

Design of an User friendly ECG system

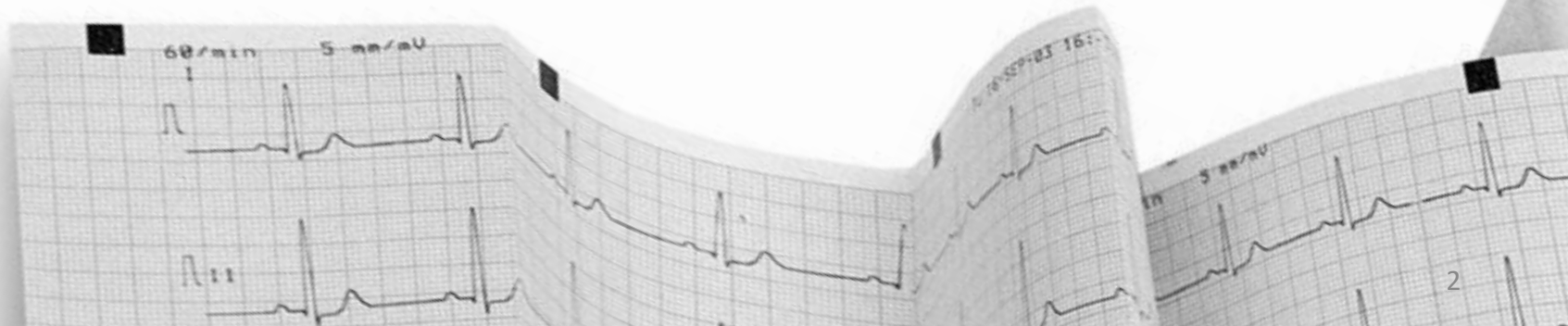
Dattaram Chari | 146130003

GUIDE : Prof. Vijay Bapat | CO- GUIDE : Prof. B. Ravi



Why ECG recording is done ?

ECG, Electrocardiogram is a record of the electrical signals conducted through the heart muscles at certain defined points to understand the heart activity.



Primary Research

Target Users

Primary User



ECG Technician



Patient

Secondary User



Doctor



Intern



Nurse



Attendant

Data Collection



Secondary Research

Field Visit



Key Findings

Based on the patient & the environment related aspects



Design Research

The background is a collage of grayscale images related to design research. It includes a person in a white lab coat, a person looking at a screen, a person working at a desk, and various sticky notes and diagrams. The collage is divided into four main sections, each with a title and two descriptive bullet points.

User Interviews

- Understanding the user's Perspective

- Understand the Key issues

Scenario Observations

- Understand the Environment

- Understand the Secondary issues

Activity Analysis

- Deeper Level Understanding Of the process

Problem Identification

- System Related
- Process Related
- User Related

Market Study

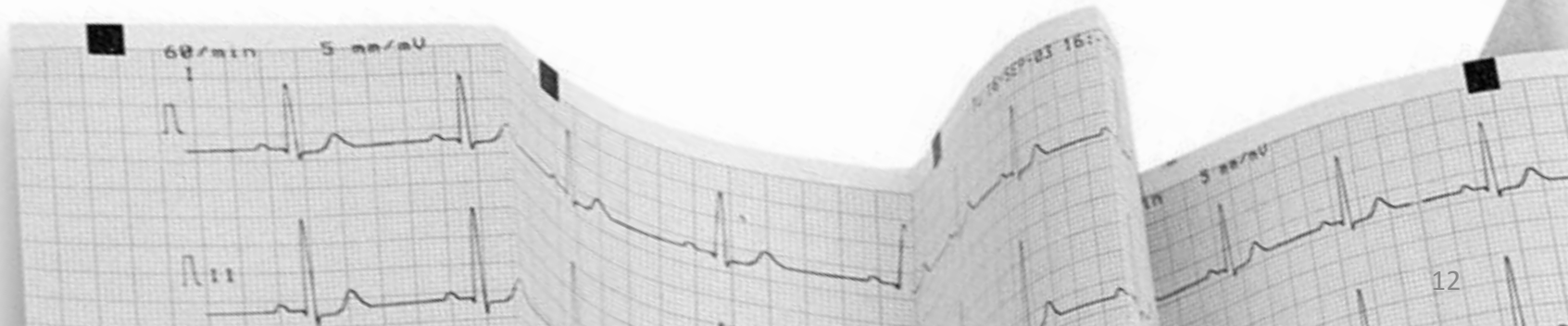


Design Process

Design Brief

To design and conceptualize a medical grade , 12 lead recording aid & develop an user friendly ECG recording system considering the user centric approach of design.

Scenario considering the OPD Room in Public Health Centre.



Primary Needs

- Provide accurate docking and electrode placement
- Making the process comfortable & simple
- Making the process Economical (Cost Effective)
- Cable management to counter the wire entanglement issue
- Development of Reusable aid

Secondary Needs

Organize the ECG recording process & develop an intuitive system considering user centric approach.

Concept Development

Issues with Electrode Gel

- Non Hygienic
- Sticky & messy
- Uncontrolled use
- Inaccurate location & mapping on the chest



Objective

SECURE

SIMPLIFY

OPTIMIZE

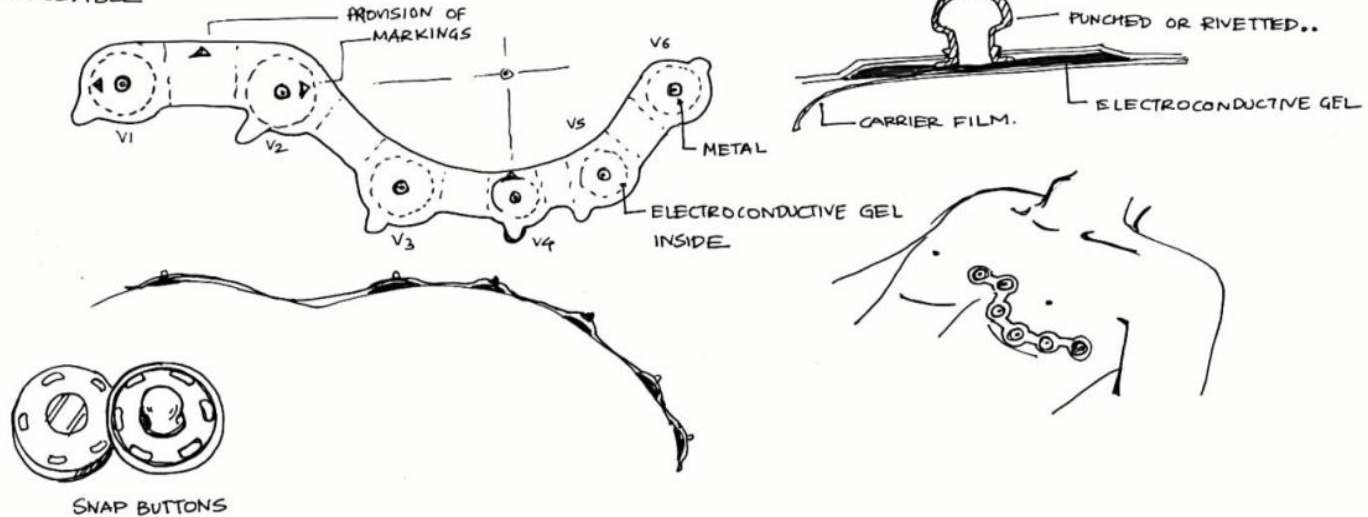


Early Ideations

ELECTROCONDUCTIVE GEL TAPE

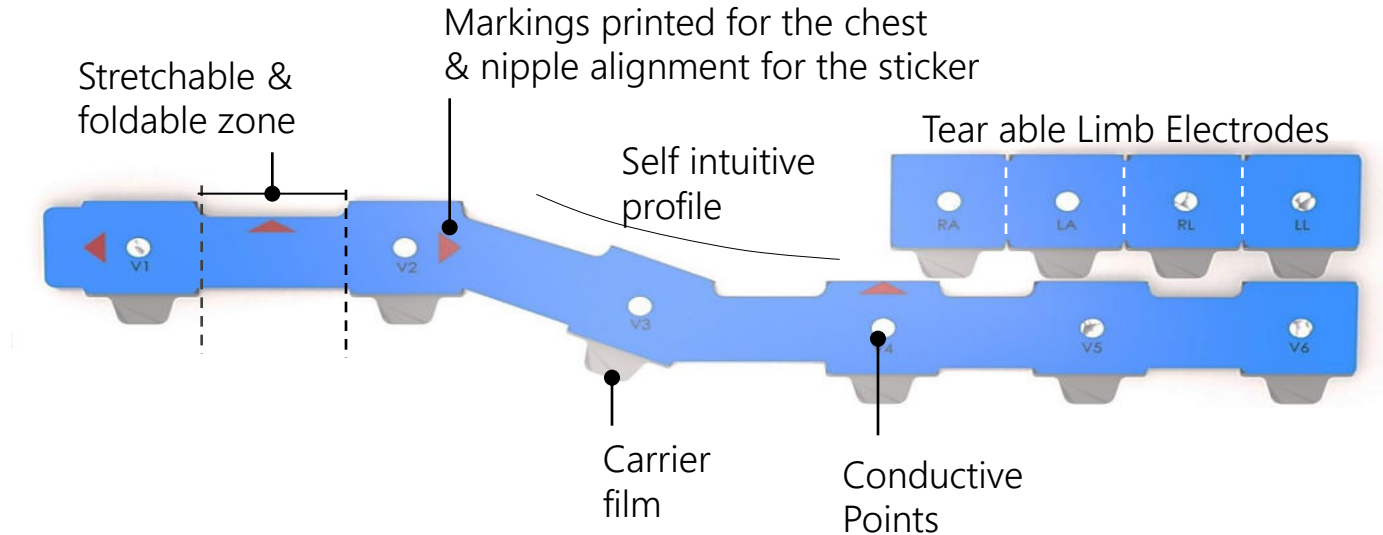
LIKE A POST-IT STICKER

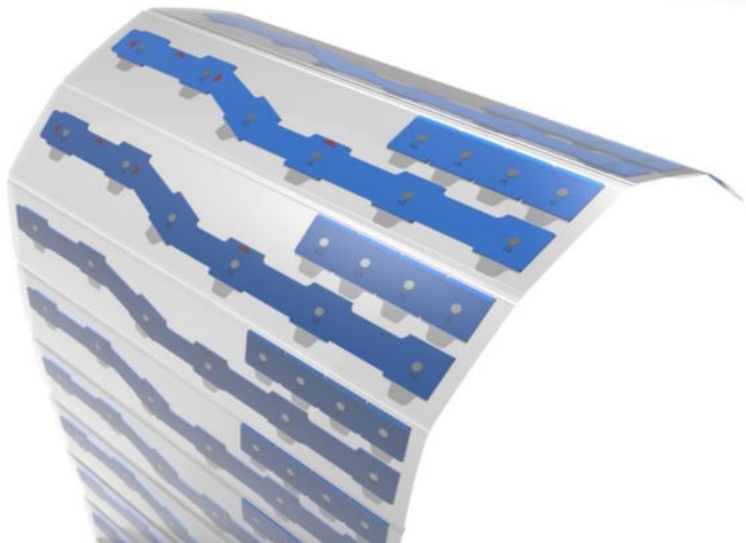
- FLEXIBLE
- DISPOSABLE



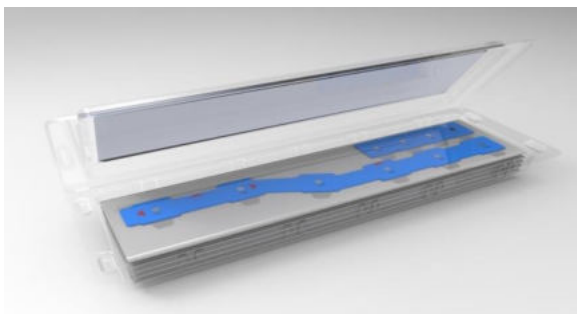
The Concept

Stretchable Pre gelled Base Stickers with conductive points.

