DESIGN OF A FRUGAL VEIN DETECTOR FOR KIDS

PRODUCT DESIGN
PROJECT II

MPR-467

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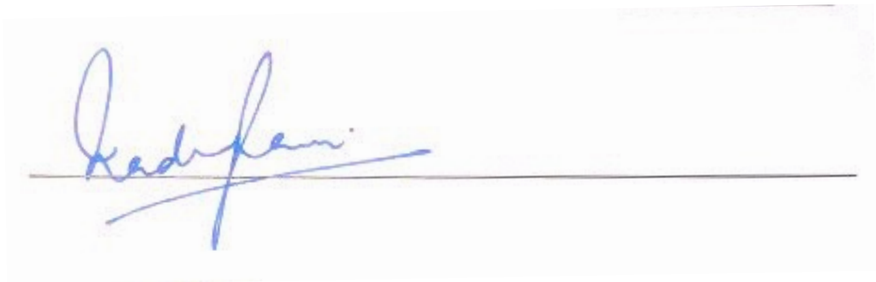
is approved for the partial fulfillment of the requirement for the degree of “Master of Design” in Industrial Design.

Guide _____

Chairperson 

Internal Examiner _____

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I wish to thank Dr Ketan, Dr Nandini and Dr Chincholi from KEM Hospital anaesthesia department for their support in taking me through the real life problem scenarios and letting me interact with patients.

-Ankur Rawal

Abstract

Intravenous injections have been used in the medical industry for various drug deliveries. Locations for conducting venipuncture are: Hospitals, Path labs, dispensaries, etc. A key issue in this procedure lies in finding a suitable spot for injection. Many individuals face difficulties in as their vein is not visible or close to the surface enough for a successful venipuncture. A vein detection device was made by Trivikram Annamalai, an IDC ex student in 2014.
This project takes the technical learnings from the development of the vein detector and targets a specific user segment- kids owing to their special requirement and constraints.
Kids owing to their soft epidermal tissues and thin bones, allow for red light (Near Infrared region) to pass through their palms and make the venal structure visible of the back of the hand. This aspect along with ethnographic observations from the Hospital about the way kid patients are handled for a veni-puncture led to the development of a doctor and patient friendly form.
The final design includes the following:

- Form fits the hand of children in the age group 2-10years
- Comfortable for the doctor to hold
- Provides illumination on the back of palm for effective venipuncture
- No parting lines come in contact with patient’s skin, keeping it averse to catch germs

Contents

01 INTRODUCTION

Venipuncture

A vein being punctured pre cannulisation for an adult patient at KEM Hospital

Source: Author

Venipuncture is the process of obtaining intravenous access and is an everyday invasive medical procedure. Among patients admitted into hospital wards, the prevalence of a peripheral venous access line is as high as 80% depending on the condition of the patient and the location of the hospital . Although a peripheral vein can be accessed in a single attempt, in a substantial number of patients the attending nurse needs between 2 and 10 attempts to insert the needle successfully.

The main causes for multiple attempts are:

- lack of adequate venipuncture skills
- lack of adequate care and maintenance
- Subcutaneous fat presence also affects visibility, hence multiple attempts are made
- A medical situation regarded as a peripheral difficult venous access.

Accessing veins in cases of elderly or obese as well as dark toned & adult patients becomes very difficult sometimes for drug delivery physicians. Although significant work has been done in this area and many devices have come up, but the major problem lies in their cost and portability. A low cost, portable & efficient infrared imaging detection system is the need of the hour. Burns and other physical injuries make it difficult to locate veins and administer lifesaving drugs. In such cases it becomes very necessary to have a device that detects the exact location of required vein. Also in case of blood transfusion or withdrawal, etc. it is necessary to know the position of the veins.

Venipuncture

Even trained nurses and doctors many times find it difficult to exactly locate the blood veins on the first attempt itself. In some medical situations, the location of vein needs to be identified. Each second counts when the doctors are treating trauma patients. The other situations where vein imaging is required are:

- Bruises and Burns: In case of vein diseases bruises appear on the skin like Deep Vein Thrombosis and Varicose Veins, therefore for the treatment detection of veins is highly essential. Accidents involving first or second degree of bums cause the scarring of the skin. The appearance of the skin becomes deterred making the skin to appear either whiter or darker. The determinations of veins become tough in such cases.
- Intravenous injections: For giving medicines and drugs to the patients, intra- venous injections are given by doctors and nurses.
- Amongst children: Having to puncture them several times with a needle is very frightful and agonizing for the child & so locating veins in young children and infants may be difficult.
- Blood transfusions: It is a process in which blood is given to the person intravenously. Blood donation, kidney dialysis also need perfect vein detection.
- Geriatrics: Old people often require numerous blood tests or medicinal injections and an efficient means of puncture would reduce excessive bruise and enhance the patients overall comfort level. Human eyes can only detect visible light that occupies a very narrow band (400 - 700nm) of the spectrum. However, in other bands of the electromagnetic spectrum there is much more information contained rejected by the objects of interest.

Venipuncture

Vein viewing

Needle insertion

Dressing or strapping

Several approaches have been developed to improve venipuncture success rate.

There are four main strategies:

- Manual procedures with the aid of chemicals, but these are not suitable for children and are not effective on people with dark skin
- The use of ultrasound-guided procedures, which have the disadvantage of the need for additional trained staff and expensive equipment
- Use of secondary light sources, which make the venal structure more prominent, and
- Usage of near infrared (NIR) spectroscopy.

Phlebotomy

Equipments used in carrying out a standard phlebotomy procedure namely: tourniquet, butterfly needle, gloves, alcohol gauze, collection container and syringe

Phlebotomy is the process of making an incision in the vein with a needle. The procedure itself is called venipuncture. Phlebotomists are people trained to draw blood from a patient for clinical or medical testing, transfusions, donations, or research.

Venipuncture is one of the most routinely performed invasive procedures and is carried out for following purposes:

- Blood sampling
- Blood donation- whole blood or components via apheresis
- Drug administration under controlled environments
- Anaesthesia
- Visual enhancer deployed in CAT scans- use as a contrast agent
- Dialysis

Venipuncture involves successful identification of a potent vein and subsequent needle insertion. Many a times, in admittance cases a cannula is used.

Experts speak- IV procedures in kids

IV procedures in kids are only undertaken under a health anomaly

"Intravenal procedures in kids are not undertaken in general medicine, as it needs an expert. I in my 30 years of practice still avoid IV injections and call for a blood collection partner….but let me tell you..it is still a huge need as the risks are huge"- Pediatrician, Pune

All vaccines etc are given via intramuscular injections

"We generally administer only IM injections in buttocks, upper arm or thighs, IV drips etc are mostly given on the wrist for kids"- Nurse

There are solutions for soothing pain post injection

"Sweets have been proven to relieve pain, especially amongst kids"- Pediatrician, Powai, Mumb

How to bring kids to rest and remove their fear of an injection?

"Do you have Subway Surfer on your phone? .you give that to my child and slit his arm..he wont pay attention" - Parent

"The kid will end up looking at the spot of injection, you can't avoid that" - Prof Athavankar

"There is no cure for fear, I just give them a strong bashing and post injection ask them- did it hurt as much as you thought it would?" -General Physicist, Powai

"For kids below 2 years, parents can be used for distraction..Doctors often ask the mother to breastfeed the child while a major procedure has to be undertaken..else the child's movements are very risky to work around"-Gynaecologist, Delhi

02

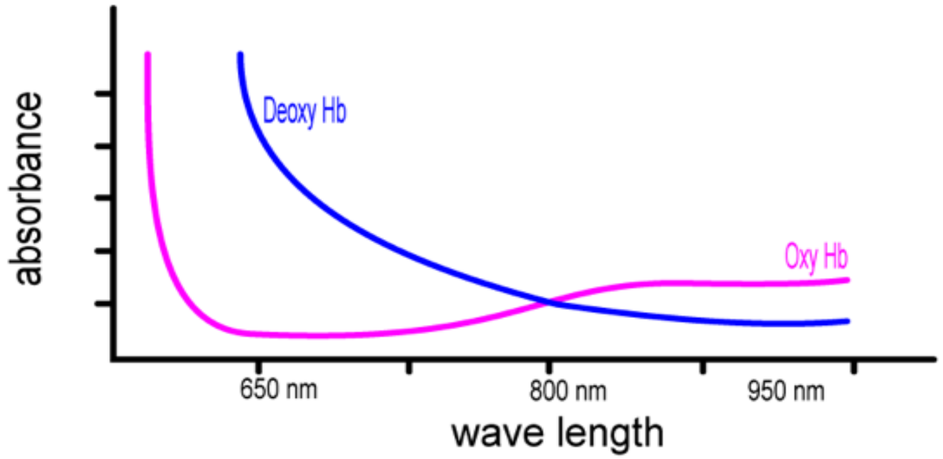
RESEARCH

Science of vein detection

Veins contain deoxygenated hemoglobin-rich blood that almost completely absorbs light at near-infrared wavelengths (740 nm–760 nm) at a distance of up to several centimeters.

The situation is the reverse for the oxygen-rich arterial blood supply. NIR spectroscopy takes advantage of this differential absorption to clearly distinguish the veins from the arteries and the surrounding tissue.

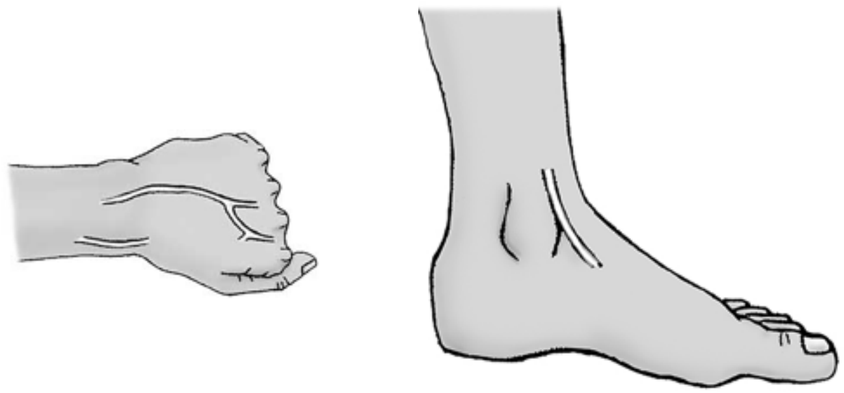
Orange wavelength (~650nm) is seen to give the best contrast in visibility due to higher absorption difference between veins and arteries. The reason is the deoxidized haemoglobin [deoxy-Hb or Hb] in the veins almost completely absorb the radiation while the oxidized haemoglobin [HbO] become almost transparent.



Source: https://www.howequipmentworks.com/pulse_oximeter/blood_absorption_spectra

Science of vein detection

•Biggest veins usually found
- On back of hand and side of wrist
- On inside crease of elbow
- Just in front of inside ankle bone
- On inner forearm – common in men
- In groin (femoral vein) – in emergency only



Locations for venipuncture in big sized veins

In admittance cases especially for children, cannulas are mostly placed on the wrist as opposed to forearm. Wrists are easier to render immobile by use of splints and offer greater efficiency in finding veins as they are more proximal to the skin due to less amount of subcutaneous fat as compared to forearm.

