

# Impedance Cardiography

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# Outline

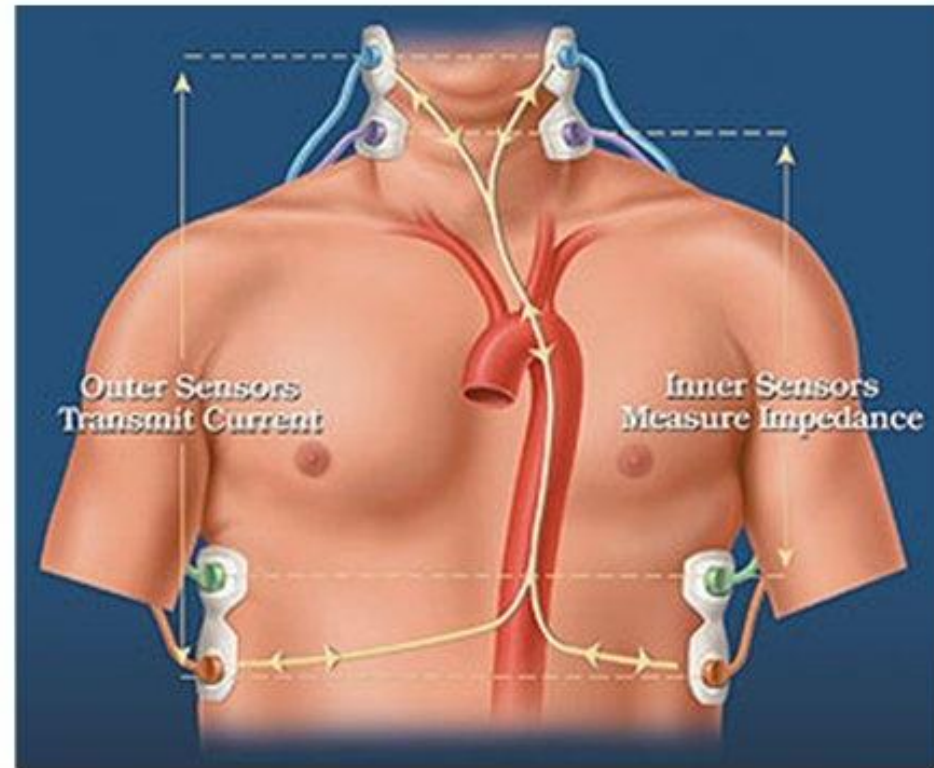
- Background
- Client Requirements
- Track Design
- Mesh Liner System
- Gel Electrode Matrix
- Gel Liner System
- Design Matrix/Final Design
- Future Work

# Background:

- Frequently necessary to determine state of patient's circulation
- Current methods invasive, complicated
- Impedance cardiography may be a solution

# Impedance Cardiography

- Uses high frequency (100 kHz) to measure impedance and track volumetric changes occurring in the cardiac cycle
- Non-invasive, painless procedure