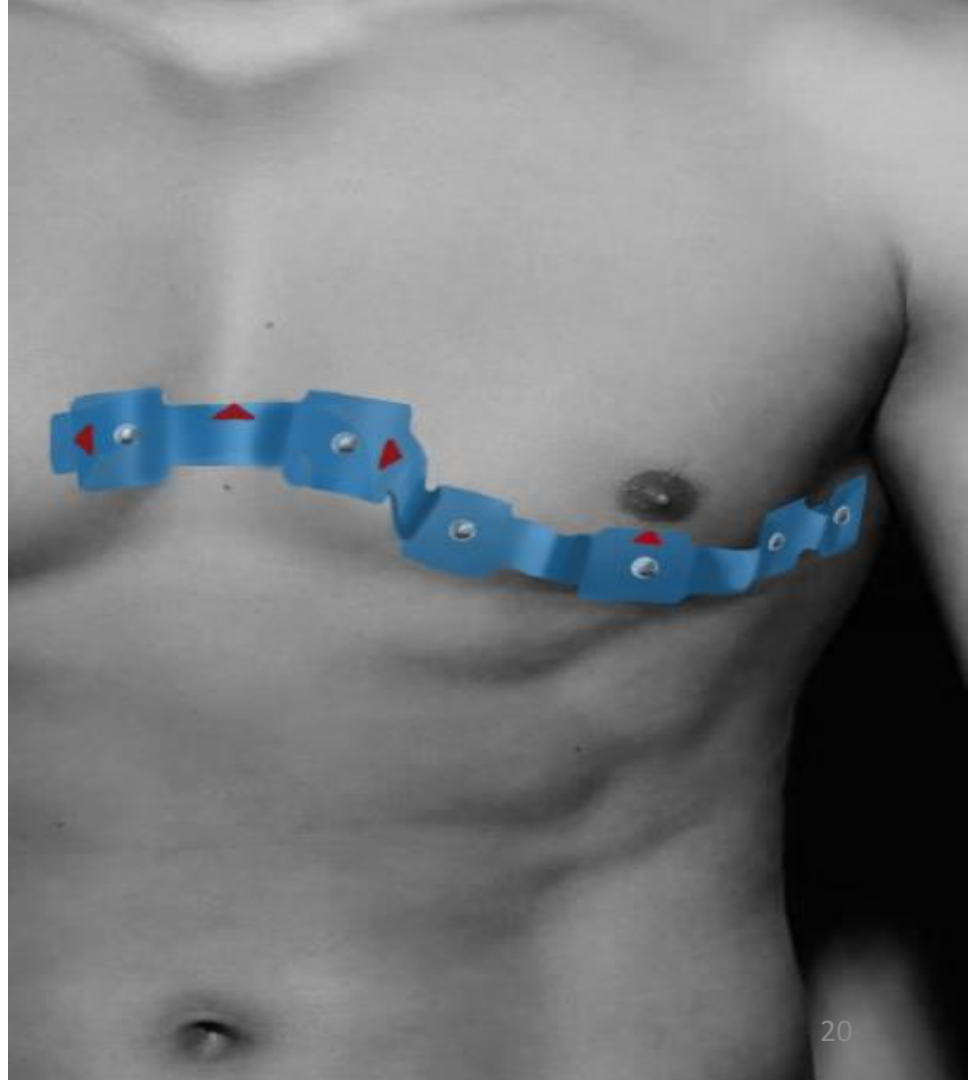




Sticker electrodes provided in a pack of ten number



Instructions provided on every sticker sachet



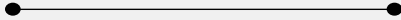
Issues with electrode wiring

- Frequent entanglement
- Time consuming
- Distressing

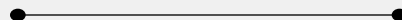


Objective

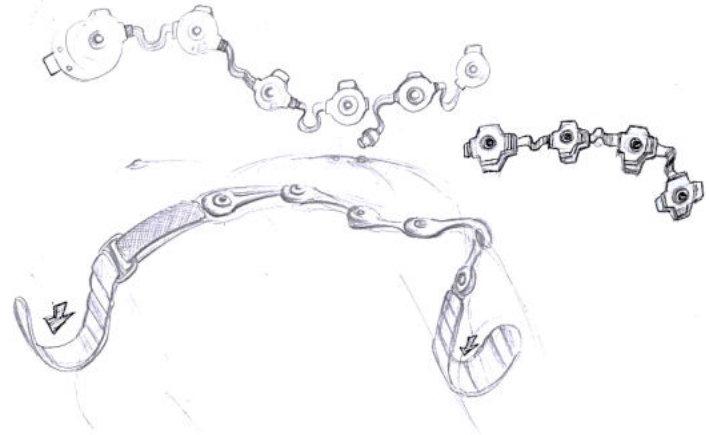
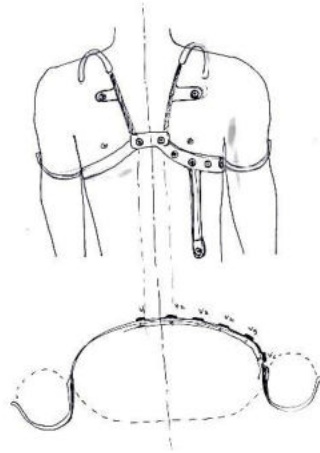
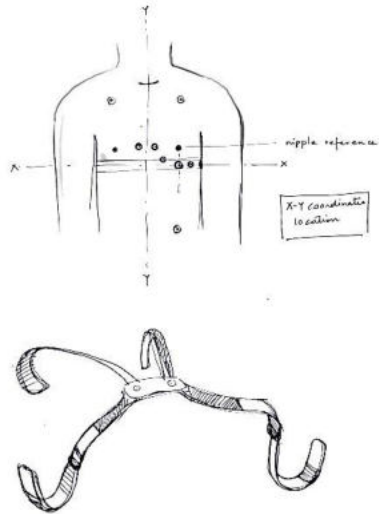
SIMPLIFY



REDUCE

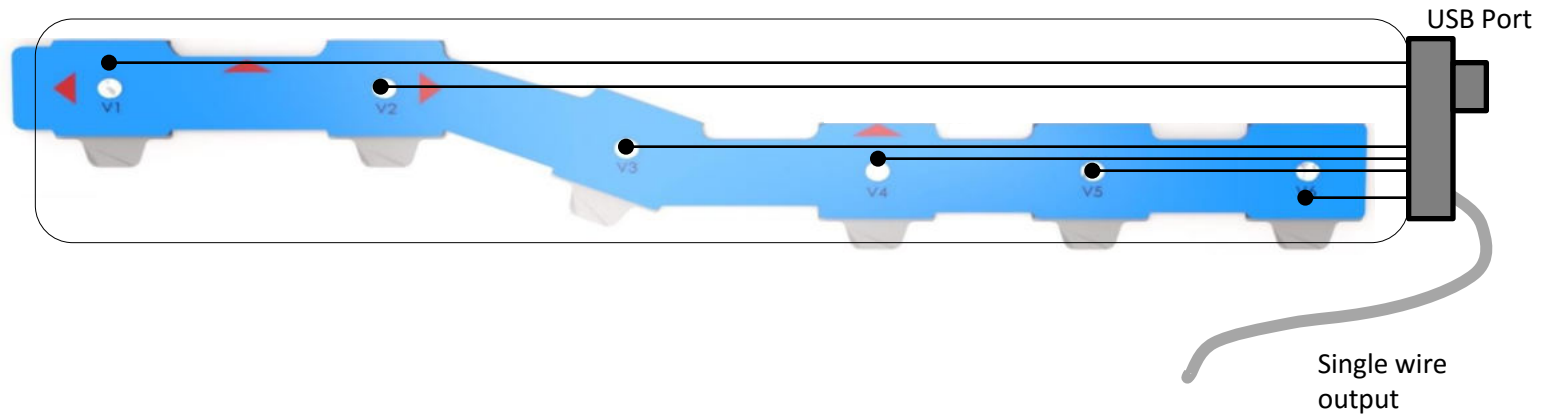


Early Ideations

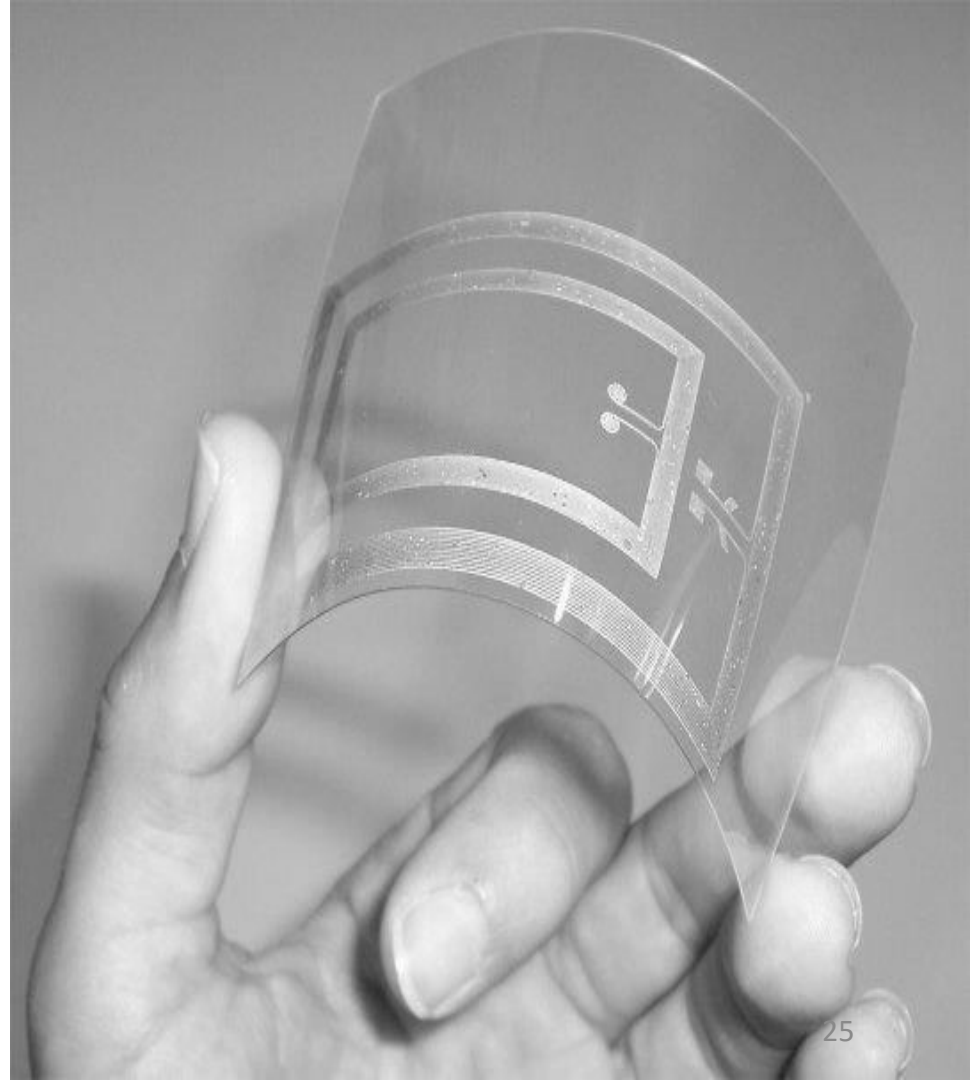


The Concept

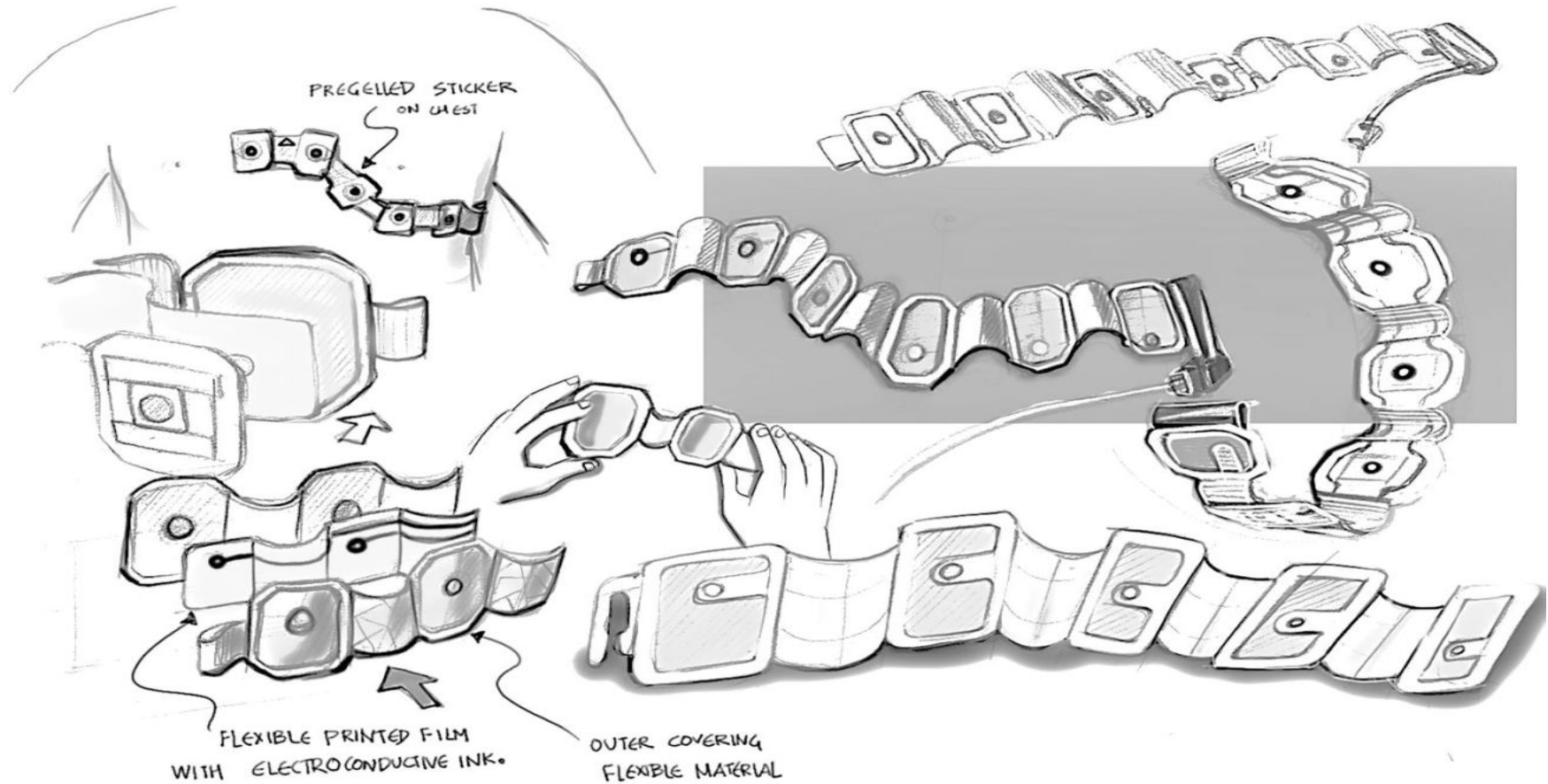
Reusable Flexible printed circuit electrode