Vein structure in wrists

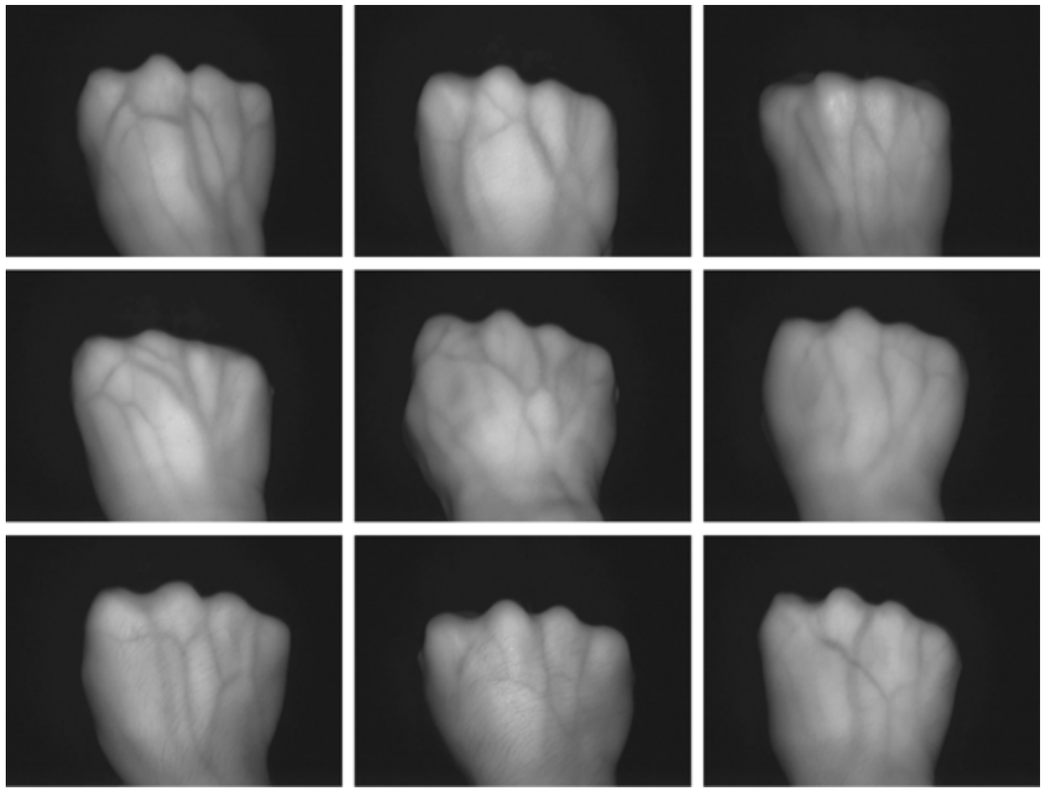
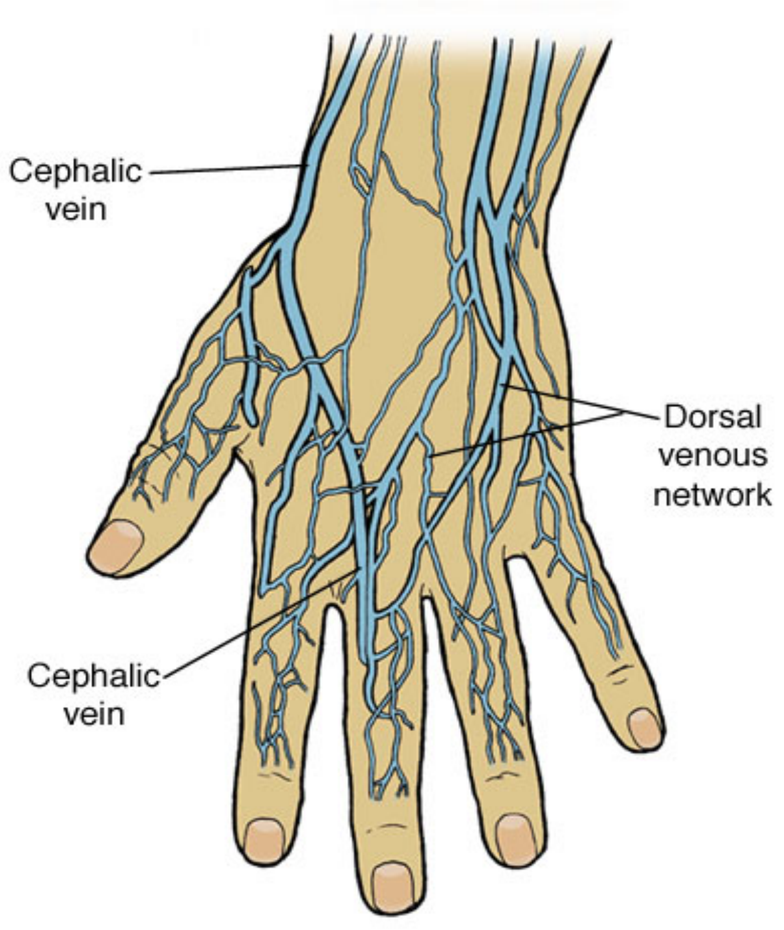


Image: Venal structure in wrists visualized by NIR spectroscopy (source: http://opticalengineering.spiedigitallibrary.org/article.aspx?articleid=1158305)



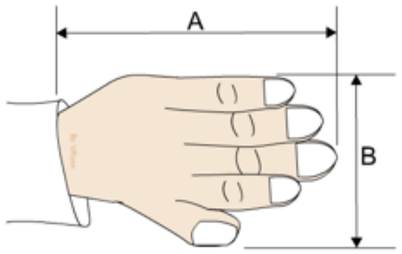
Schematic venal structure

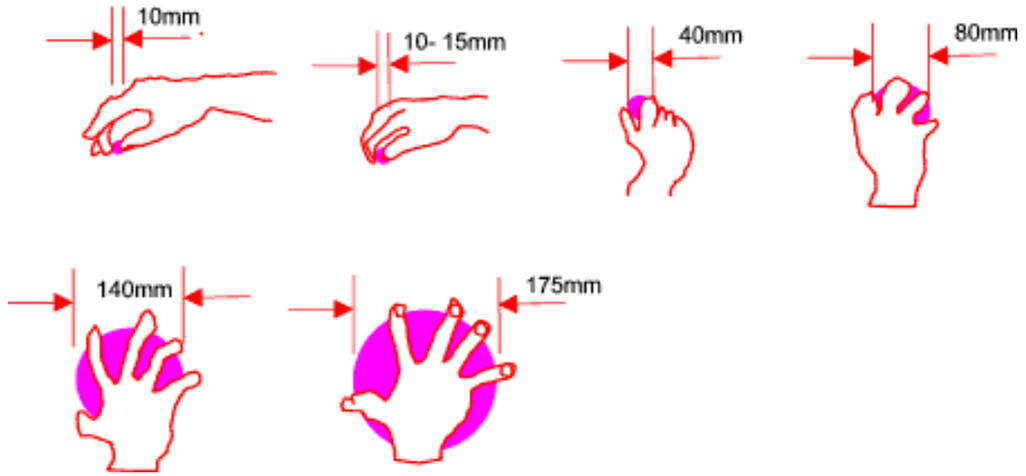
Vein structure in wrists

ANTHROPOMETRIC DATA

PUPIL/PERSON	A	B
Child A	100mm	53mm
Child B	103mm	45mm
Child C	90mm	47mm
Child D	95mm	44mm
Child E	102mm	50mm
Child F	87mm	41mm
Child G	75mm	43mm
Child H	102mm	51mm
Child I	104mm	51mm
Child J	74mm	36mm
Child K	78mm	46mm
Child L	81mm	39mm
TOTAL(S)	1091mm	546mm
AVERAGE	90.8mm	45.5mm

Anthropometric data on hand sizes for kids median age 6yrs
Source: https://**journal**.cpha.ca/





Data for design considerations for a wrist based device for kids aged 4-10 yrs

Image of a 1 yr old hand at KEM Hospital (Source: Author)

Activity analysis

Preparation for venipuncture in a child at Dhirubhai Ambani Hospital

Preparation:

- Explanation of the procedure briefly. This is known to ease the anxiety in kids and bring them to rest.
- Exceptionally active kids are brought to rest using force (by an attendant or accompanying parent)
- Comforting techniques: (A technique known as PPM Patient Pain Management is often used)

Source:http://www.rch.org.au/comfortkids/about_us/About_Comfort_Kids/

- **Positioning for comfort** - upright positioning for procedures, empower the child and promote comfort
- **Distraction** - activities, toys, books, media, music, guided imagery, relaxation and breathing
- **Preparation -** parent and child for both the procedure and available coping strategies
- **Language -** developmentally appropriate words, positive coping language,explain procedure steps
- **Pharmacology -** procedural sedation agents oral, IV and inhaled, topical local anaesthetic agents and analgesia
- **Sucrose -** administered to infants and children up to 18 months of age

Activity analysis

Locations for venipuncture in big sized veins

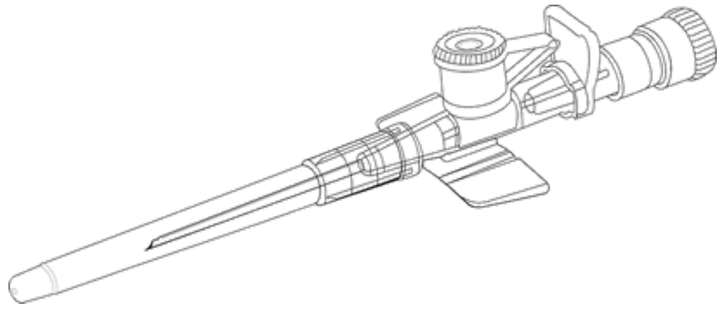
Locations for venipuncture in big sized veins

Sites

- Look carefully with a tourniquet for the most suitable vein & remember that in paediatric patients the best vein may not necessarily be palpable.
- Upper face of the non-dominant hand is preferred - the vein running between the 4th and 5th metacarpals (bones counted from Thumb to little finger) is most frequently used.
- In addition to the usual sites in adults, commonly used sites in children include the forearm, the foot & the great saphenous vein at ankle.
- Consider practicalities of splinting (e.g. elbow, foot in a mobile child).
- Scalp veins should only be used by more experienced doctors (shaved scalp hair re-grows very slowly).

In most cases, it is observed that veins may be cannulised in the hand (wrist) itself.

Activity analysis



Cannula: a thin tube inserted into a vein or body cavity to administer medication, drain off fluid, or insert a surgical instrument.