# Impedance Cardiography cont'd

## Problems

- Not accurate
- Imprecise electrode positioning
- Inconvenient to users

## Improving the System: Move electrodes closer to heart

- Better signal
- Reduced noise
- Greater accuracy

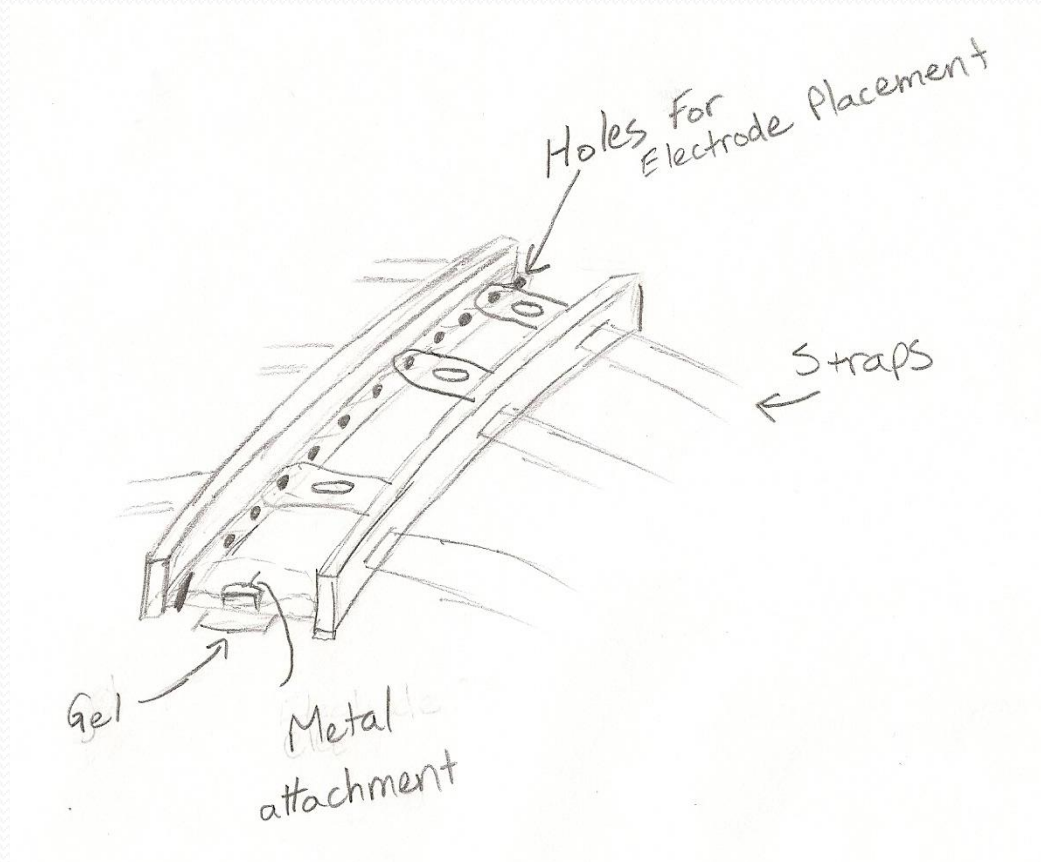
# Client Specifications

- Electrodes closer to the heart
- More secure
- Easy to apply
- Reusable



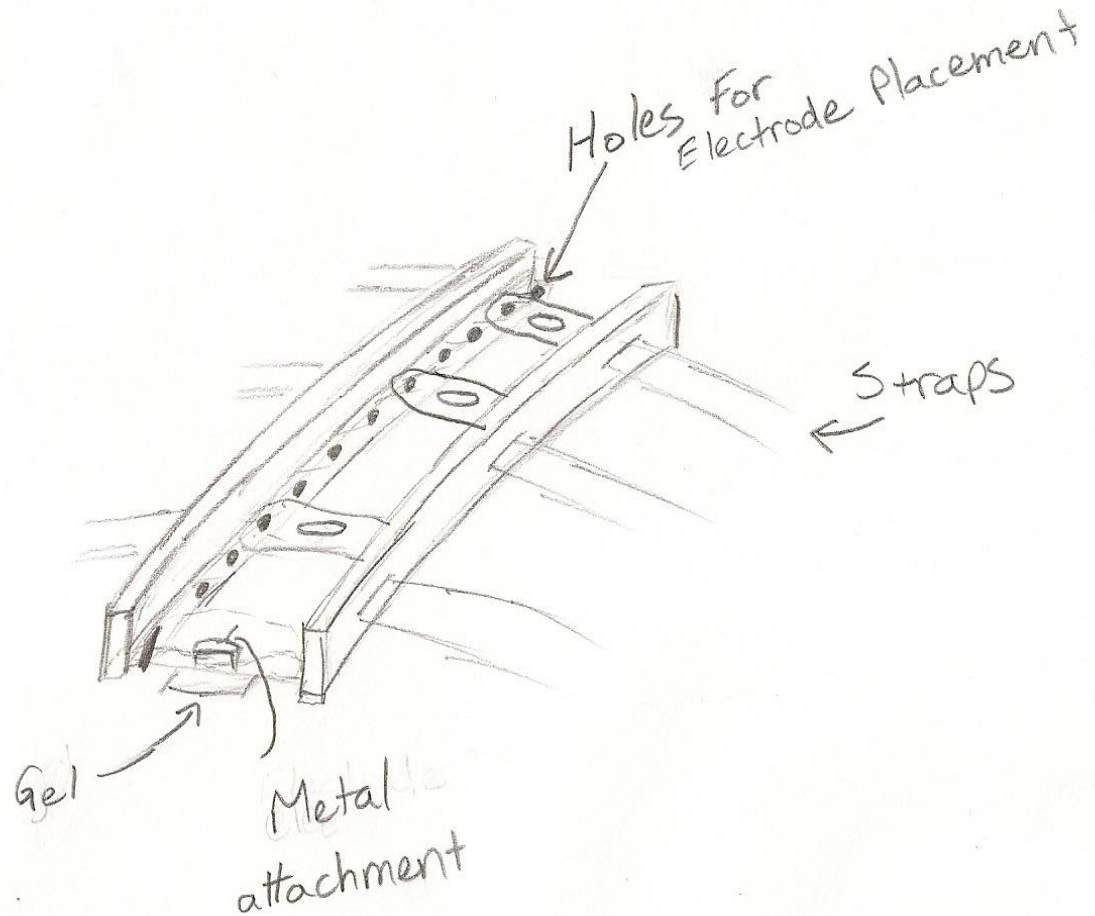
# Track Design

- Flexible, solid rubber backbone