Flexible printed Circuit Board

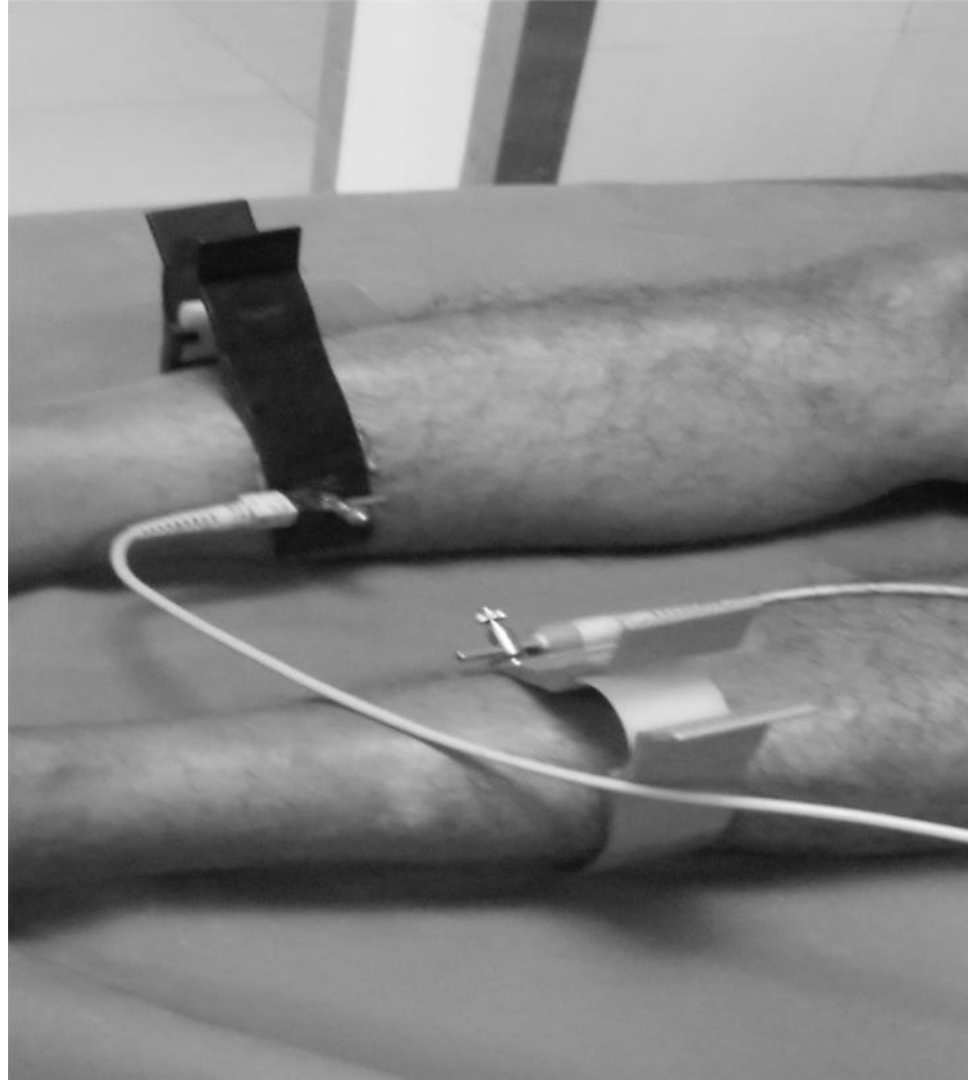


Reusable Flexible printed circuit electrode

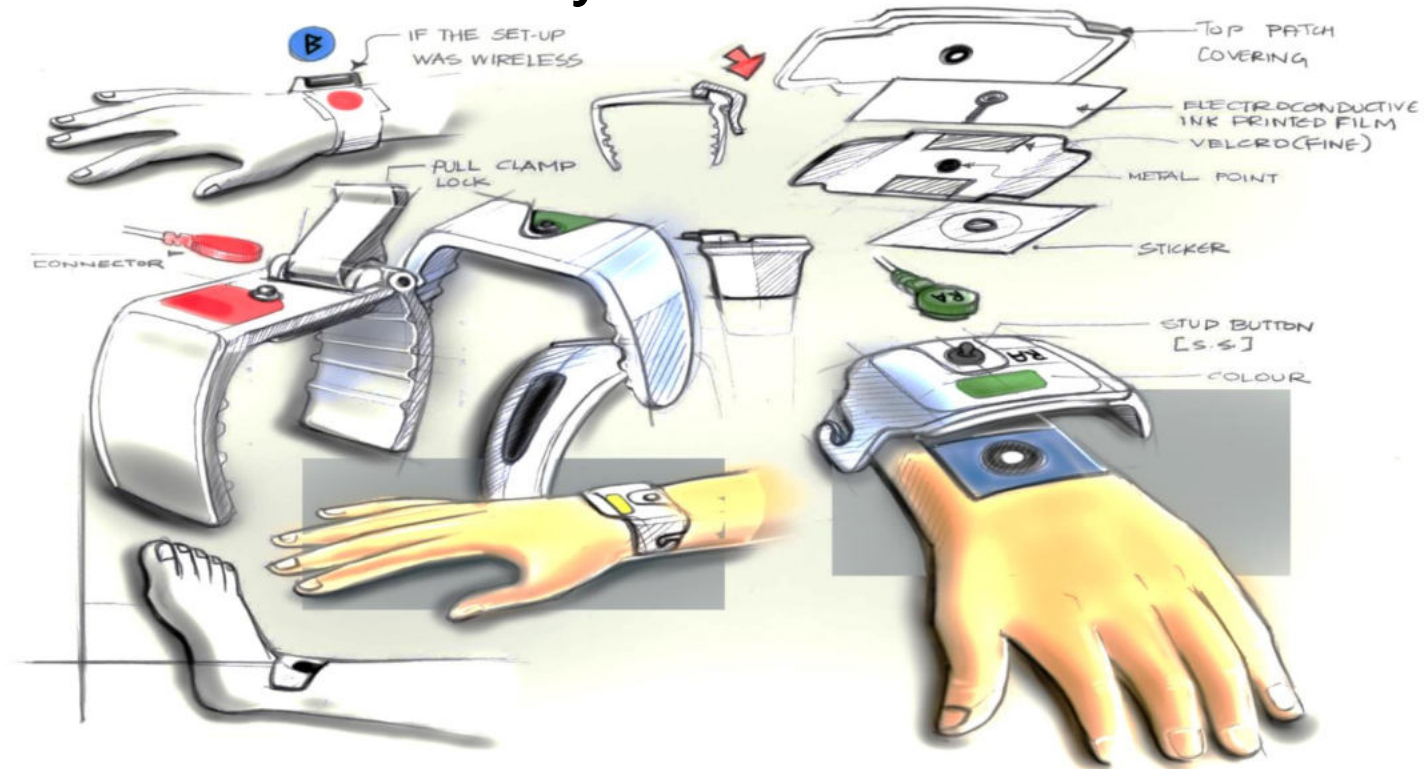


Issues with Clamp electrodes & Wire traffic

- Unhygienic
- Easily Breakable
- Difficult maintenance
- Messy

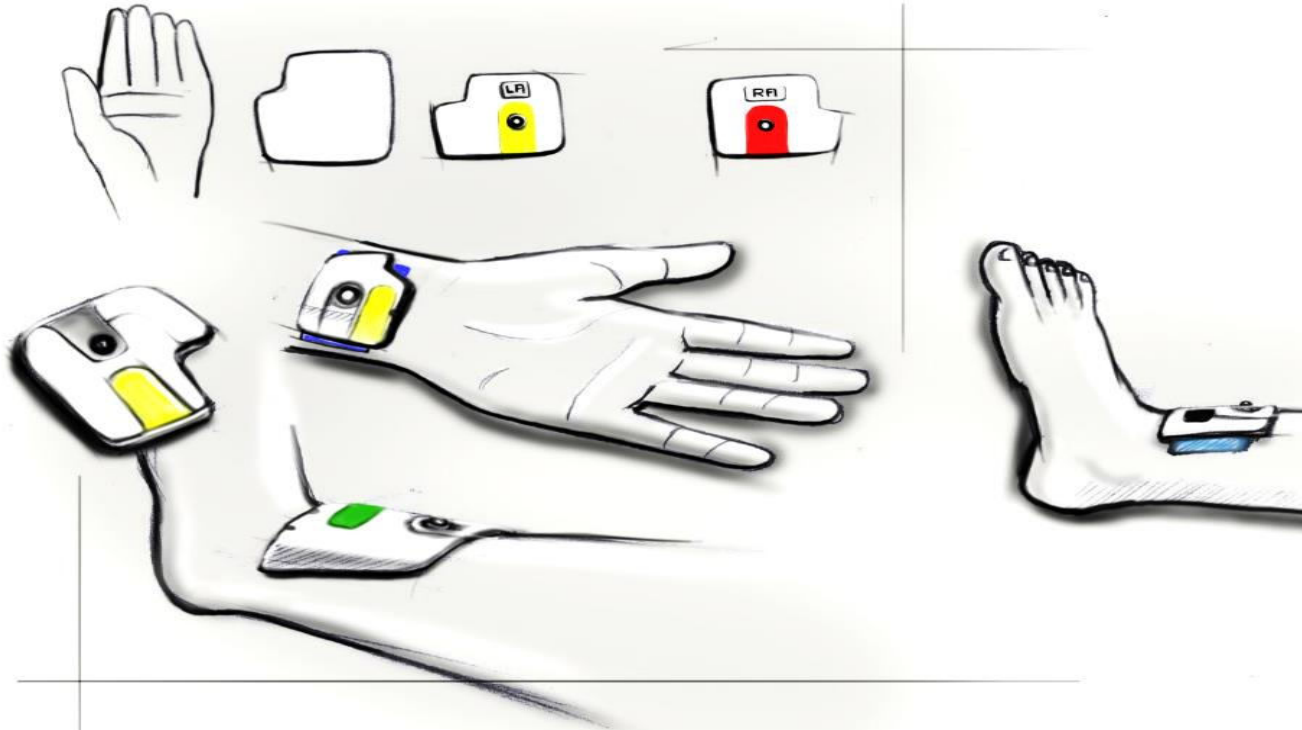


Early Ideations



The Concept

Intuitive configuration of electrodes for easy visual identification





Right hand electrode