Inserting the cannula

- Decontaminate skin with alcohol wipe or alcoholic chlorhexidine 0.5% & leave to dry. Use 'no-touch' technique for insertion after decontamination.
- Insert just distal to and along the line of the vein
- Angle at 25-30°
- Advance needle & cannula slowly
- A 'flash back' of blood may not occur for small veins.
- Once in vein, advance the needle & cannula SLOWLY a further 1-2mm along the line of the vein before advancing cannula off needle.
- Secure the hub of the cannula at the skin entry point either by holding it down or asking the assistant to place tape across.

03 Environment

Hospital procedure room

Procedure rooms are designated for carrying out smaller tasks like strapping, taping and dressingof ward patients

The room also keeps stock of medical supplies like syringes, cotton and common IV drugs

A wall mounted charging station seems like a good possibility

Advantages:

- Easy and accessible location for use on difficult vein finding cases
- No wires to be plugged in, Dock remains stationary on the wall

Image: procedure room at KEM Hospital pediatric ward

Procedure timeline

Patient’s wrist held in tourniquet action by assistant

Doctor (Cannula administrator) palpating the vein for activation

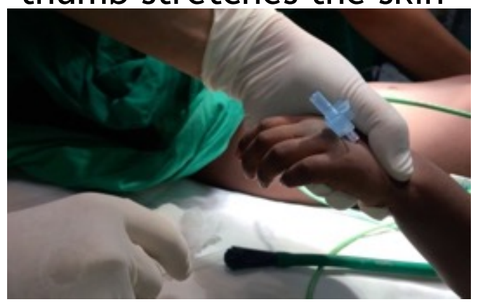
Key holding grip for cannulization

Notice how Doctor’s hand is used to grip, while its thumb stretches the skin

Second hand used for inserting needle while first hand continues to stretch skin and keep patient’s wrist stationary

Angle of needle is reduced once the needle has pierced skin

Thumb of first hand grips cannula in order to safely remove the inner needle



First hand remains in gripping posture

Key Learnings

Upper surface of wrist should be available for the procedure

The device should allow for effective gripping of patient’s wrist as well as allow the skin to stretch

Device should be used single handedly, as other hand is used for carrying out procedure

Key insights

An assistant is available for preparation, pacification and holding the child stationery

Index and middle finger do not move in the procedure

Thumb is first used to stretch the skin, then is used to support cannula while needle is taken out

One hand is dedicated to hold the patient's wrist, the other is used to insert needle

Key insights

A particular way in which doctors hold the patient's wrist. Images are captured by self at an Indian Hospital (top left) while the rest are from the internet under 'phlebotomy on kids'

The same hold is quoted to pacify the child as well as stretch the surface for venipuncture. It has been made use of in the product design

04 Existing devices

Existing devices

Power switch (below)

Strengths	Weakness
Small size- Portable and can be worn with a lanyard Curved surface for suiting the palm Clear positioning- usage on infants and neonates (0-2years)	Age restrictions Red light not always suitable for dark skin tones Often needs dim ambient lighting No brightness control Usage of non rechargeable batteries
Opportunity	**Threat**
Light color adaptation Rechargeable batteries Use on a slightly higher age group	Cheaper alternatives Better service warranties by other companies

Existing devices

A white labelled torch style solution for vein detection in kids is also retailed

ASTODIA→

Combination of yellow and red LEDs for diverse skin tones

Powered base

Brightness control present

Finger assist end module

05

Innovation amalgamation

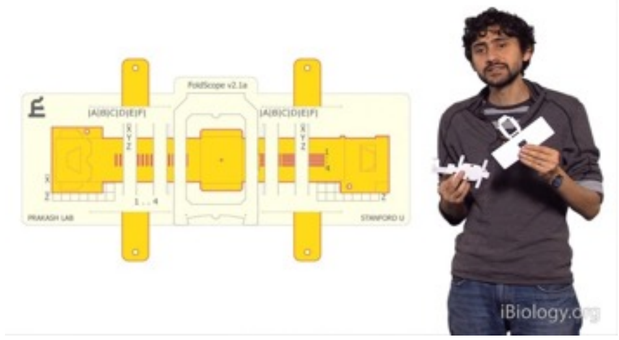
Frugal Innovation

Frugal innovation or **frugal engineering** is the process of reducing the complexity and cost of a good and its production. Usually this refers to removing nonessential features from a durable good, such as a car or phone, in order to sell it in developing countries. Designing products for such countries may also call for an increase in durability and, when selling the products, reliance on unconventional distribution channels. When trying to sell to so-called "overlooked consumers", firms hope volume will offset razor-thin profit margins. Globalization and rising incomes in developing countries may also drive frugal innovation. Such services and products need not be of inferior quality but must be provided cheaply.

However, an innovative product is irrelevant if it doesn't reach those who need it most, and Jaipur Foot has succeeded in creating an effective service delivery model that minimizes overhead costs while reaching remote users efficiently. Employing a hub-and-spoke delivery model, Jaipur Foot reaches patients through 22 centers across the country as well as 50+ mobile camps held in remote rural areas. This highly coordinated network allows Jaipur Foot to divide up resources efficiently, reducing overhead and human capital cost, without limiting the reach of its services. The main campus in Jaipur also provides free residential facilities for families that arrive from all over the country for treatment. Additionally, the organization provides access to livelihood generation activities for people with severe disabilities. This robust network of initiatives enables Jaipur Foot to extend the reach of its core product deep into underserved communities.

ChotuKool by Godrej

Jaipur Foot



Foldscope- paper microscope

Notable frugal products (Source: Wikipedia)

Inspiration from the Million SoUL project

The Million SoUL project is an exemplary case study in deployment of frugal devices
The distribution mechanism of 1 million lamps and solar panels funded partly via the MHRD and the user.
The repair and maintenance of the same has been planned from inception itself and a certain sum is paid to the local electronics repair guy along with the PCB replaceable components. This ensures successful repair without delays at the site and the user would not be inclined to junk the devices when it is non-functional

Construction of the lamp's casing and PCB show the robustness and repairability of the device in order to deploy successfully at the given scale and in remote areas with harsh usage conditions.

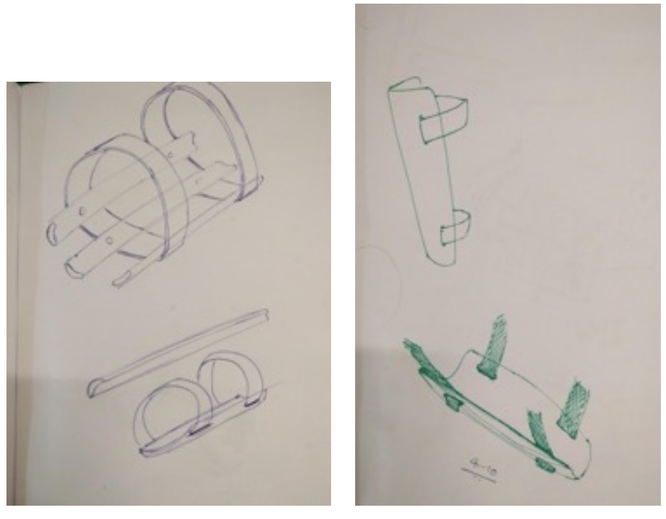
06

Failed attempts in problem identification

An attempt to redesign the tourniquet

The central idea being- utilizing the parent's presence to bring the child's arm to rest.
The parent's forearm was assumed to suffice the length of the child's full arm.
The idea was dropped as it was digressing from the main issue at hand- which is vein visualization. Later, a report by 2013 M.Des senior, Kartika was found which addresses the same issue

Quick and dirty mockup of tourniquet design



Other ideations of a standalone strap mechanism

Straps patient to parent

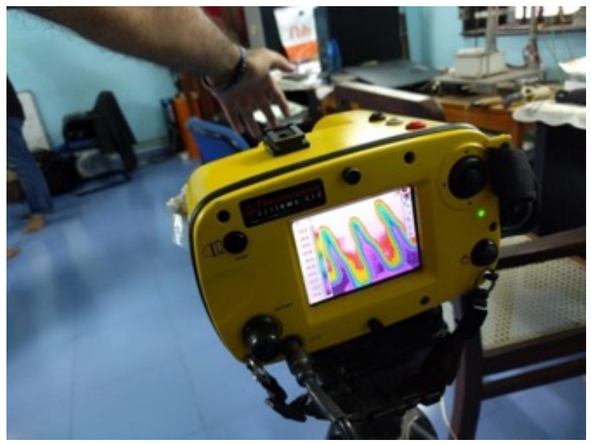
Rapid testing on user

An attempt at thermal imaging

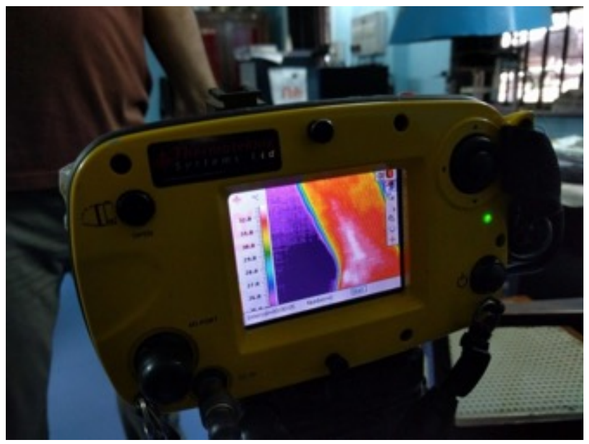
Owing to the temperature difference in veins from the skin and mass on its periphery, an idea to use thermal imaging to lead to effective non contact vein visualisation as done in many sophisticated vein finders was generated.
The attempt was to see the possibility of making a high technology and accurate solution to the problem

The idea was dropped due to low service cycles and maintenance of equipment at Hospitals in the country.
Even after making the technology slightly more affordable, the aspects surrounding effective deployment of a medical device in the country rendered this option futile

A thermal imaging camera was gained access to in the Fluid mechanics Lab at IIT and certain quic experiments were done to see the feasibility of the technology to find veins



Temperature difference is seen via hotspots



A clear hotspot is seen near the wirst

07

Design brief

To design a low cost vein detctor for use on kids (age-2-10years) by anaesthesists and any other form of veni puncture procedure that occurs on the wrist

The device should be frugal- hence reliability of technology has to be ensured without compromising on the functionality

The device will be used on patients who need to be either operated or admitted, hence a cannula needs to be placed on their wrists

The device will be using reliable and easily replaceable/ serviceable technology like LEDs. The charging circuits and casing should be robust enough for rough use

The device should be low cost (that is less than Rs 600 ex-factory and retail at less than Rs 4000) so that it may penetrate the markets effectively

The design should be easy to mass manufacture and assemble, while quantities will be kept high in order to achieve the low cost

Target Users

Identification of the target users

PRIMARY USER

Key User

Anaesthesist

Role

Vein identification, pacification, choice of veni puncture site

Assistant/intern

Stabilizing patient, strapping and post veni puncture dressing

Patient

In patient- to be admitted to ward post operation

SECONDARY USERS

Hospital staff

Maintenance, cleaning and storage of equipment

Need to cater device for kids based on:

