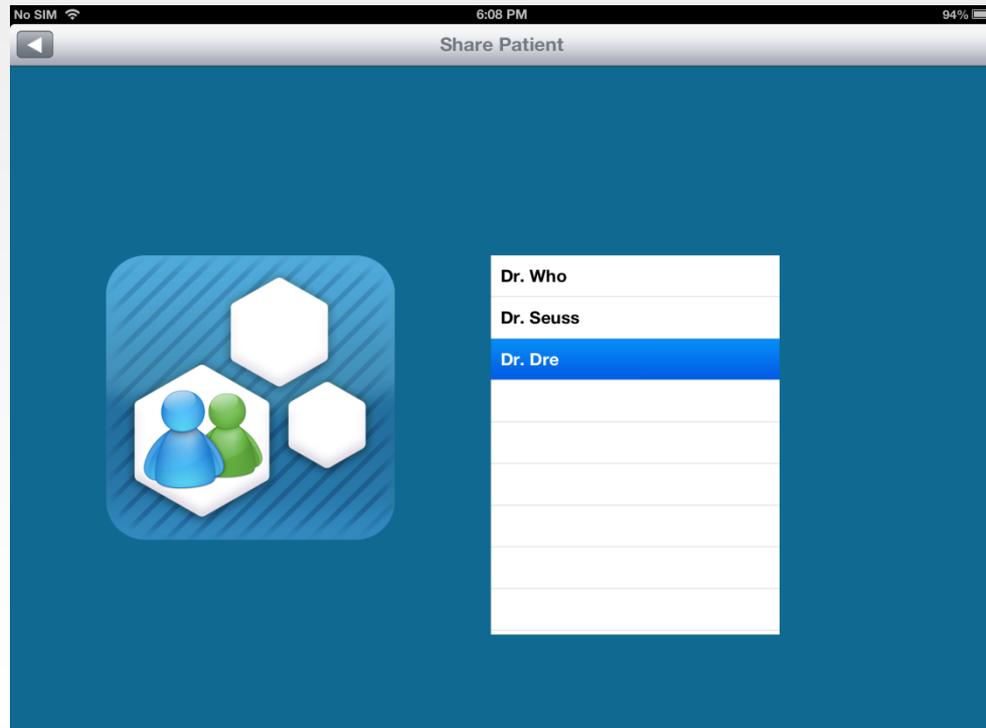


# Access Restrictions





# Sharing



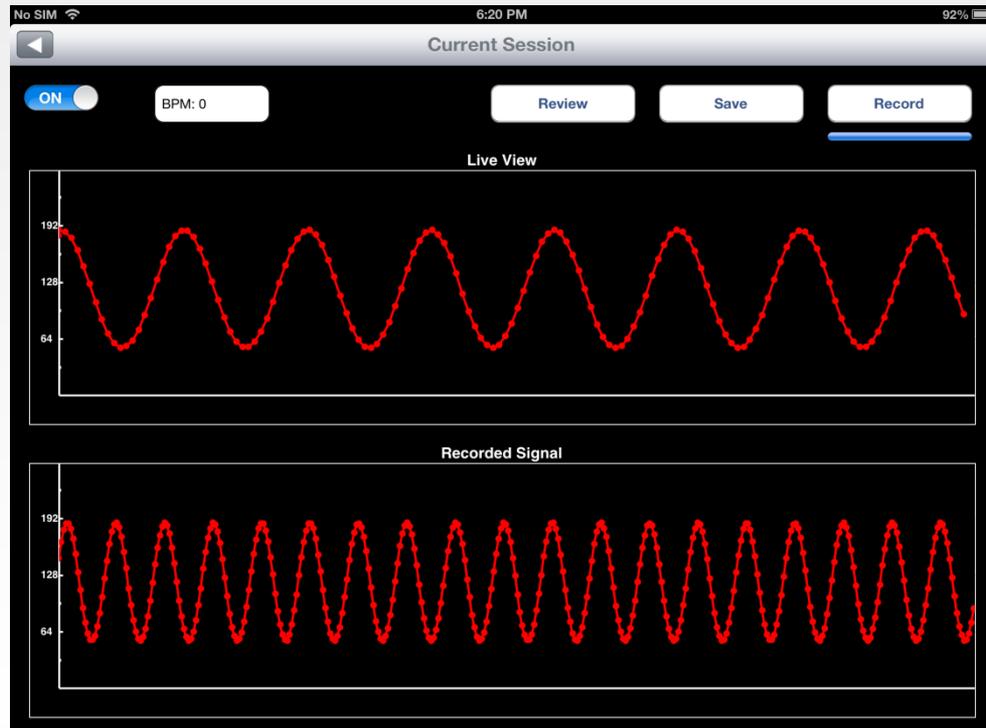


# New Session

The screenshot shows a mobile application interface for adding a new session. At the top, the status bar displays 'No SIM', signal strength, '6:10 PM', and '94%' battery. The app's title bar reads 'Add New Session' with a back arrow on the left. The main content area is titled 'New Session' and contains three input fields: 'Doctor:' with the text 'Dr. Who', 'Nurse:' with the placeholder 'Enter nurse's name', and 'Hospital:' with the placeholder 'Enter hospital'. A 'Save' button is positioned below the input fields. In the bottom right corner, there is a blue square icon with a white background, containing three stylized human figures (one blue, one green, one white) and three white hexagons.