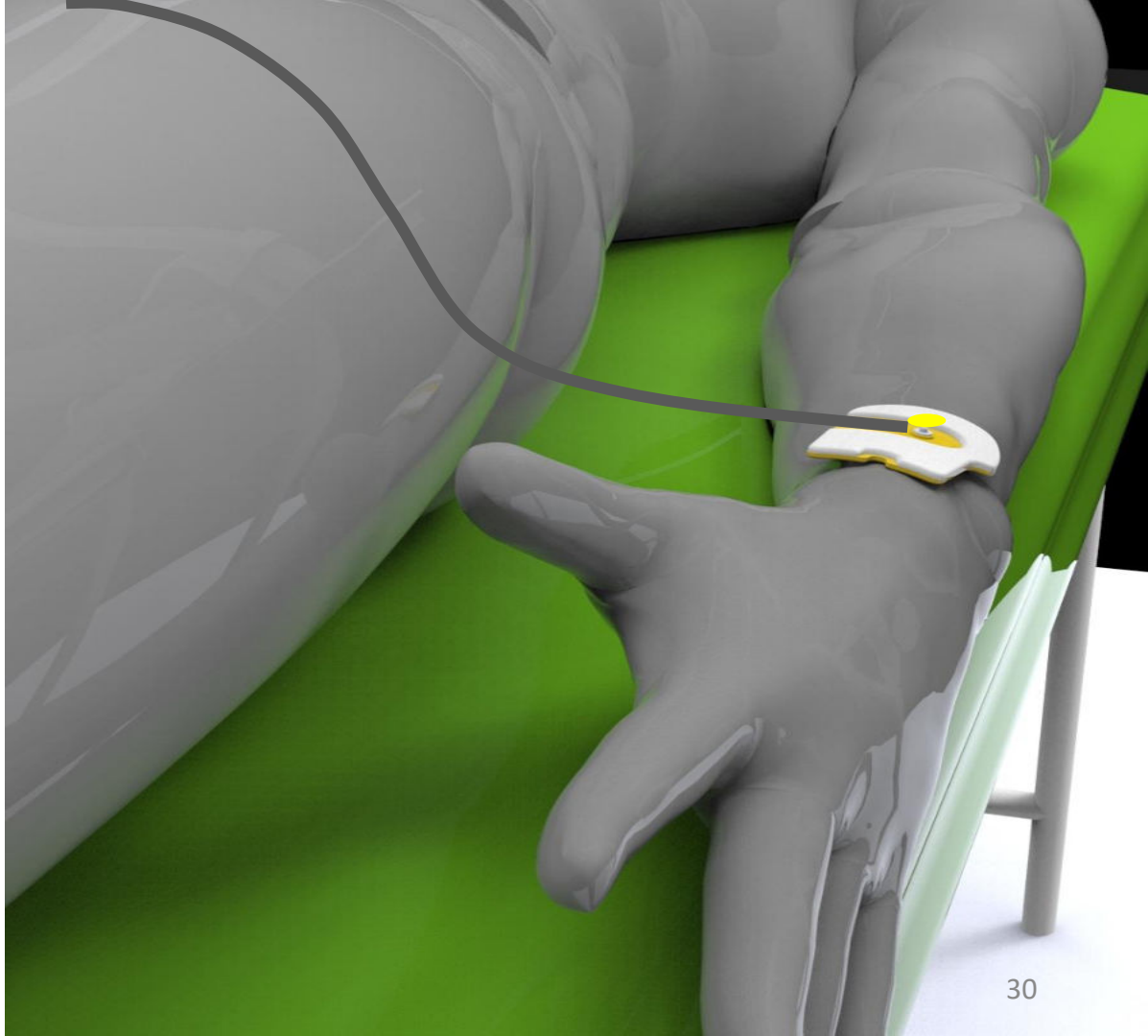
Left hand electrode



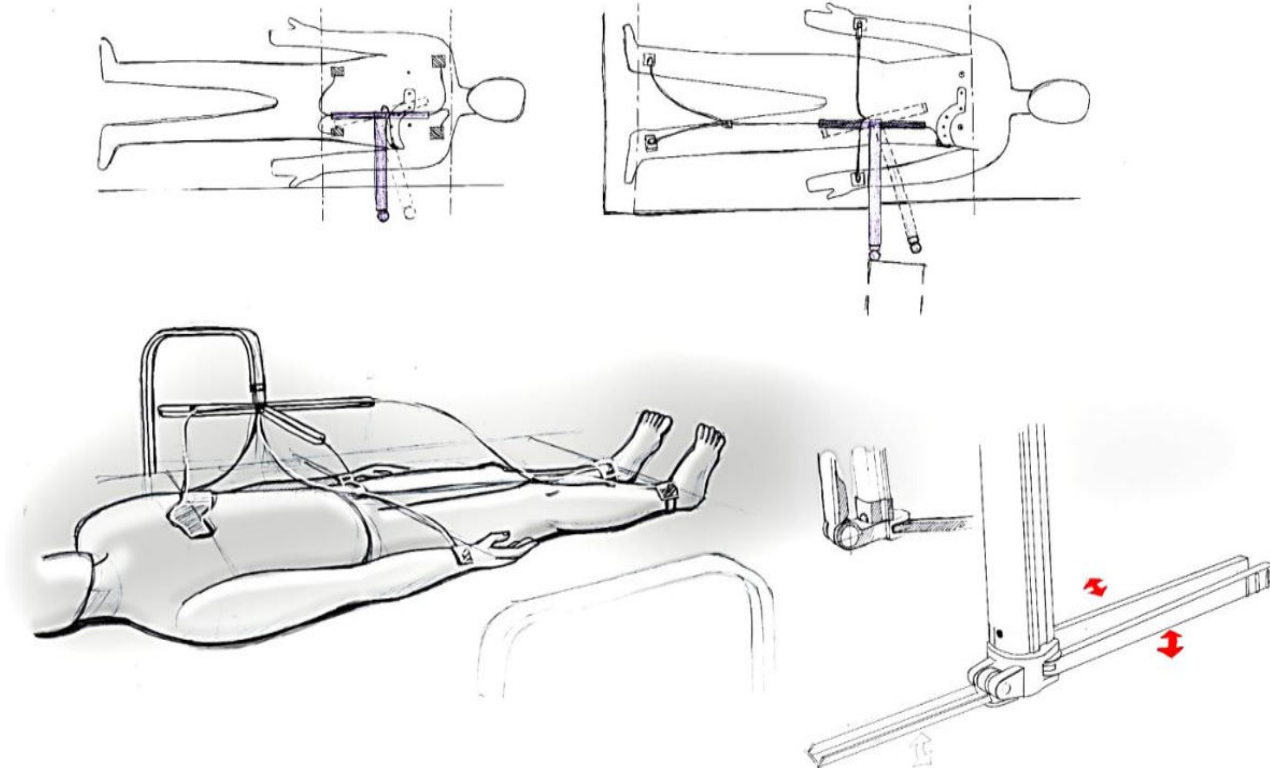
Right Leg electrode

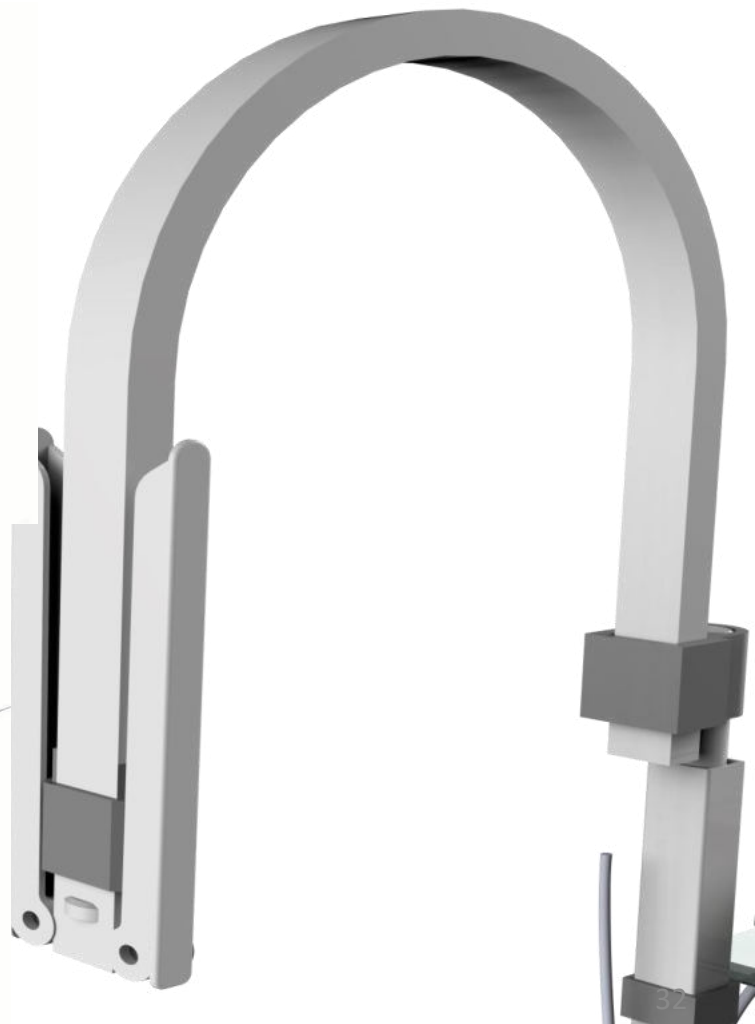
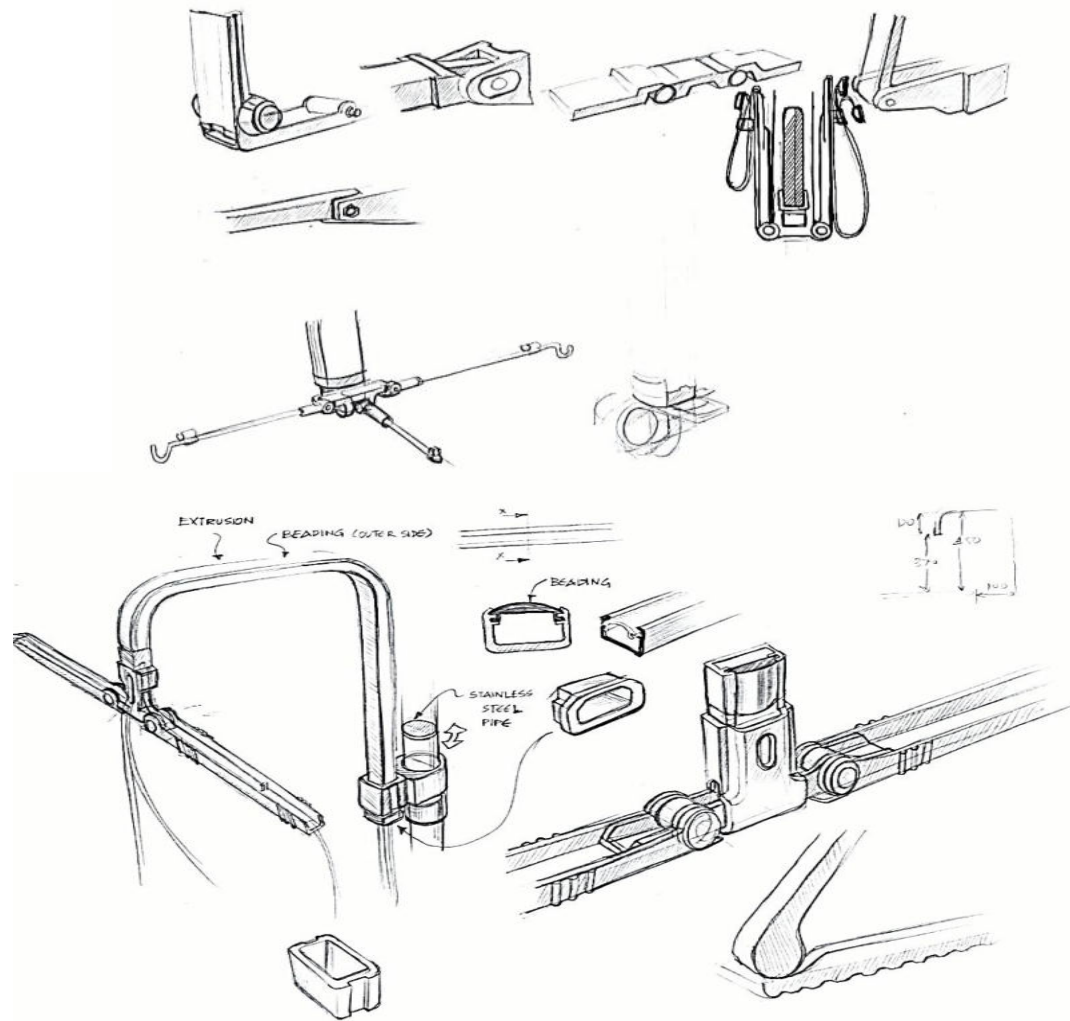


Left Leg electrode



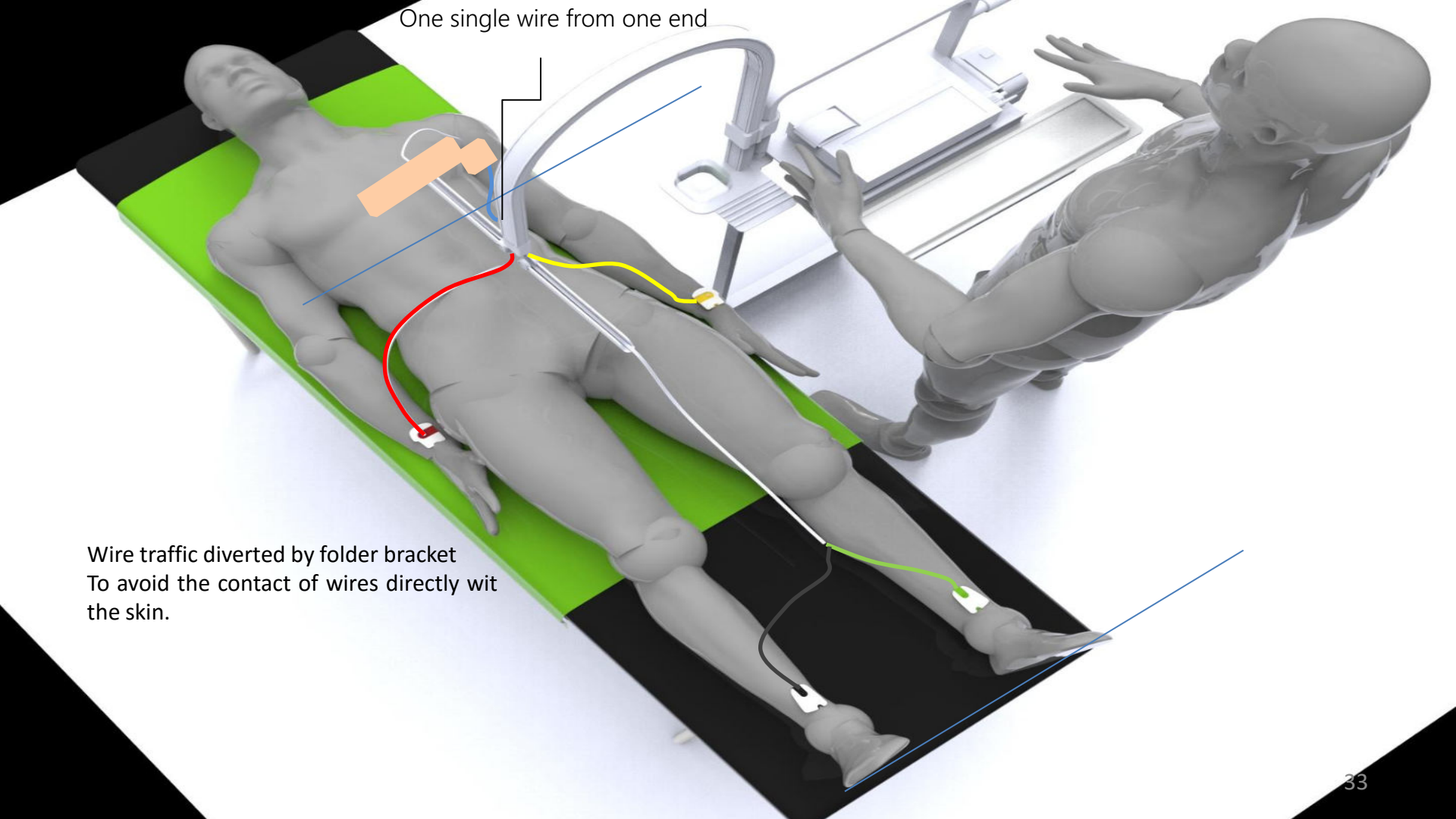
Boom Ideations





One single wire from one end

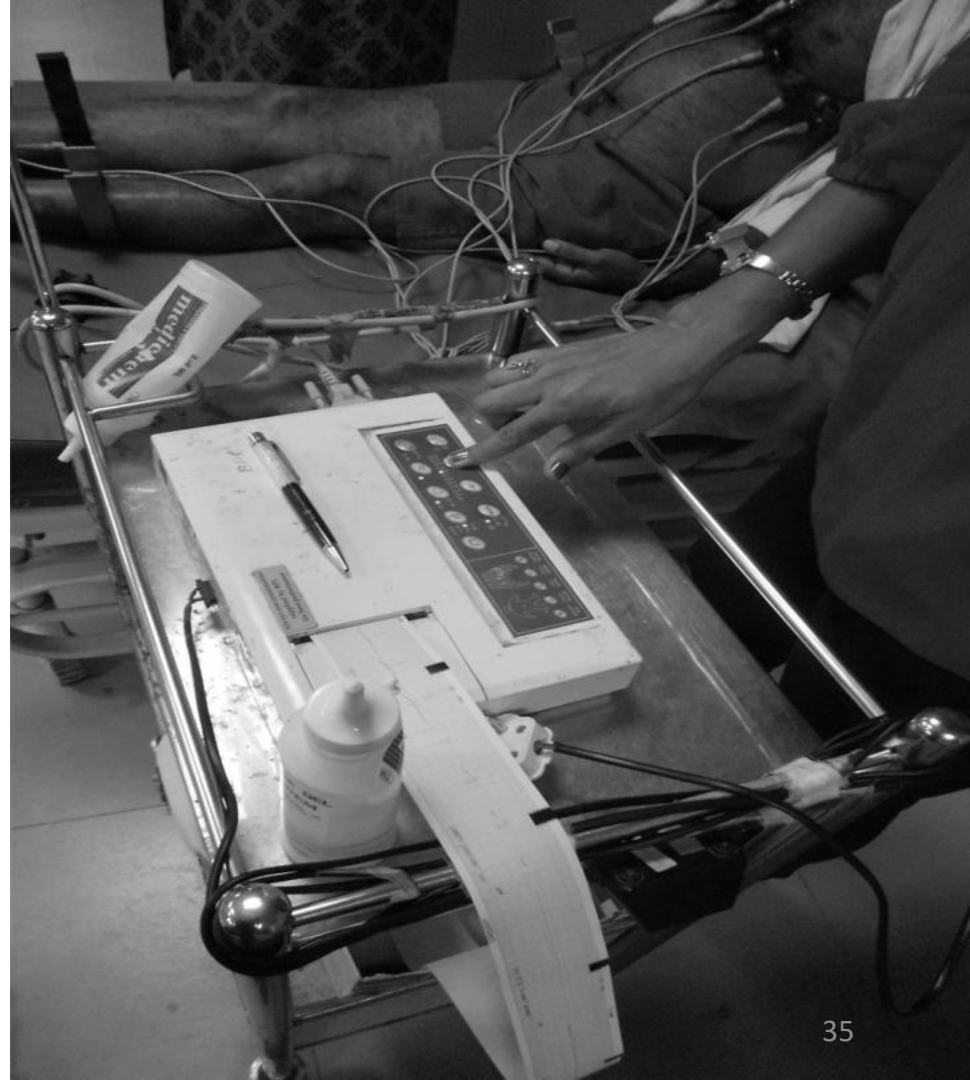
Wire traffic diverted by folder bracket
To avoid the contact of wires directly with
the skin.