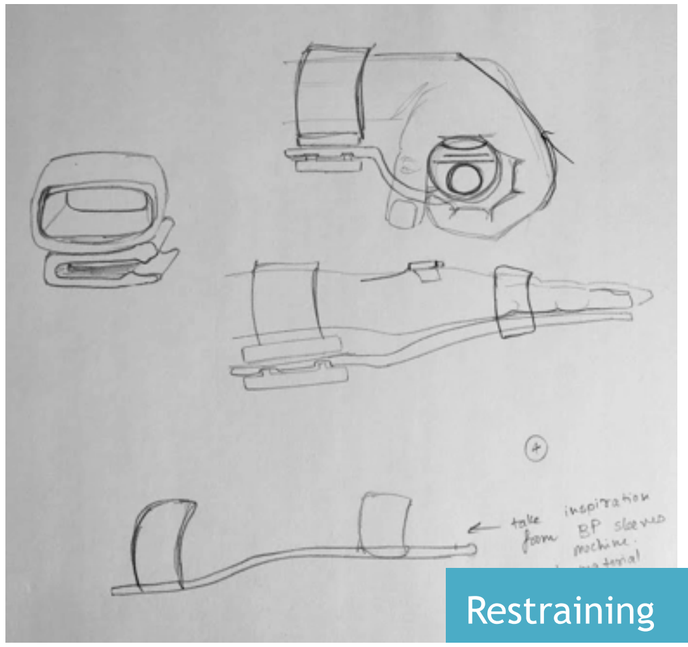
- Lack of kids-specific solutions in straps and tourniquet
- Small hands and circumference restricts use of bigger devices
- Difficult to bring kids to a stable rested position
- Heavy difficulty in finding vein due to frail skin, subcutaneous fat and often dark skin tones

08

SEARCH FOR SOLUTIONS

Concept 1

Using form generation technique



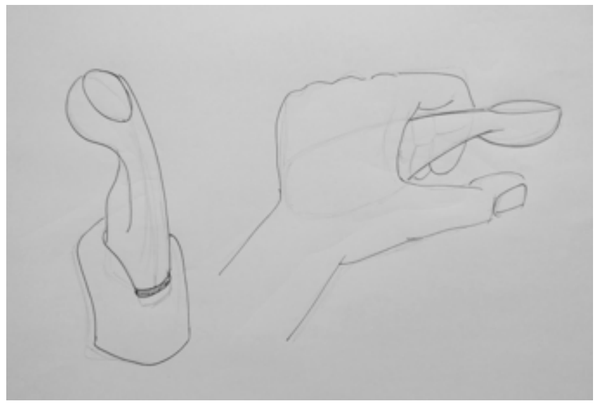
Restraining

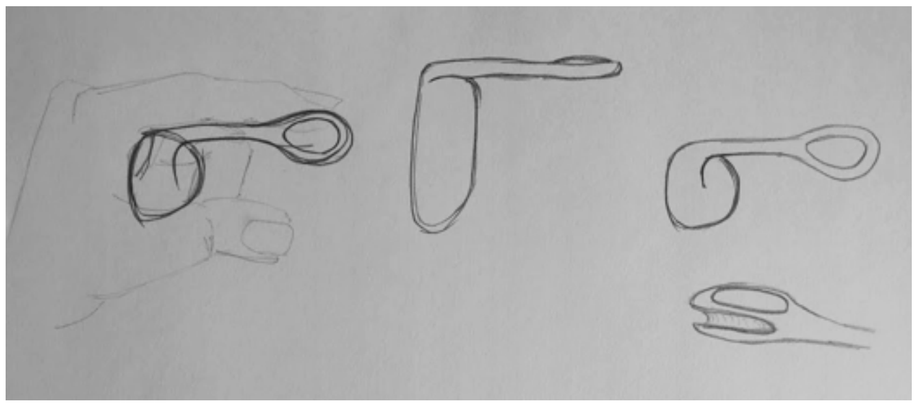
The form is such that it allows for use by a single doctor and no assistants as it combines a tourniquet action with a vein finding light source

This also has a retraining strap which could replace the vein finding light source once veni uncture has occured. This restraining strap would further eliminate the need for wooden planks

Concept 2

Using a handheld form for the doctor





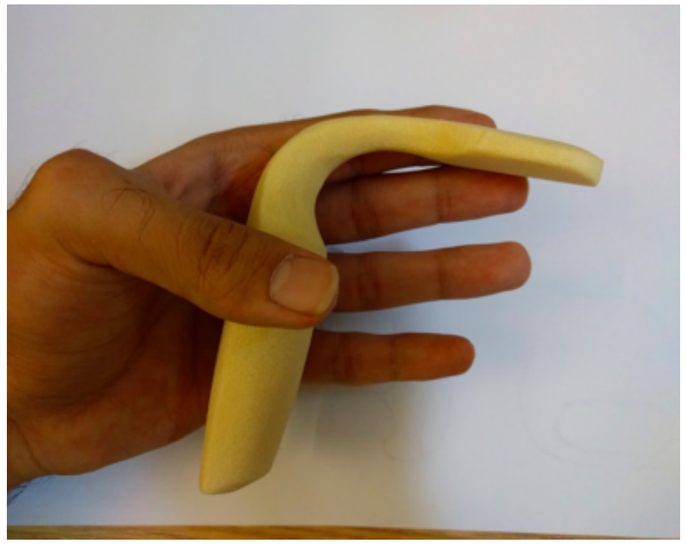
The concepts revolves around a finger assisted form which allows for a natiral fit to the doctor while an assistant holds the forearm in a tourniquet like fashion

Keeping a standard 18650 cylindrical battery in the palm and LED array at the end of the index finger

The index finger was observed to be a key pivot for holding the patient’s wrist while the thumb stays free for stretching the skin

Concept 2

Quick and dirty mockups



Quick mockups were made in PU foam and wood in order to obtain a certin rigidity in the structure for gaining feedback while the doctor grips the patients's arm

A thermocol model would be rendered less effective as the thin profiles r
testing and would b

Using the evolved wood form, the doctor felt pressure in the wrist as the form has to be held from a side and the weight had to be surrported by theit forefingers which would otherwise be used for stretchingthe skin

Concept 2-a

Torch style attempt

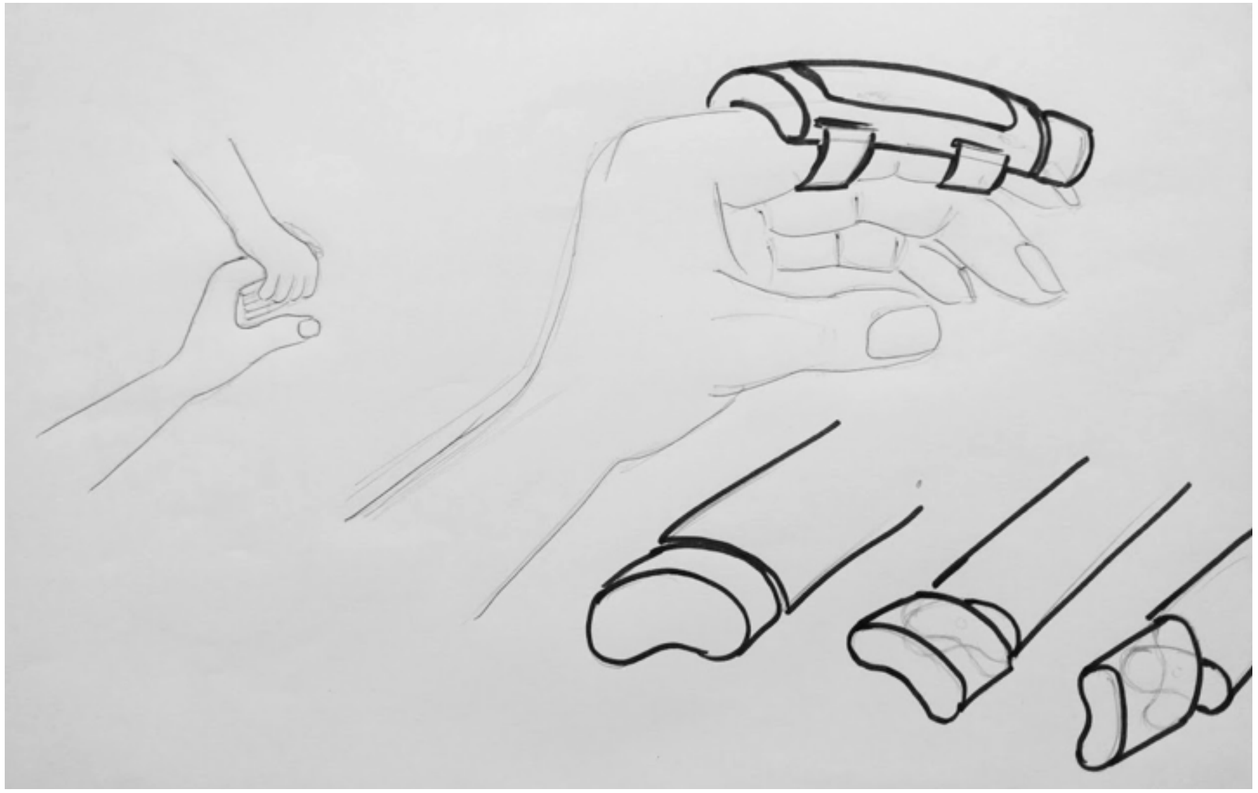
A torch like form which takes inspiration from existing low cost vein detection device sold by an Indian manufacturer

The form allows for a single LED usage with a cylindrical 18650 battery

When tested, the vertical orientation of the LED was rendered futile as he doctor cannot easily grip the device while performing the procedure, and feels strained to use it. When kept on the stretcher bed, this form does not give the benefit of resting on the bed surface, hence the idea was dropped

Concept 3

Finger assist



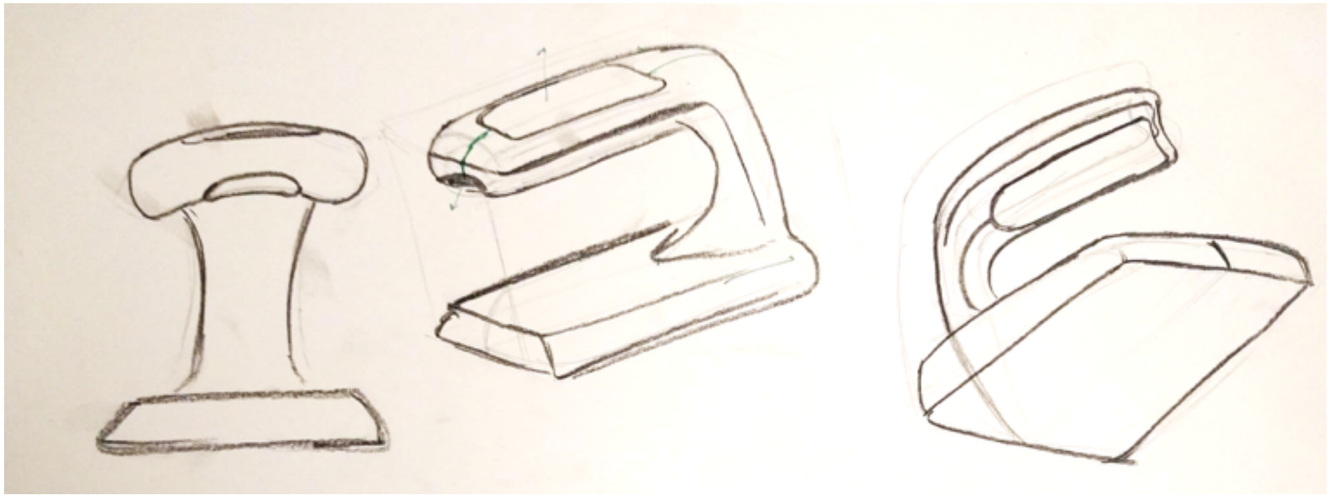
This concept uses a parental finger hold as a basic premise for the device.