- Track for proper Electrode placement
- Straps for proper location
- Possibilities of attachment to skin



# Track Design cont'd

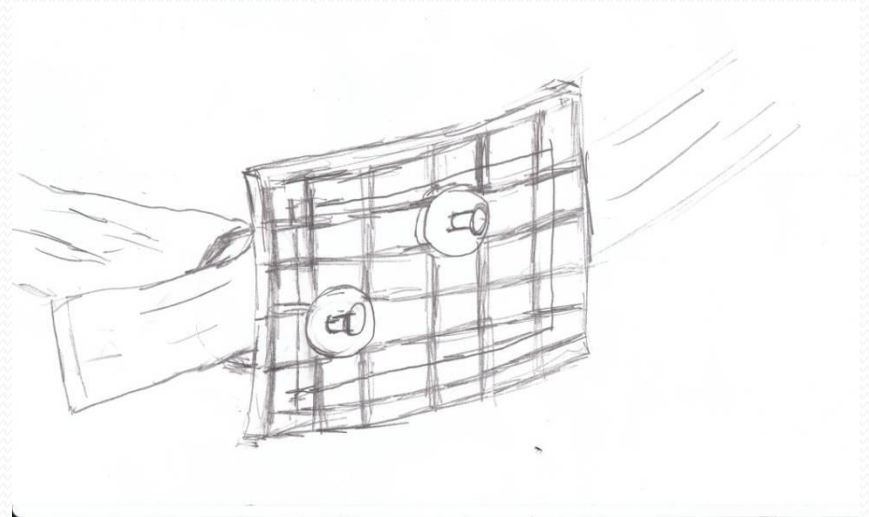
- Advantages
  - Stability
  - Reusable
  - Durable
- Disadvantages
  - Bulky
  - Problem staying on desired location





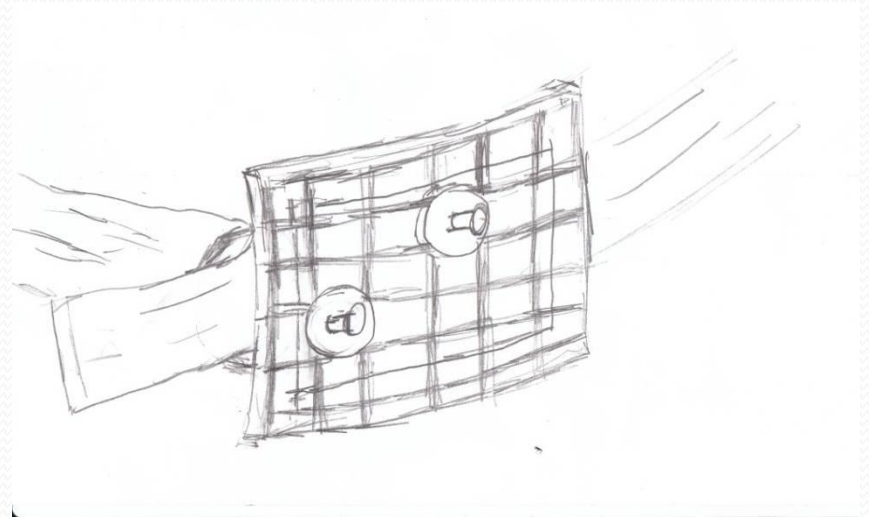
# Mesh Liner System

- Mesh fabric holds electrodes
- Shelf liner prevents slipping
- Elastic band holds unit on patient