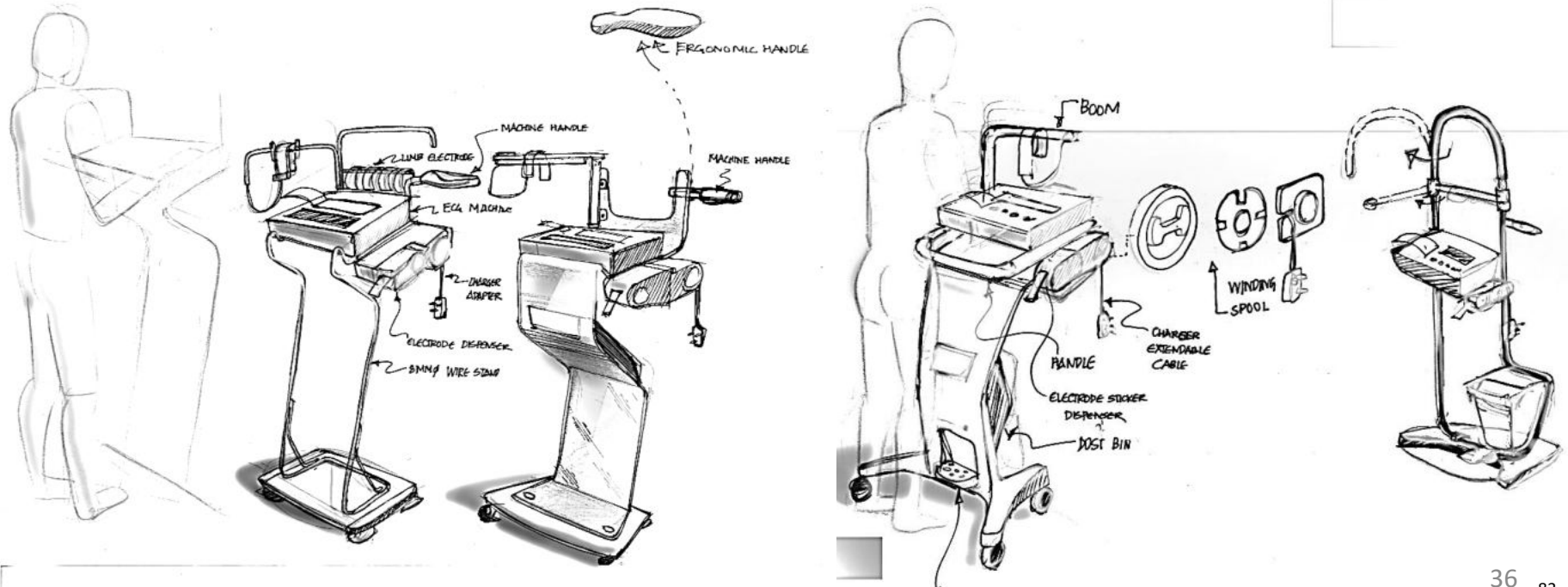
Trolley Design

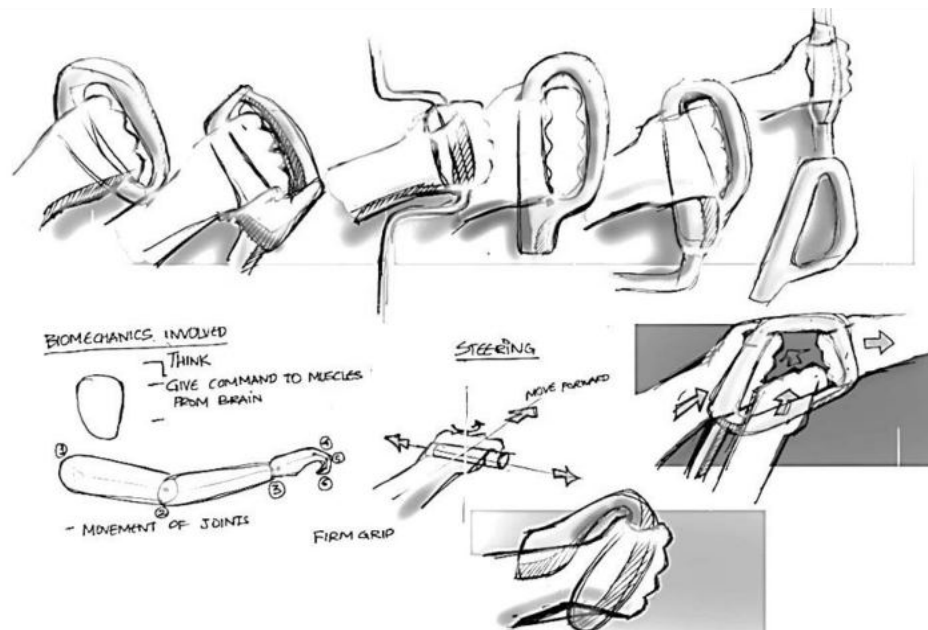
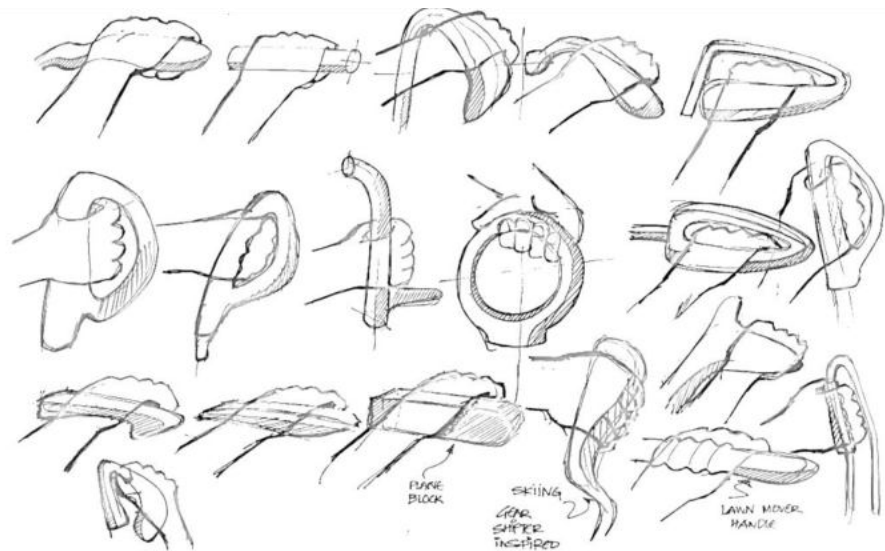
Issues with Trolley

- Disorganized
- Time Consuming
- Ergonomically & visually distressing



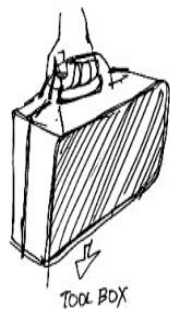
Early Ideations



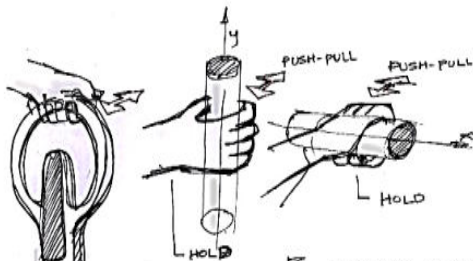
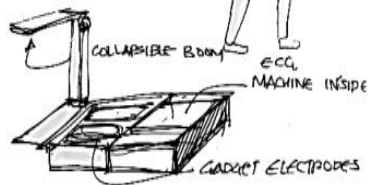


IN HOW MANY WAYS I CAN HANDLE THE SYSTEM?

↓
carry in hand
↓
portable.

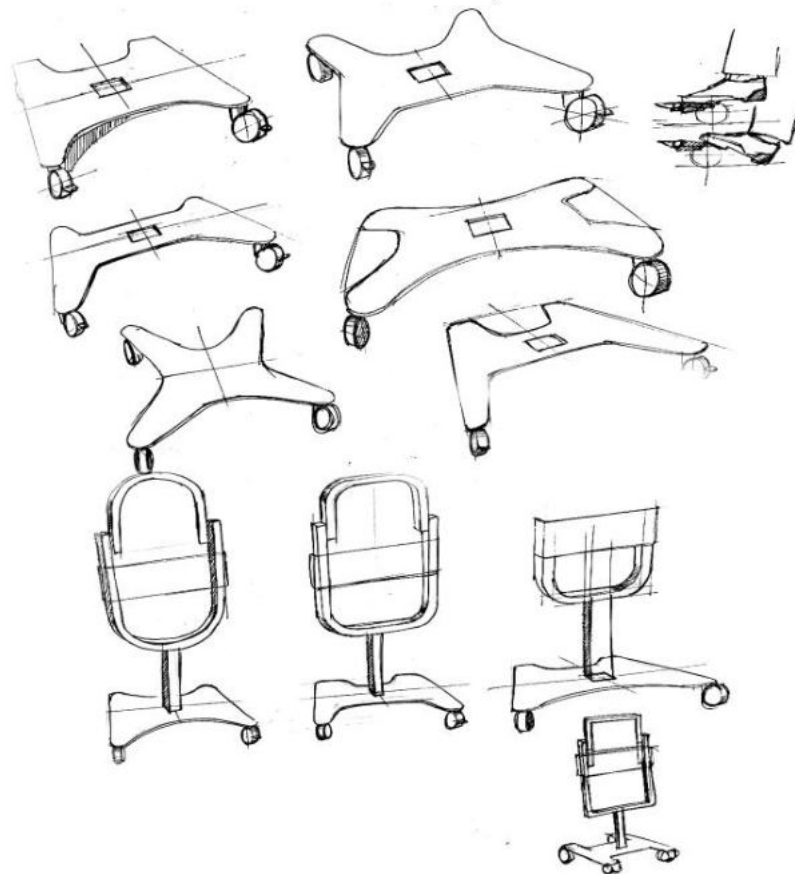
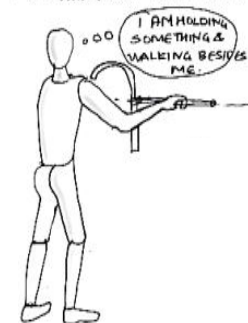


WHICH OPENS UP



STEERING OF
THE
EQUIPMENT...

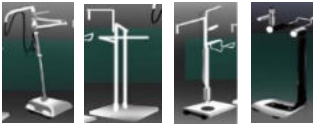
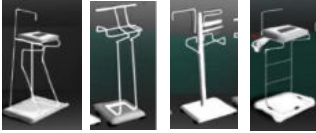
WHICH ONE IS BETTER?



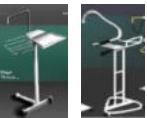
SKELETAL

MINIMAL

Visual treatment – thin structure



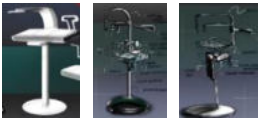
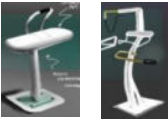
Visual treatment – pipe structure



MASSIVE

VISUAL MASS

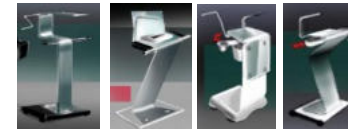
Visual treatment - more mass. bulky



EXECUTIVE

FORMAL

Visual treatment – Glass & metal



MODERN

URBAN

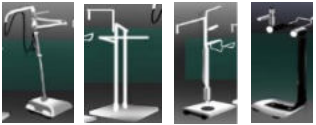
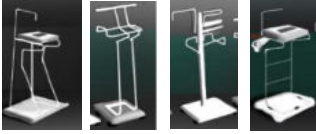
Visual treatment – bulked up structure



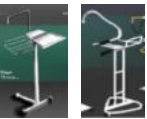
SKELETAL

MINIMAL

Visual treatment – thin structure



Visual treatment – pipe structure



MASSIVE

VISUAL MASS

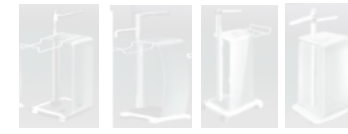
Visual treatment - more mass, bulky



EXECUTIVE

FORMAL

Visual treatment – Glass & metal



MODERN

URBAN

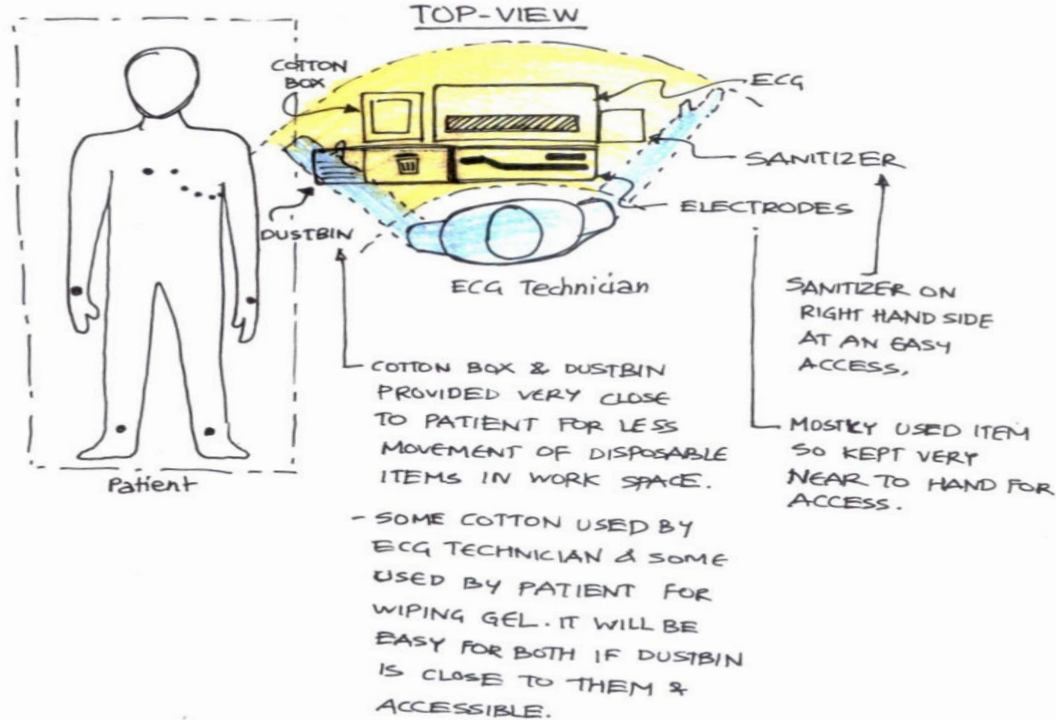
Visual treatment – bulked up structure



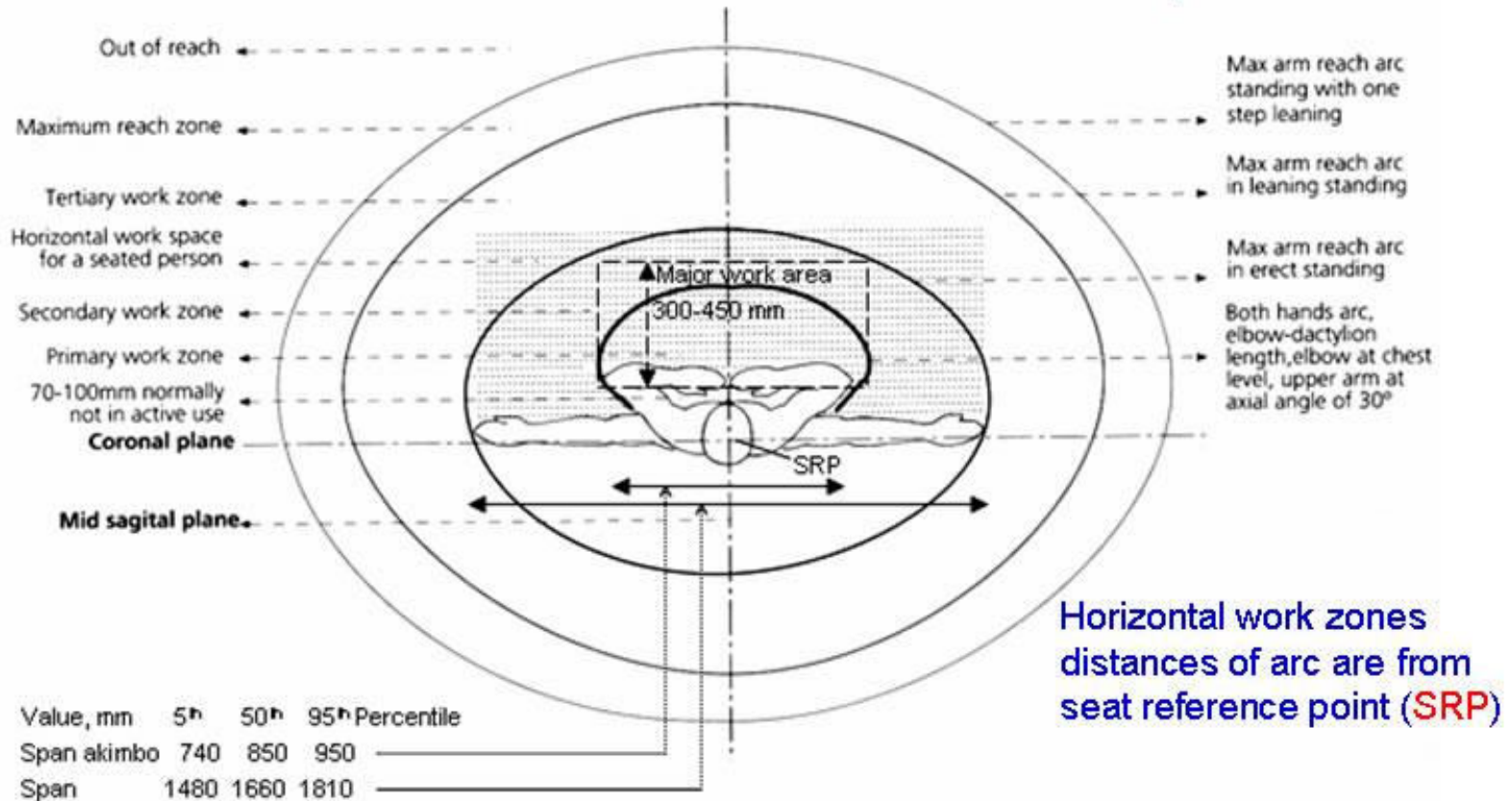
Skeletal structural language was selected for further refinement