This form allows for a regulator to alter the brightness of the LED

The size and construction of the device using thin surface mount LEDs and battery would result in high heat dissipation as the High wattage LEDs dissipate a lot of heat and would not be usable for extended periods of time

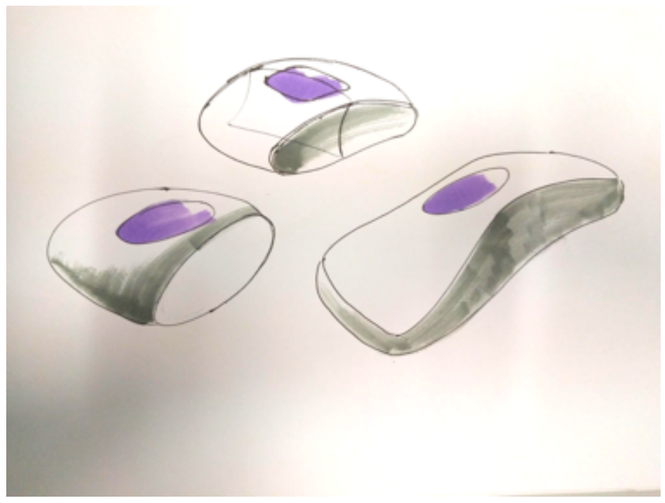
Concept 4

Rested base



This concept uses a synchronous form generation technique and takes inspiration from a lighting device

The base would contain the flat battery and PCB while the top would allow for a finger assist plus rested base utility, leaving a gap for the doctor’s hand



This concept uses the stretcher bed surface as a support for keeping the patient’s hand while the doctor’s hand does not bear the full load of supporting the wrist while the needle has to pierce the skin

Certain forms were also explored at the concept stage to see the utility

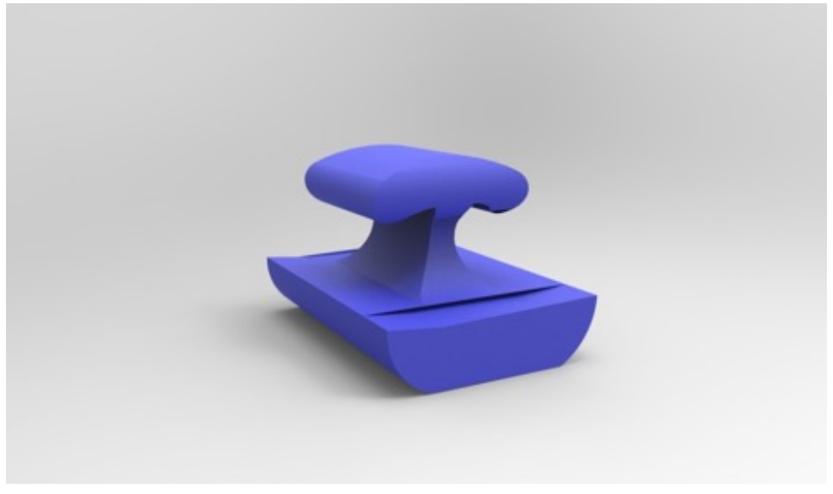
Concept 4

Feedback

Smaller sized forms were found to be more usable than larger ones

The splitting of finger for enhanced grip was appreciated by the doctor as it replicates their natural holding grip

Once used, the device could be kept away safely and the round curvy forms were appreciated more than edgy ones as pressure needs to be applied while stretching the skin and the edgy forms would have left a mark on the patient's hand

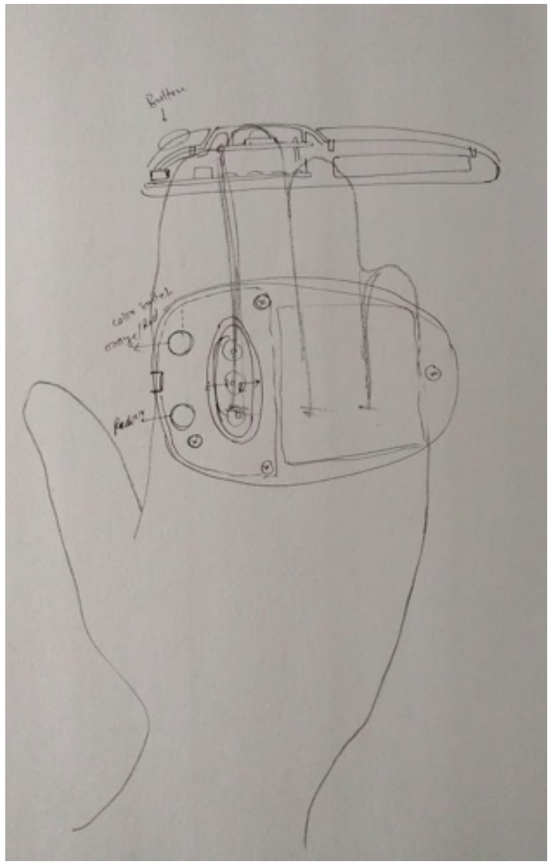


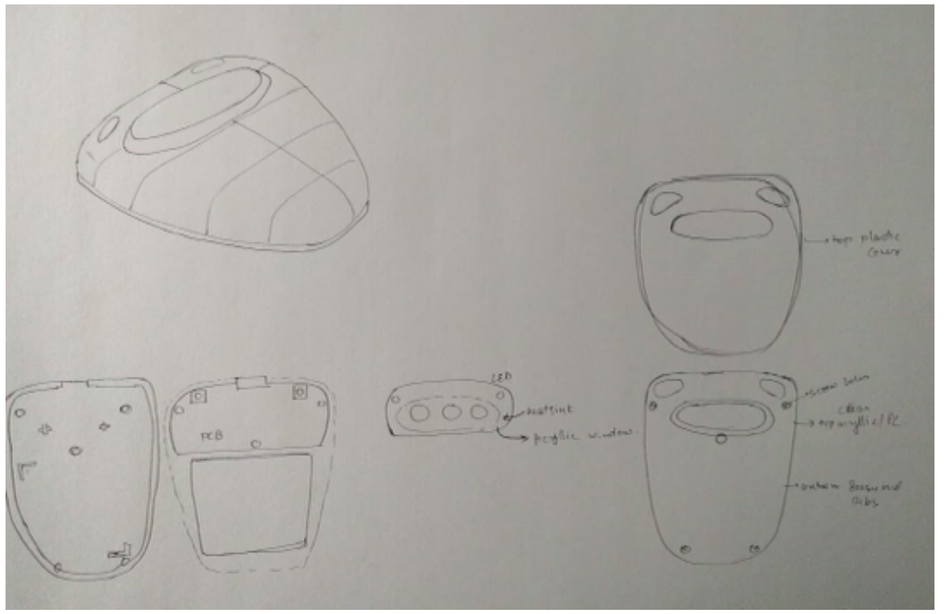
Concept 5

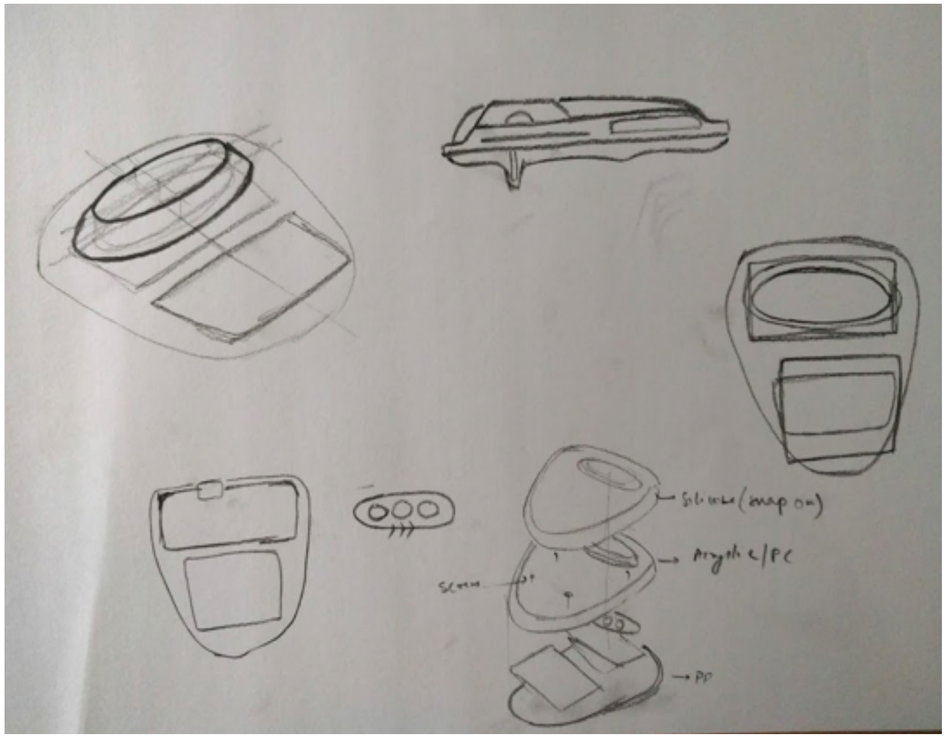
Palm hold

This concept allows for simple manufacturing and is inspired in structure from the Million SoUL project

It makes use of the doctor's palm for placing the whole device using rectangular cell phone batteries







Concept 5

Mockups

Various mockups using concept 5- palm assist concept were made in foam in order to test the feel of the device on hand before user testing