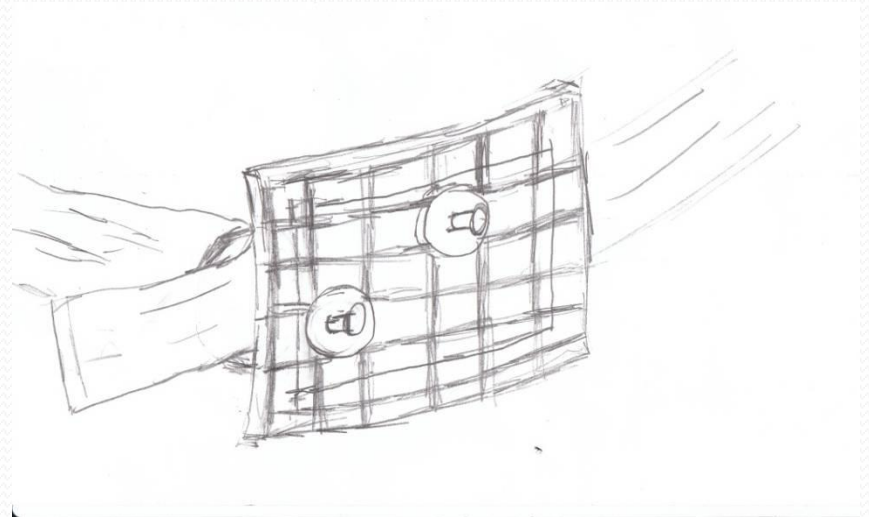
# Mesh Liner System

- Advantages
  - Easy to use and adjust
  - Fairly easy to clean
  - Conforms to body
  - Breathable



# Mesh Liner System

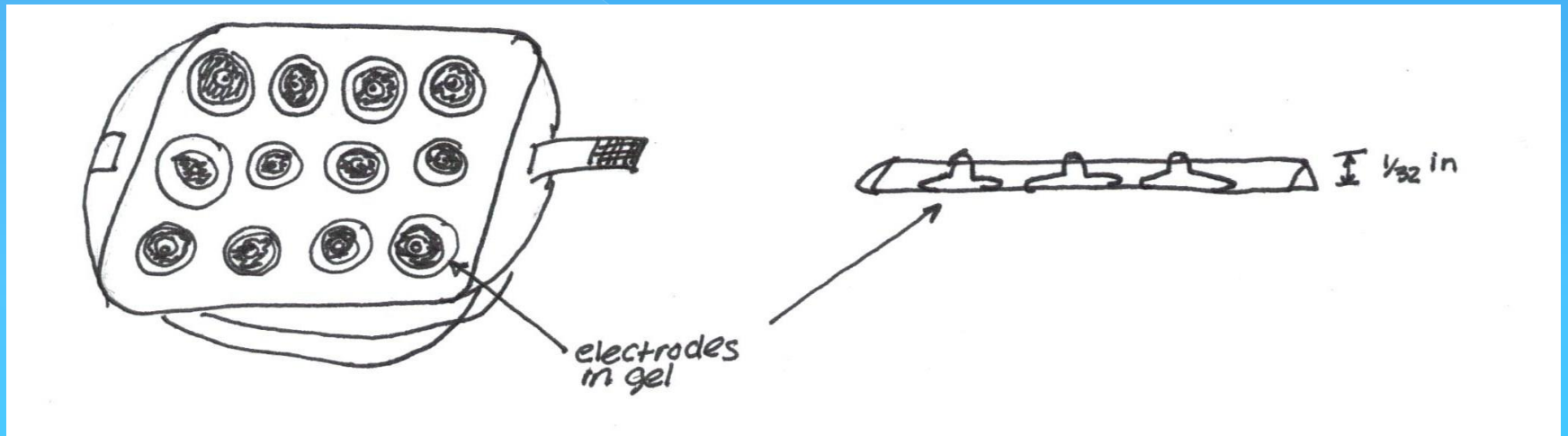
- Disadvantages
  - Tearing/fraying
  - Limited electrode contact
  - Loss of elasticity over time