Workspace & Ergonomics

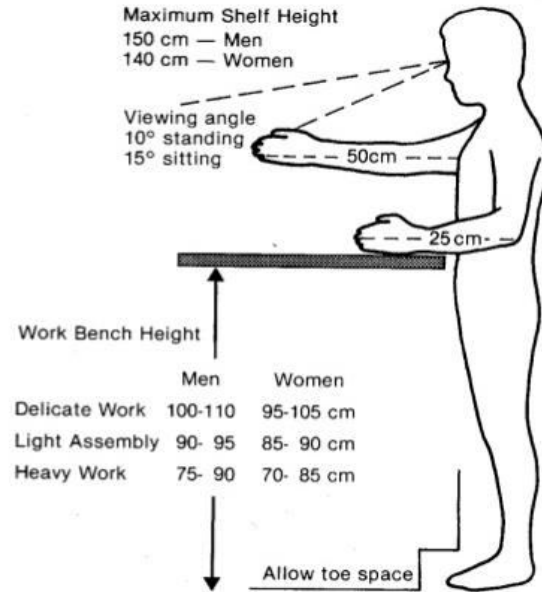
ECG TROLLEY ARRANGEMENT



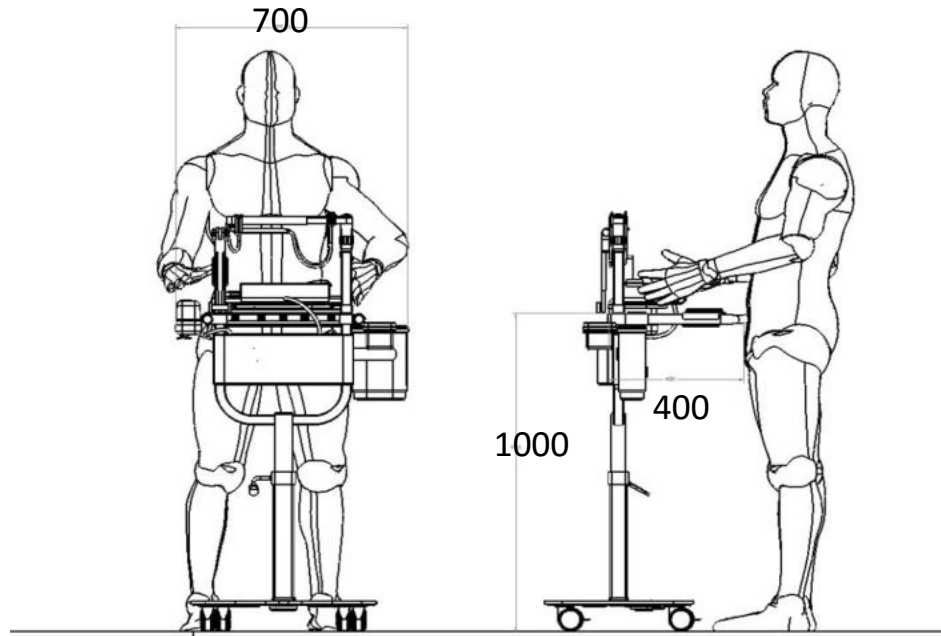
Workstation Layout



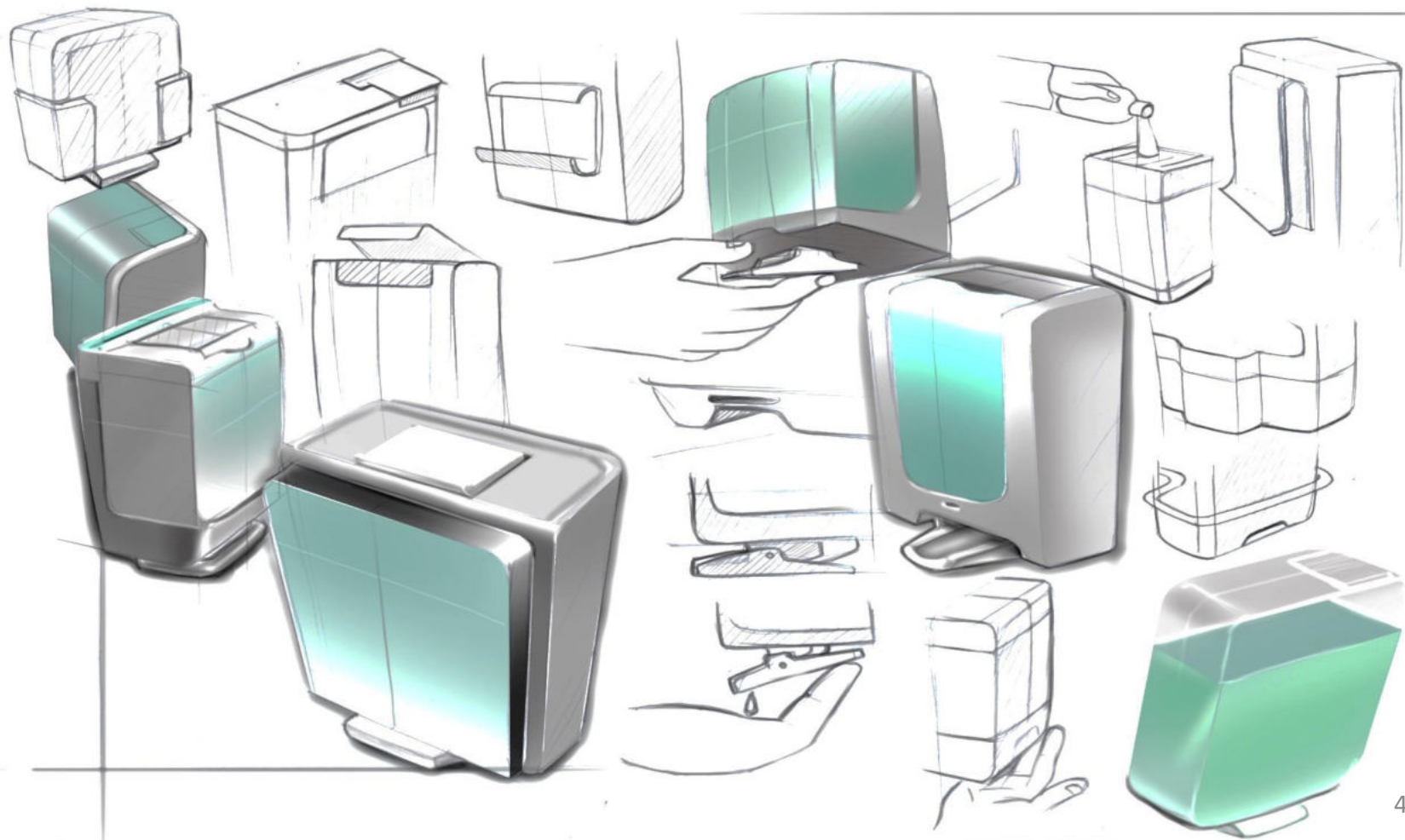
Work surface Height for Varied Work Levels