A quick render on how the form would be visualized

Sleek form

Boxy structure

Curvy

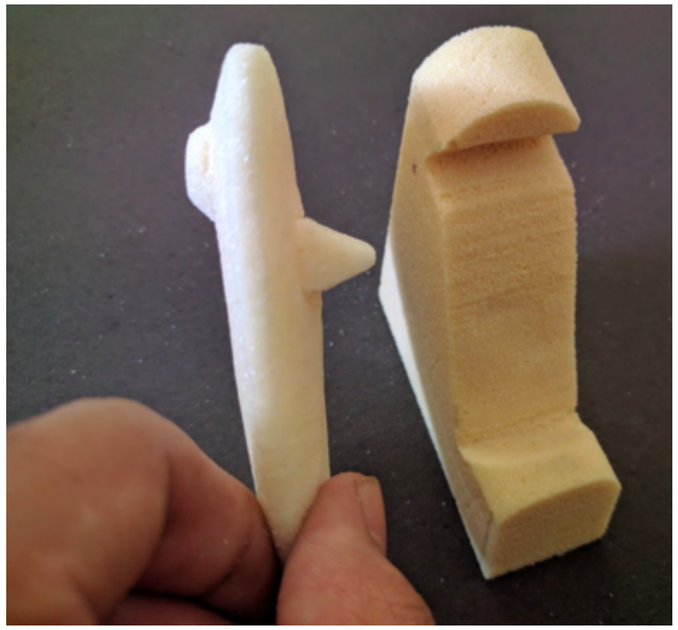
Concept 5

Added charging dock and finger hold

The protrusion at the back of the device allows for the doctor to place it effectively between the index and the middle finger

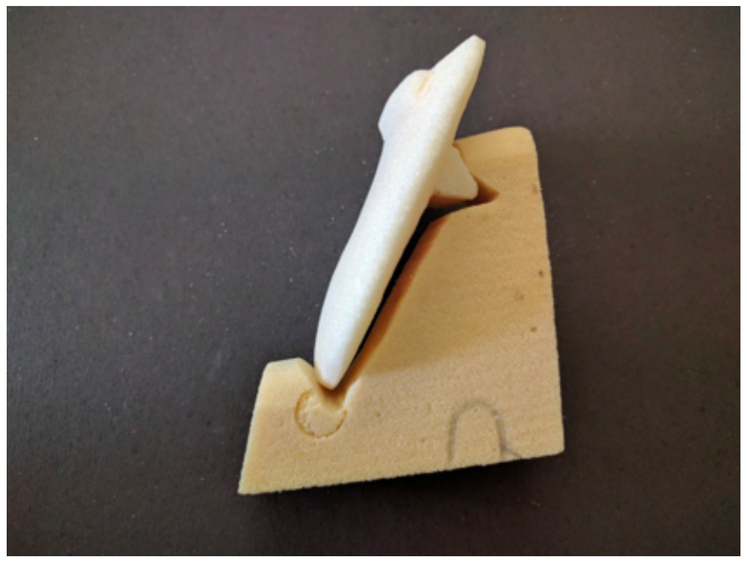
The dock uses this protrusion for connecting twi prongs for the DC supply to the device when charging

The dock is conceptualized in a way that it may be kept on a desk as well as may be mounted on the wall



Form with protrusion

Protrusion allows for better grip



Protrusion used for charging

Dock table top

Concept 5

User feedback

A quick assessment on the form was obtained from school children

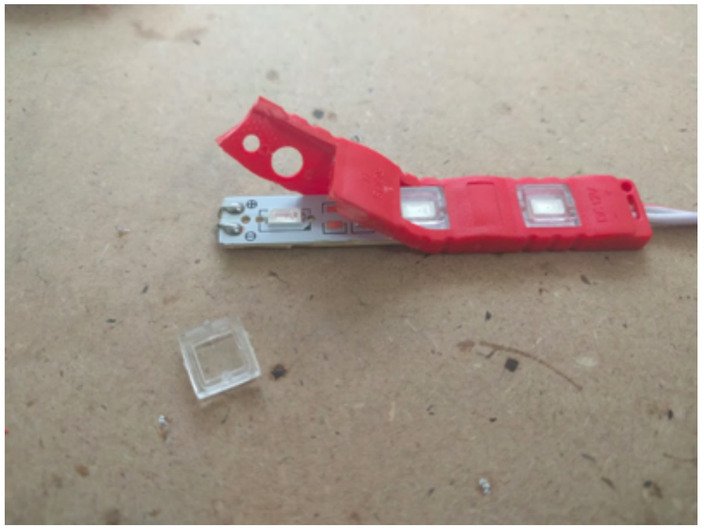
This assessment made use of approximate dimensions of internal components, hence a fitment on user's hand was desired to be tested

The user is a 4th grade student hence approximately 10years old, the form seems to be appropriately sized, but still gives a certain strain on the administrator's hand

09

Technology

LED arrangement



Taking inspiration from a 12V LED circuit made use of in hobby art and decoration

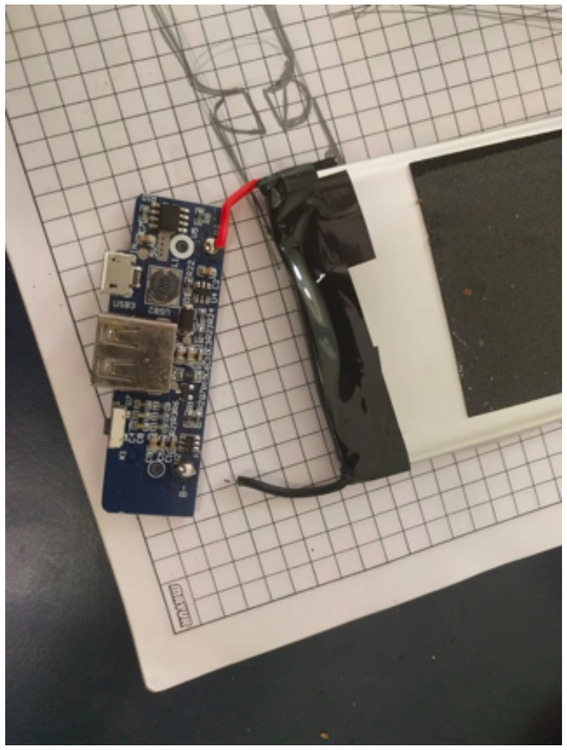
Each LED is provided with a separate polycarbonate shell for light dispersion, wear and tear resistance and heat management

Polycarbonate shell for clear dispersion of internal light from LEDs

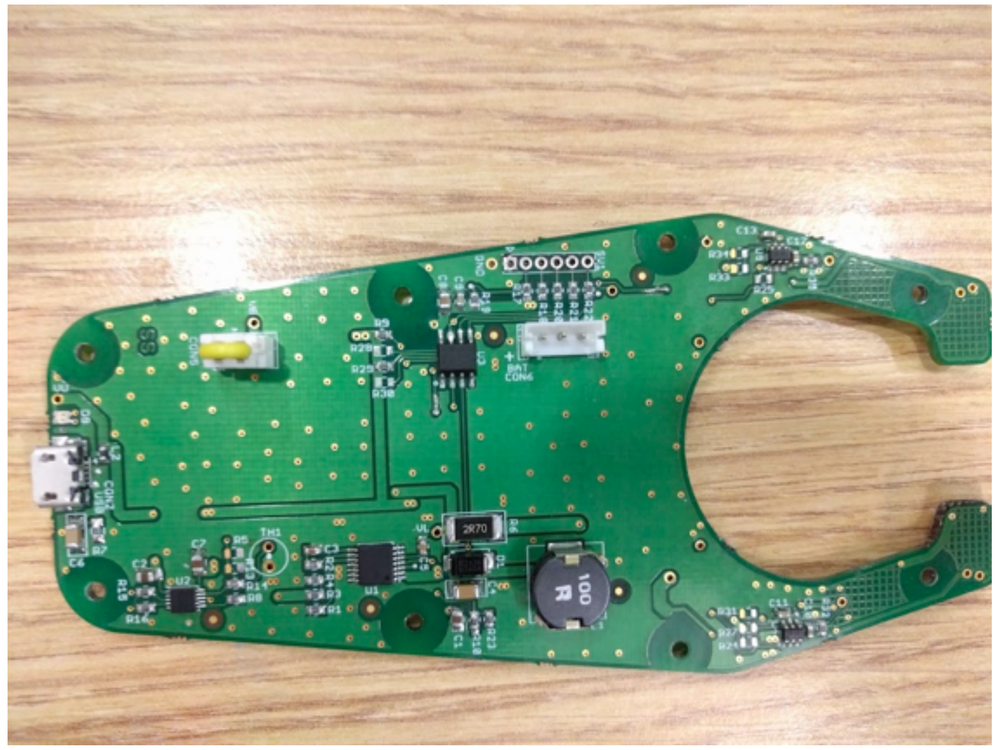
This also helps in effective heat management, as the LEDs do not come in contact with the user

Array of 3 LEDs -2 Amber (640nm) and one NIR (~740nm)

Existing PCB designs



PCB design of a slim power bank which gives the desired output of 5V and 2A current and houses a 3.7V cuboidal slim battery



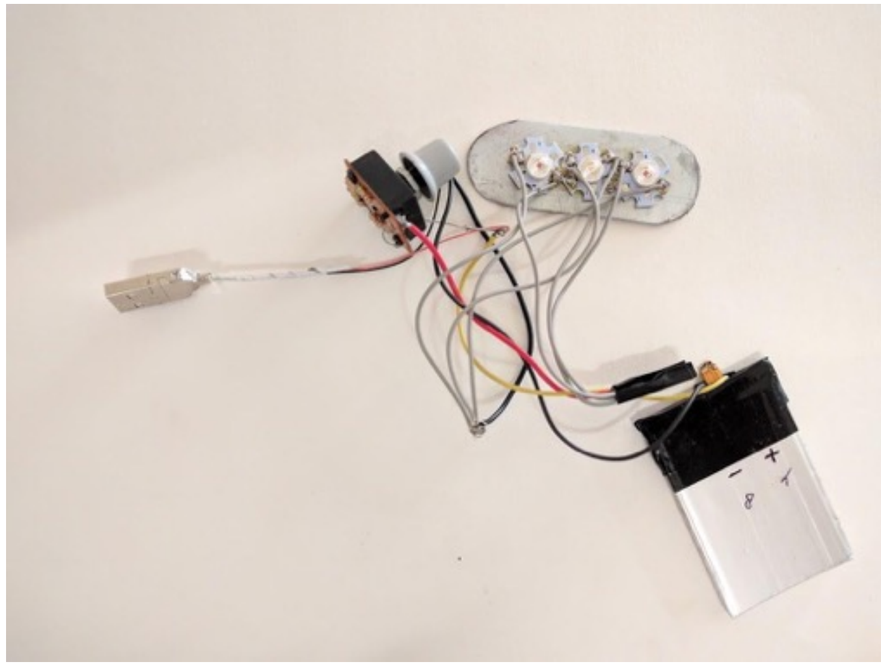
PCB design of existing Vein detector at Design Innovation centre