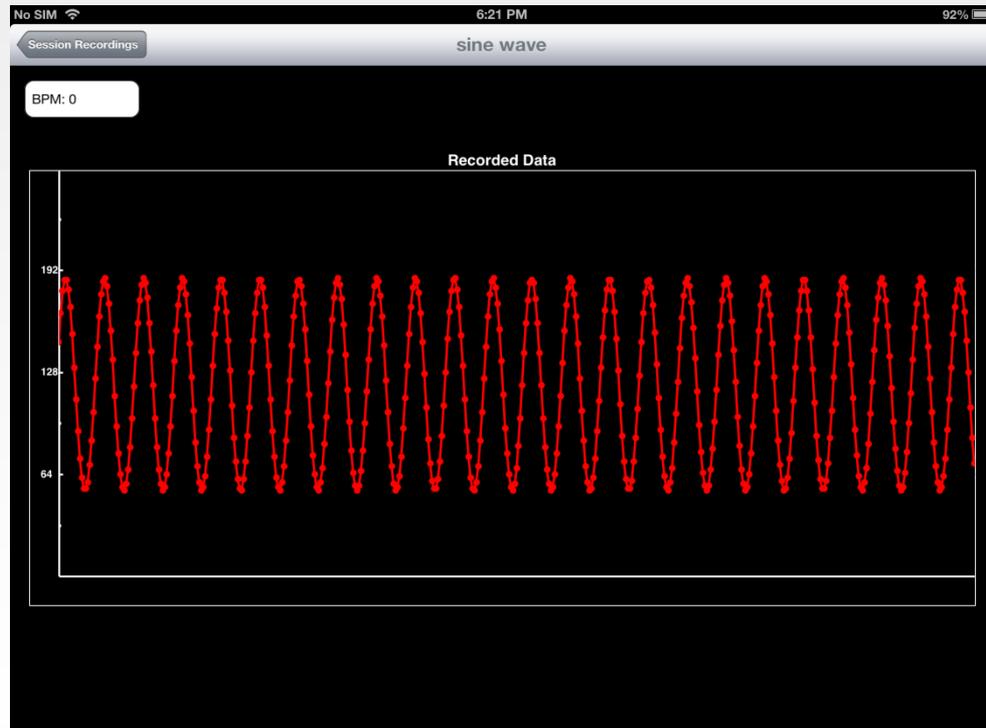


# Live Session





# Review Session





# Finances





# Budget Breakdown

Projected		Actual Costs	
Materials Needed	Cost	Materials Needed	Cost
Headphones	\$75	Ethernet Shield	\$68.77
Microphone	\$50	Battery	\$29.99
Wireless Transceivers	\$50	Case	\$20.00
Microcontroller	\$250	Software License	\$110.88
Amplification and transmission circuitry/fabrication	\$160	Amplification and transmission circuitry/fabrication	\$258.99
Wireless Networking Hardware	\$50	Wireless Networking Hardware	\$20.37
Contingency	\$100		
<b>Total Cost</b>	<b>\$735</b>	<b>Total Cost</b>	<b>\$509</b>
		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

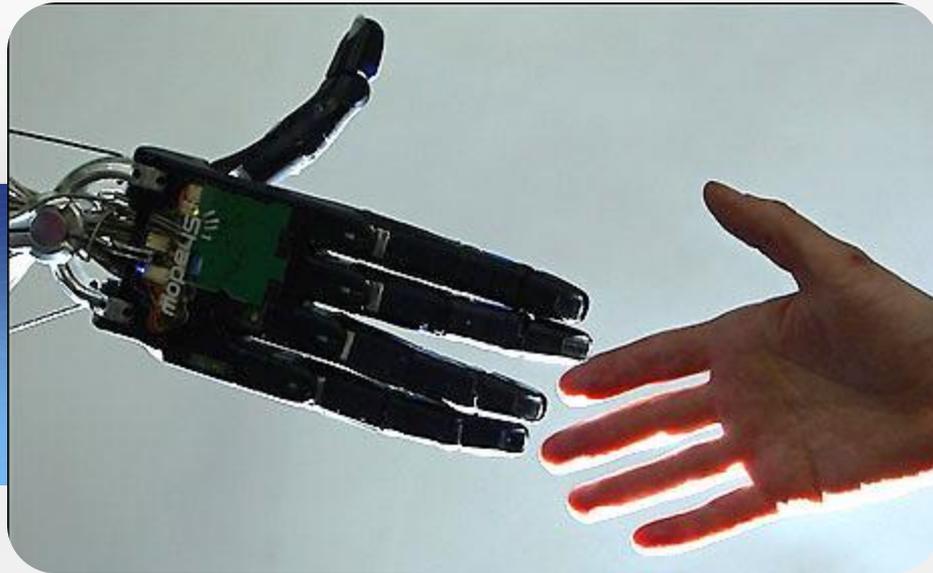
## ● Software

- 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](http://www.StackOverflow.com) – Software Development

[www.Instructables.com](http://www.Instructables.com) - Hardware Development



# Questions?