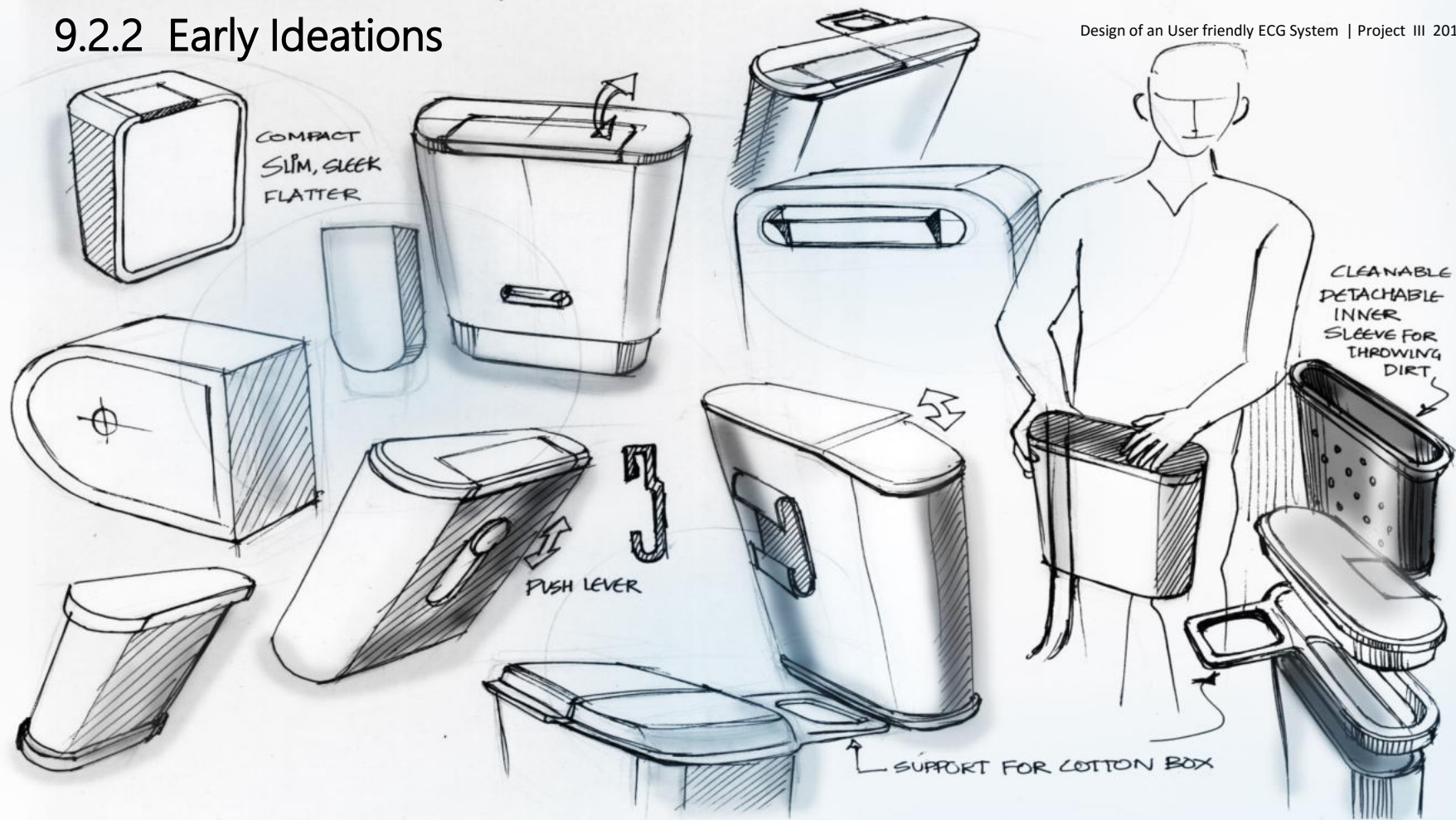
Anthropometric Details



Design of Peripheral Components



9.2.2 Early Ideations



Dustbin Explorations



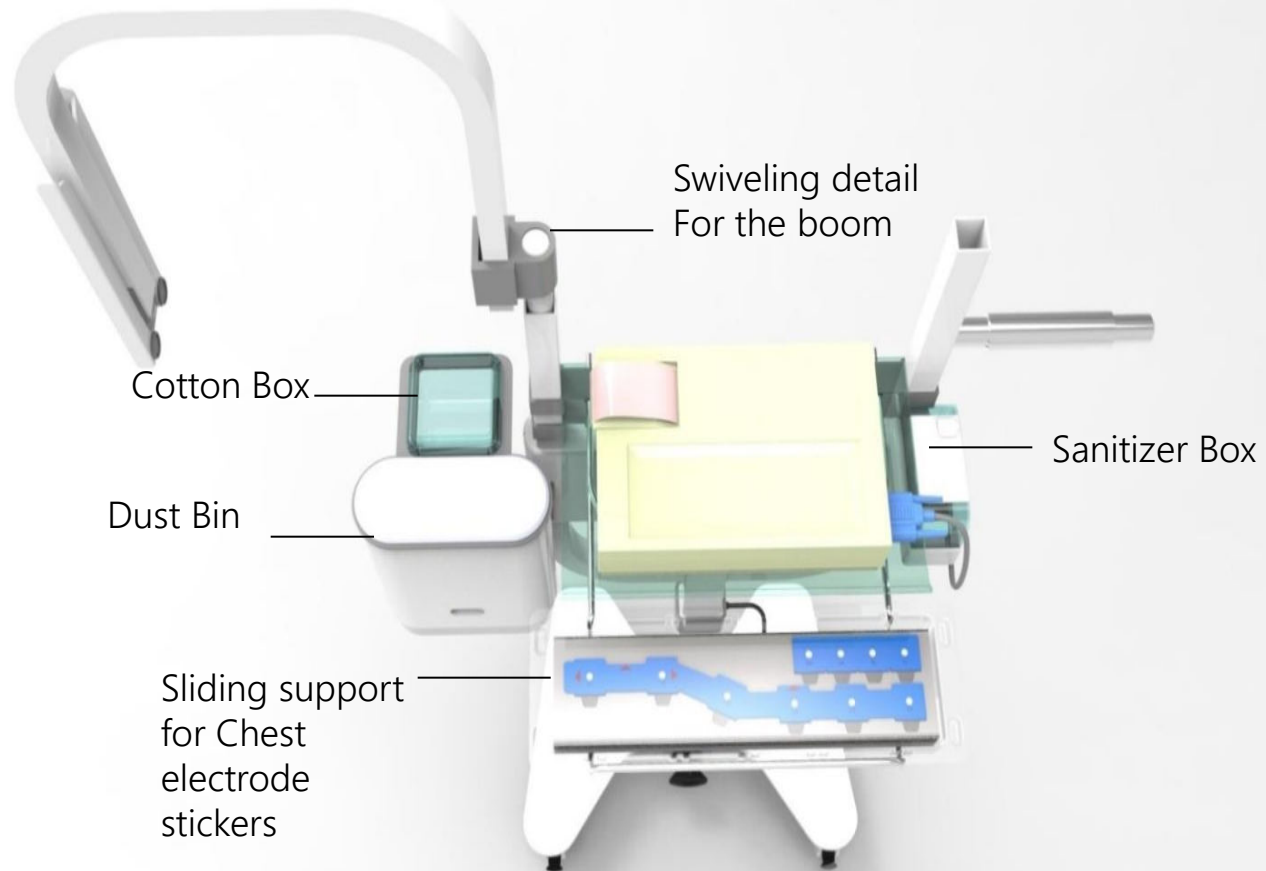
Images and Mood Board

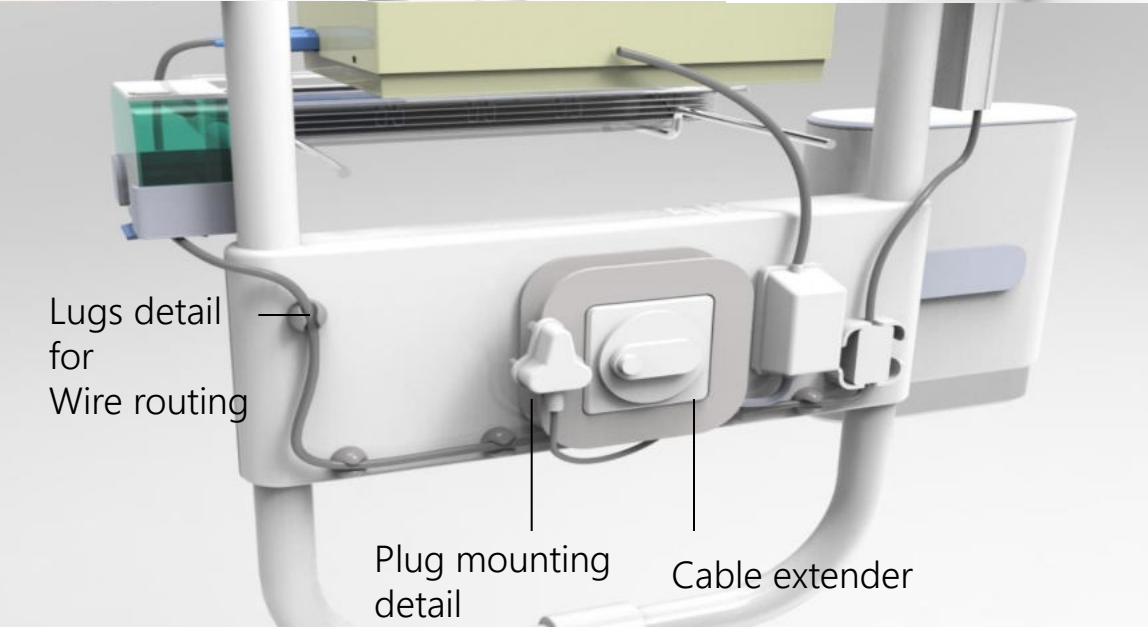
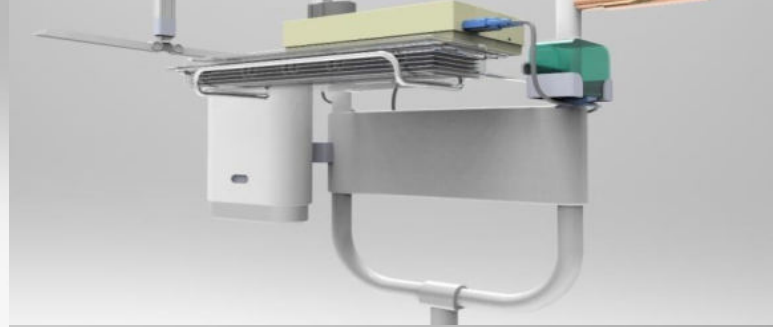
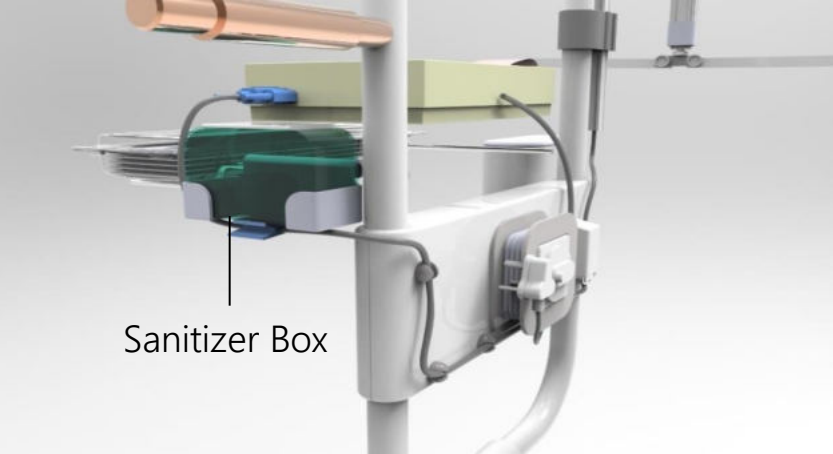
Sophisticated
Clean
Elegant Precise
Organized
Homely
Friendly
Minimal Safe



Early Design Explorations







Derived Concepts

Rendering Concept A

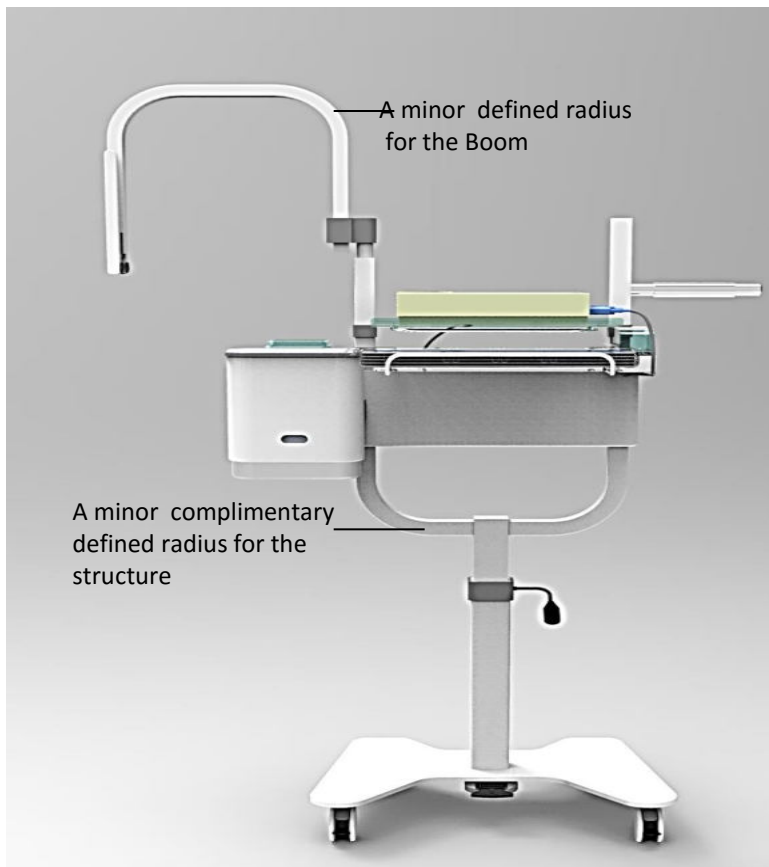


Open Condition

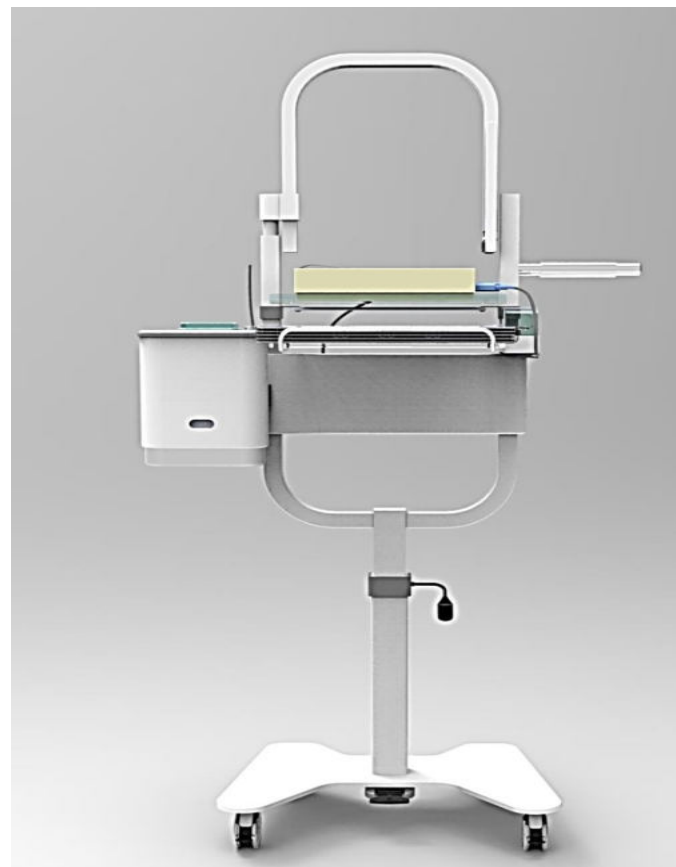


Closed Condition

Rendering Concept B

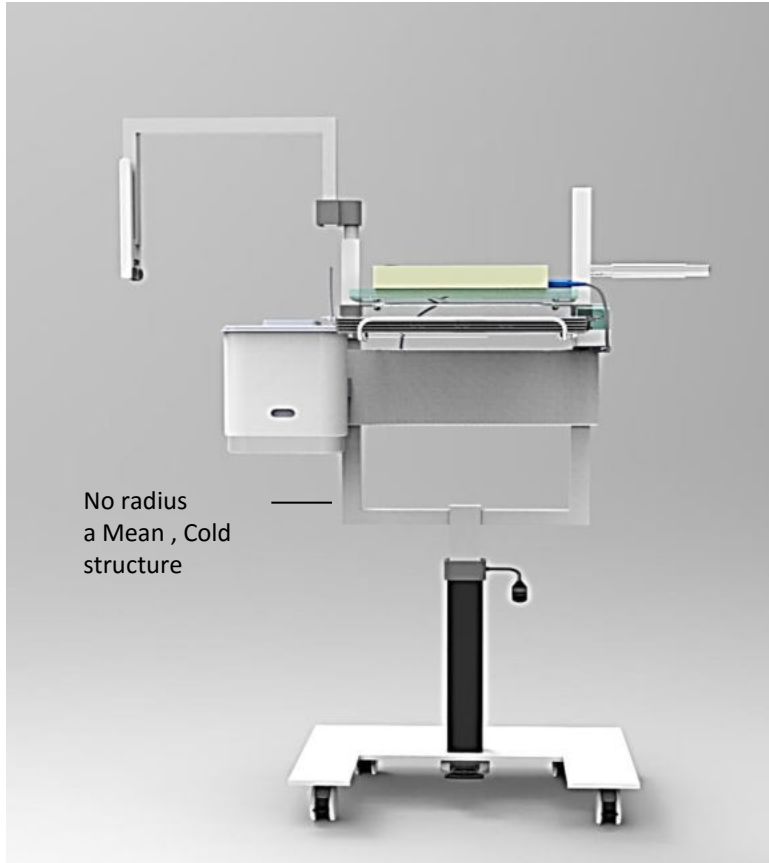


Open Condition



Closed Condition

Rendering Concept C



Open Condition



Closed Condition

User Feedback

The Mock Up

- Understand the issues in actual environment
- Feasibility Analysis



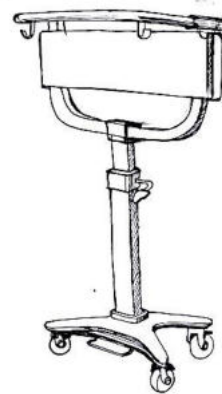
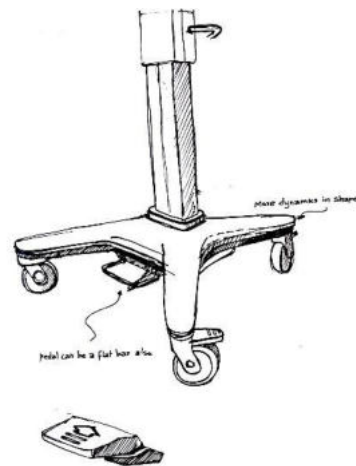
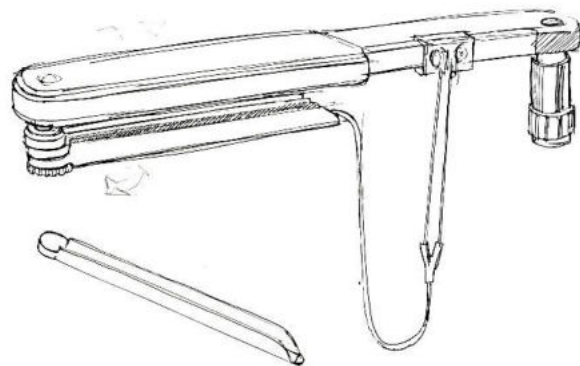
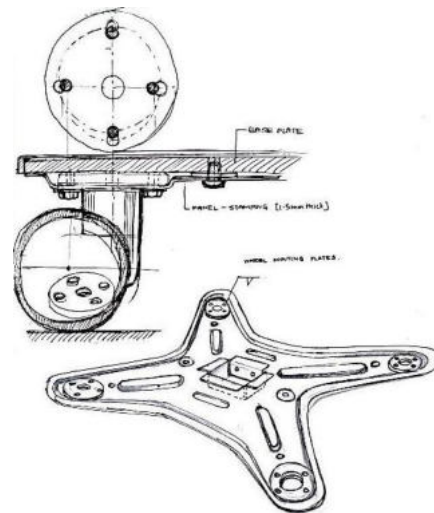
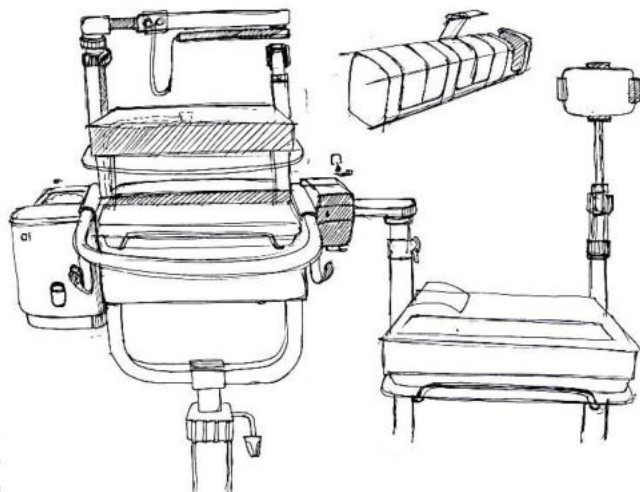


The concepts are evaluated on a system that distributes 1 point to all the concepts in each parameter

Parameters	Concept A	Concept B	Concept C
Appearance	0.3	0.5	0.2
Comfort	0.3	0.3	0.2
Compactness	0.2	0.4	0.3
Ease of operation	0.3	0.4	0.3
Visual Balance	0.3	0.4	0.2
	1.4	2.0	1.2

Concept B wins

Further Refinement



Icon Design

Various icons were explored considering the activities involved thereby making the process more intuitive.