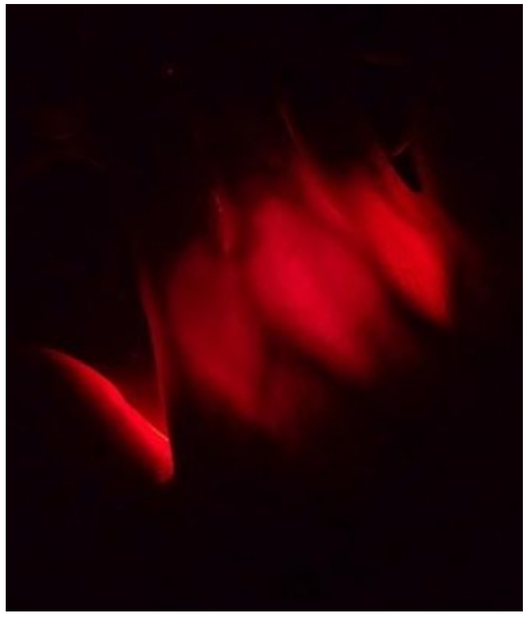
This PCB uses five 1Watt LEDs and effective heat management

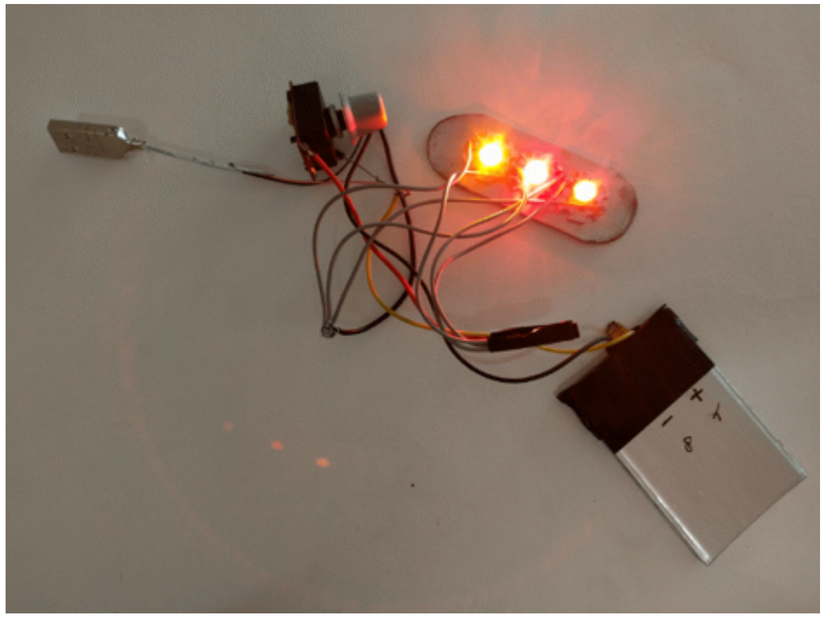
Working rig

A working rig using the desired LED array was made for testing out dimensions and usability of the proposed device

The rig uses a large heatsink, a cellphone battery (slim profile), a regulator with PCB for current management and a USB male adapter for charging







The rig unfortunately still heats up a lot and hence cannot be made to be test in prolonged usage

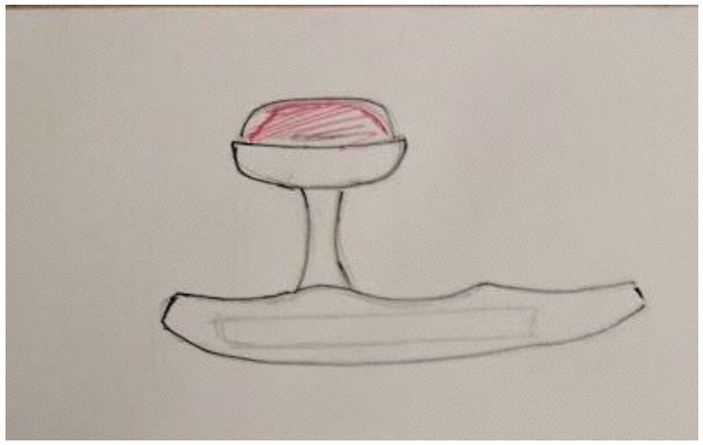
A test on an adult skin needed dark environment for effective vein viewing

But vein viewing results were still encouraging

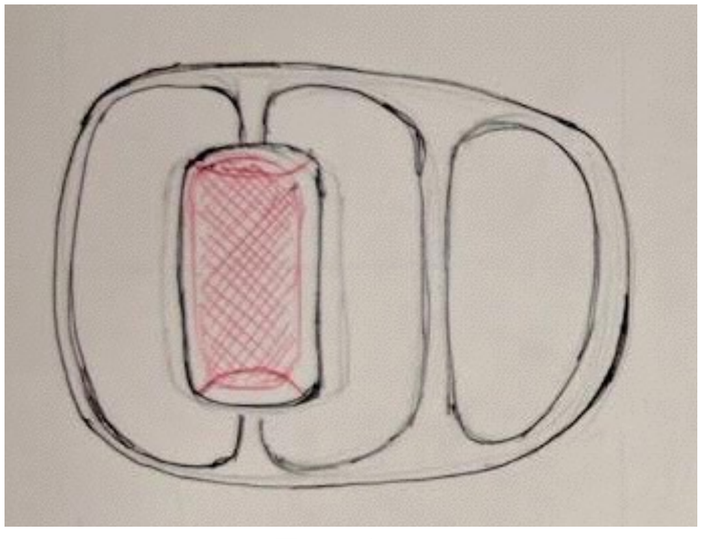
10 Final design

Sketches

Sketches and form refinement

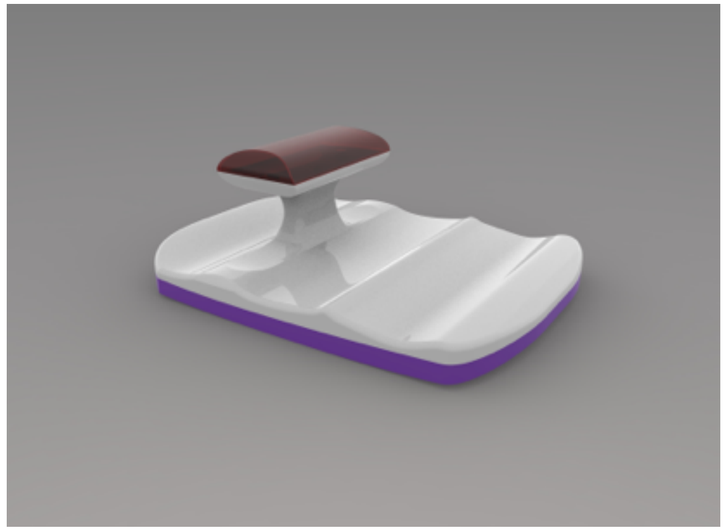


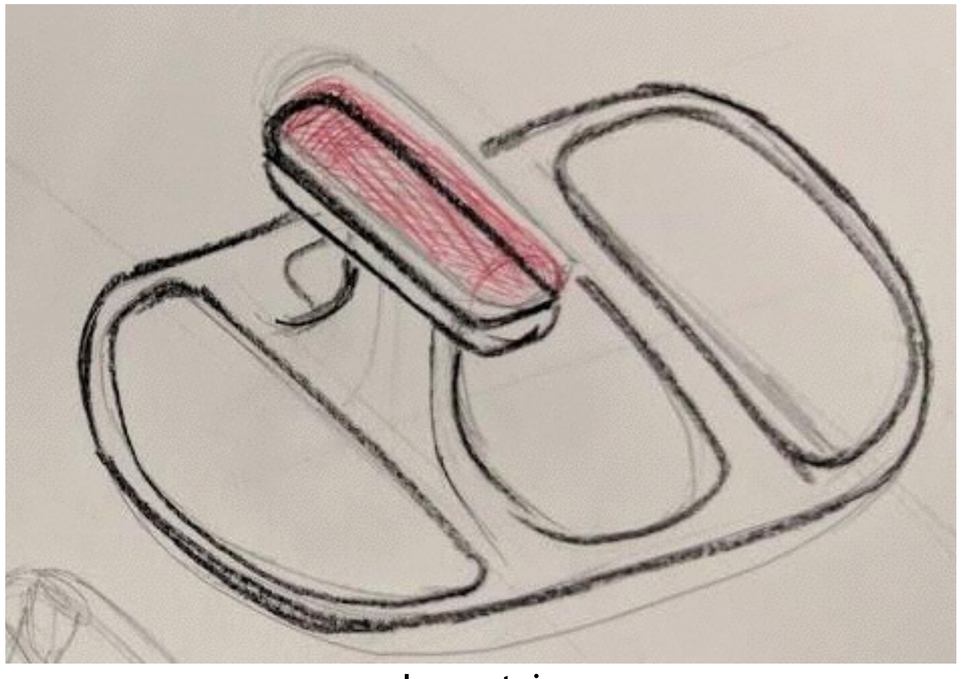
Front view



Top view

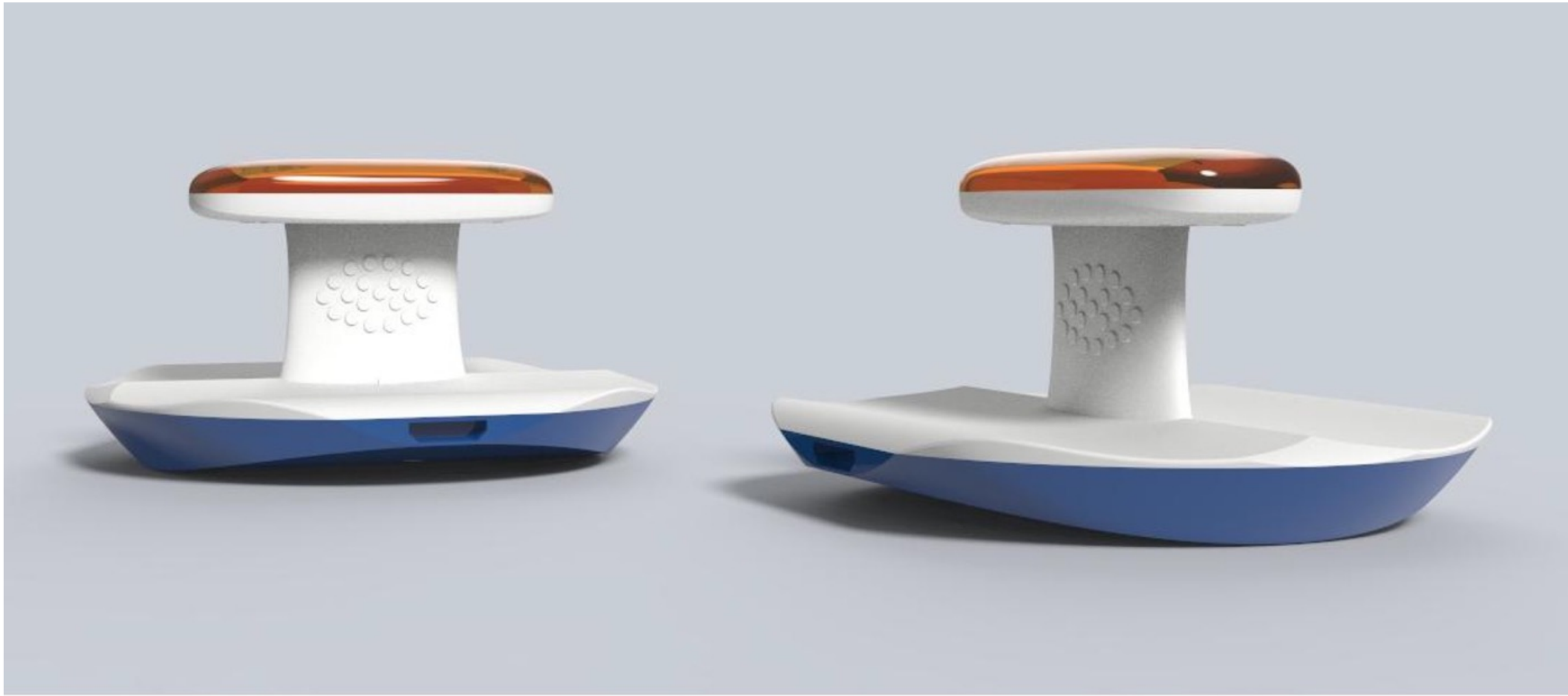
- The form allows for a glove style appeal and uses the inputs from different concepts