# Gel Electrode Matrix

- Several electrodes suspended in a gel
- Edges surrounded by hard plastic
- Allows for hook up with an elastic strap
- Electrode leads are not immersed

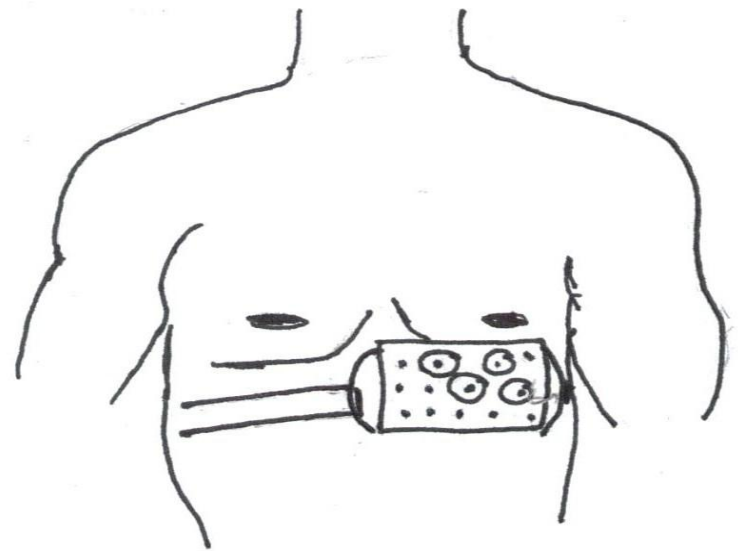
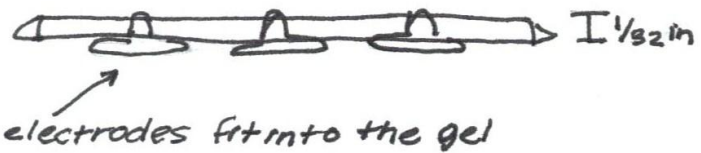
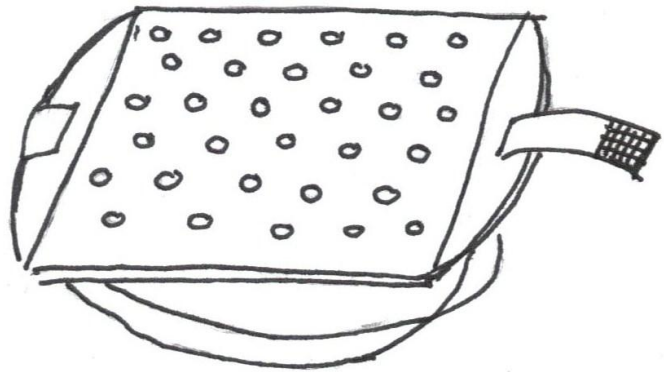
# Gel Electrode Matrix



# Gel Liner System

- Uses Silicone Rubber Gel
- Holes exist in gel
- Edges surrounded in malleable plastic
- Elastic Strap connection

# Gel Liner System



# Design Matrix

	Ease of Use (20)	Placement Stability (20)	Comfort (10)	Reusability (20)	Size (10)	Total (80)
Plastic Track System	8	12	2	18	7	47
Gel Electrode Matrix	18	16	8	20	9	71
Gel Liner System *	18	18	8	20	9	73
Mesh & Liner System	19	16	9	18	9	71



# Future Work

- Choose best possible designs
- Order materials
- Build preliminary prototypes and circuit amplifier
- Testing/Determine proper placing of electrodes
- Build Final Prototype

# Sources:

- <http://chestjournal.chestpubs.org/content/122/3/771.full>
- <http://chestjournal.chestpubs.org/content/123/6/2028.full>

# Shout Outs!

- A special thanks to Elena Bezrukova, Ryan Carroll, Amit Nimunkar, and Prof. Webster.



Questions or Comments?