Litter



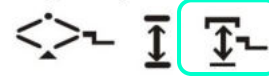
Boom wire



Battery Adapter



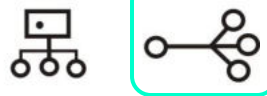
Height Adjustment



Cotton



Hub



Plug



Sanitize



Machine Platform



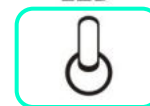
screen



electrodes



LED



Brand Design



Cardio♥Care

Cardio♥Care

CARDIO♥CARE

CARDIO♥CARE

Cardio♥care

Cardio♥care

Cardio♥care

Cardio♥care

Brand Design



Final Concept

MEET CardioCare

WITH YOU AT EVERY STEP



WHATS NEW ?

Finally, A system that could actually make the life simpler

With the CARDIO CARE system, you can:

- Enhance ECG Recording Experience.
- Streamline your routine workflow.
- Improve the communication with the patient.
- Increase portability.

Base

Gas Stay for height adjustment

Castor wheel with brake pedals

Pedal to control the height



Base



Stronger Base with
reinforcement

Utility Box

Cotton Box

Dustbin



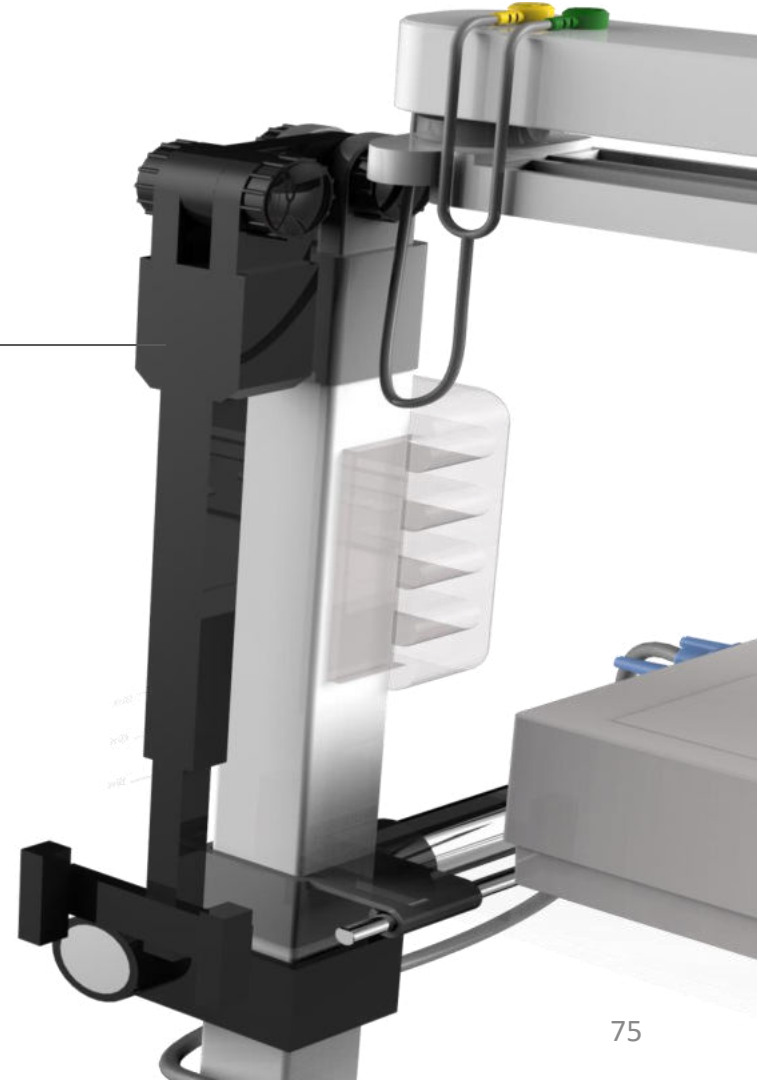
Handle

The Mounting Tray

The mounting tray for the Disposable Sticker Box.

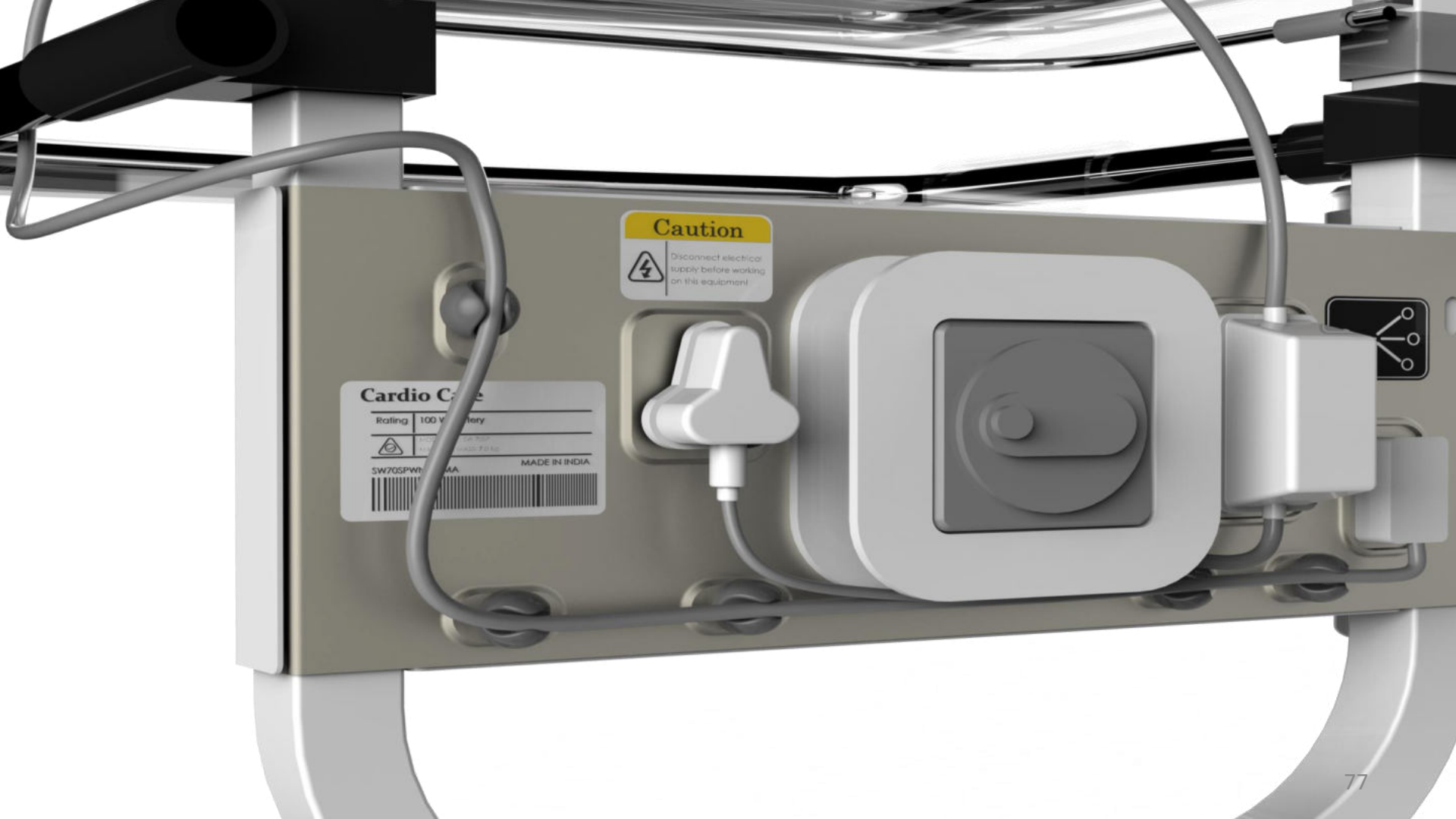


Bracket for
Mounting
LCD Display



Glass Base
For ECG machine





Caution

⚡

Disconnect electrical supply before working on this equipment!

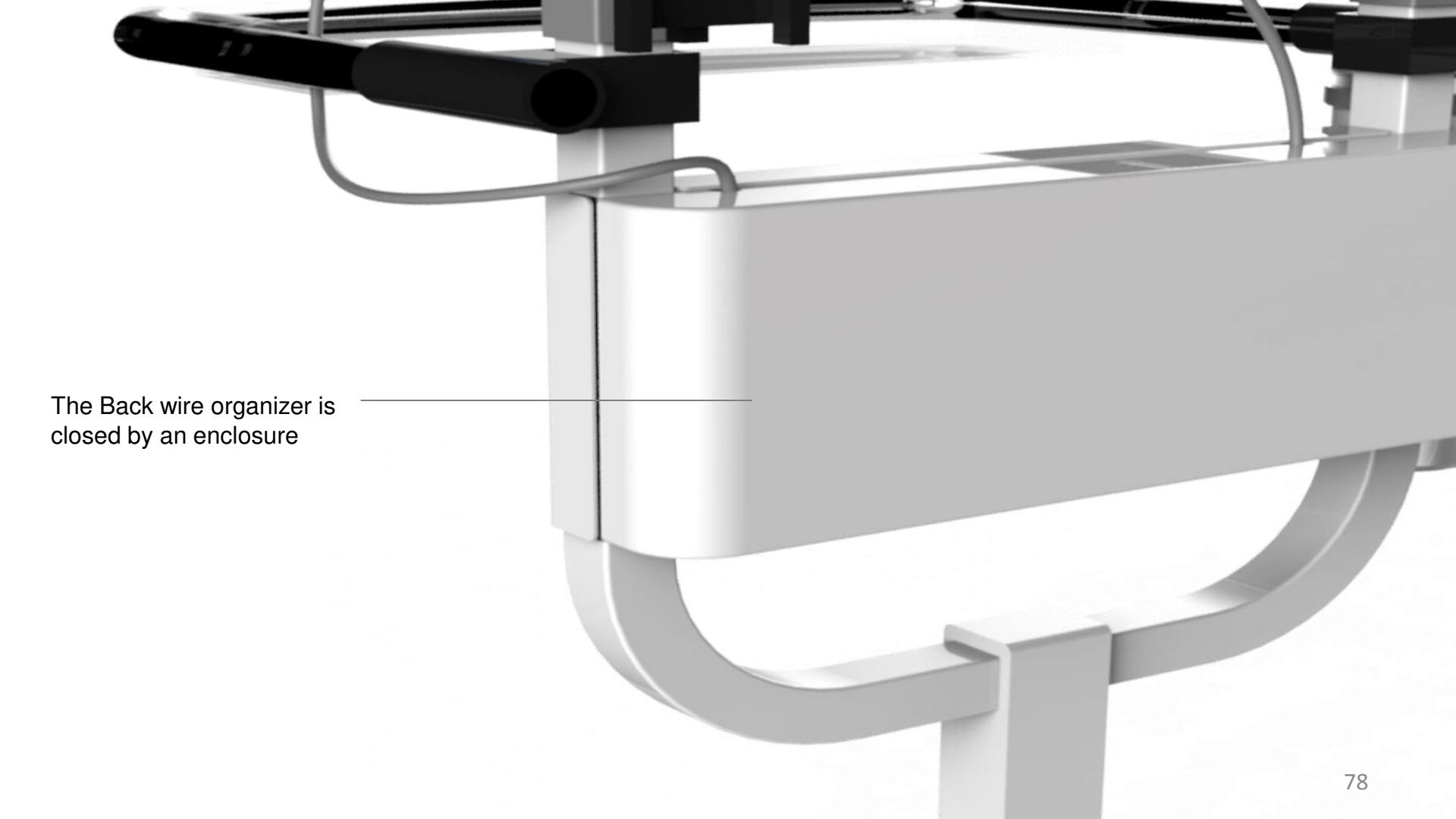
Cardio Care

Rating	100 V	Frequency	

SW705PWV11AAA

MADE IN INDIA

[Barcode]



The Back wire organizer is closed by an enclosure

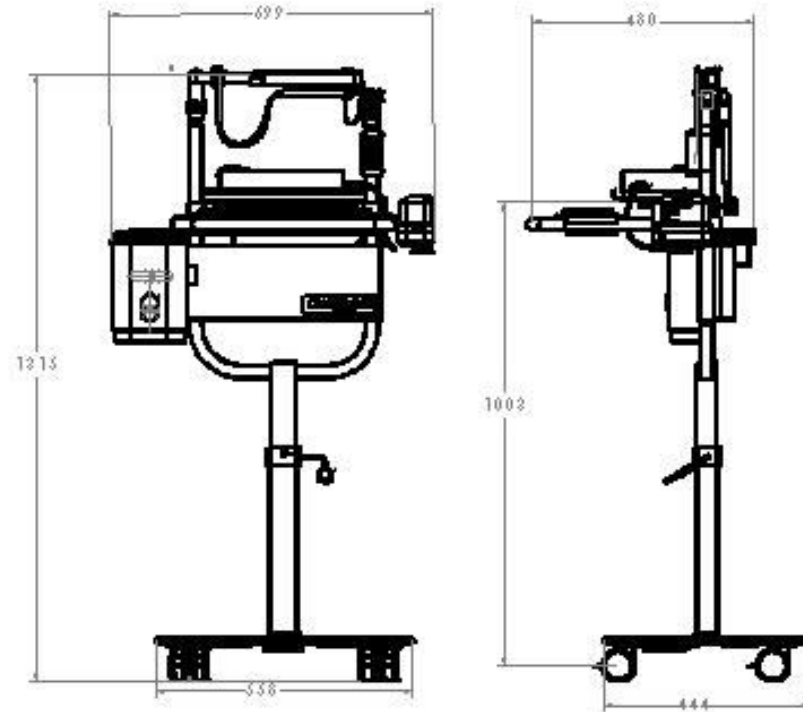
Colour Options



Value Proposition

- Organized workflow
- Organized wire management.
- Ergonomically designed workspace.
- Minimal Lean structure.
- Minimal elegant looks.
- Use of Antibacterial materials with high finish.
- Controlled use of gel & less cumbersome process.
- Efficient accessory management.

Dimensional Details



Bringing Smiles

An effort to bring smile on every heart



References

John R. Hampton, “ ECG Made Easy” ,
Chris Lefteri “ Making It”,
Casell & Co Publications, “ The Dream Catalogue”.
Taschen Publications, “ Designing the 21st Century”,
Alex Milton, Paul Rodgers, “ Research methods in product Design”,
US 2003/0199777 A1, Oct. 23, 2003, Wireless Electrocardiograph Method,
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US 2006/0030782, Feb 9, 2006, Heart Disease detection patch,
US 2013/0281795 A1, Oct 24, 2013, Wearable remote electrophysiological monitoring system,
US 8, 731, 632 B1, May 20, 2014 ,Electrocardiogram device,
US 8, 731, 632 B1, May 20, 2014 ,Electrocardiogram device,

Fin.