Isometric

Render



Benefits to stakeholders

PRIMARY USER

Key User

Anaesthesist

Single handed operation, Easy vein viewing, natural device holding technique

Assistant/intern

Wireless device means easier manoeuvrability, patient can be pacified easily
Easy to clean and charge device

Patient

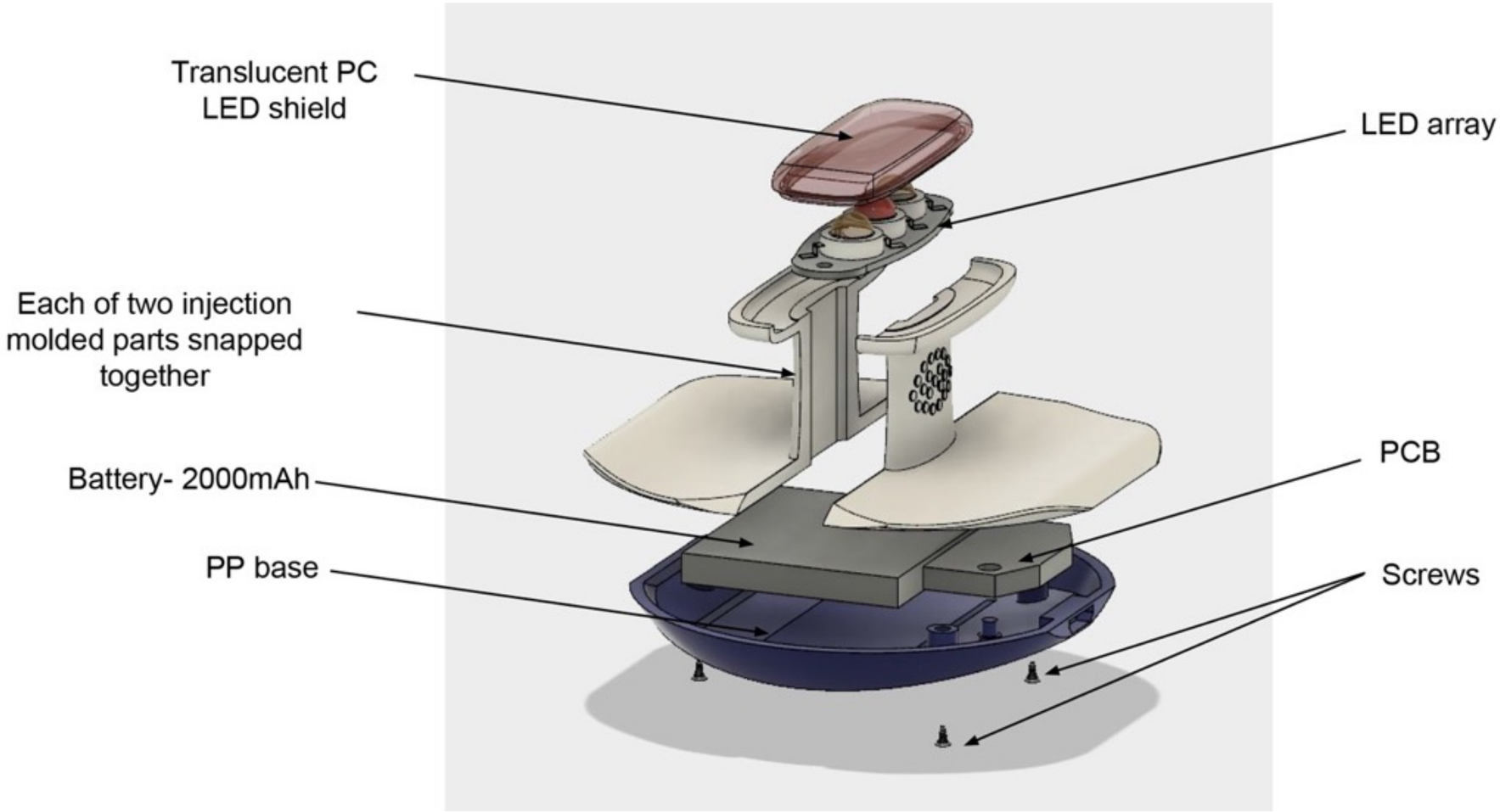
Device is out of view for patient or family member
Friendly form with round edges and circular base

SECONDARY USERS

Hospital staff

Small device with charging dock will reduce patient complaints and distress when veni puncture is mislocated
Easy to clean

Exploded view of assembly



Benefits:
The top Polycarbonate LED shield keeps parting lines away from patient's hands and gives a uniform illumination

Acryllic tubes transmit light from the PCB in the base to the top

Flat battery along with High power PCB located in the base

Steps to Use

Step 1

Place ‘Cannussist’ on your resting hand between the index and middle finger

Step 2

Place the patient’s wrist on the Cannussist and see the illuminated vein pattern

Step 3

Identify a suitable venipuncture location and insert Cannula needle

Dimensions

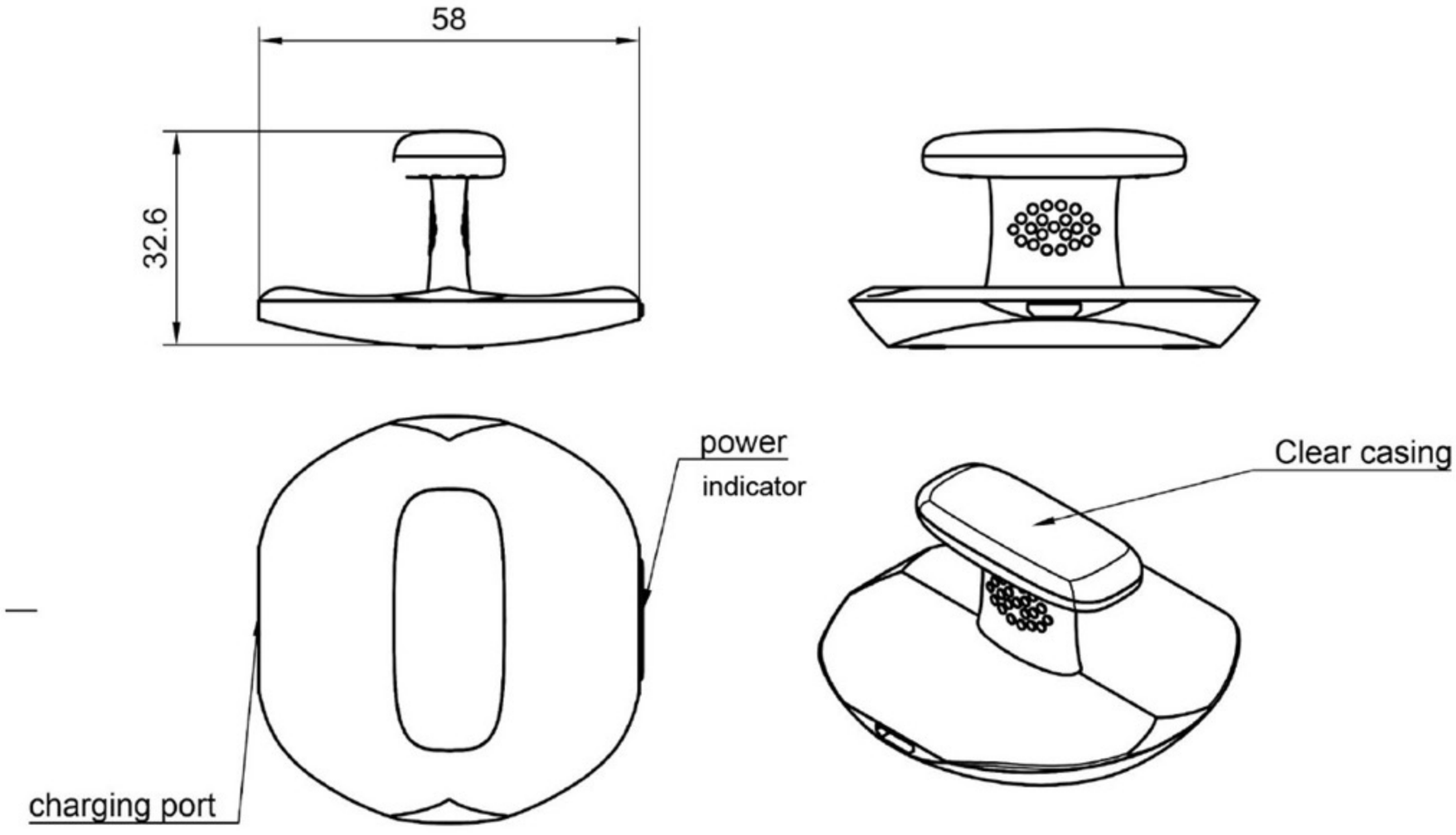


Image: isometric and orthographic views of the final device

Branding and fliers

Now eliminate subjectivity from Vein viewing when administering IV procedures on kids

CANNUSSIST

Your ideal assistant for pediatric IV procedures

CANNUSSIST™

Your ideal assitant for pediatric IV procedures

- The strong led light does not emit heat which could make it gentler on even the most delicate skin. Cannussist is designed to lie flat on a surface to allow the clinician to use
- Groves allow doctor's to keep CANUSSIST in hand while adpating to their fingers for a natural wrist hold
- large unobstructed area over wrist for cannulisation. Shape of upper LED curve allows use on hands of varied age groups
- Rechargeable and runs easily for 2 weeks (or 400 vien views) on a single charge

I have been using this device since 6 months and I found this to be very helpful in locating the "hard to locate " veins and insert the IV.This is designed at the right size to hold while placing the IV,prior to using this , placing IV in kids was a dreaded thing, now it is sooo easy to do it! it can be used in any pediatric patient and it helps!
Thanks to Cannussist

- Dr Rajagopalan Reddy, Mumbai

I work in an inpatient pediatric unit and I use my Cannussist frequently for IV starts. It does not require a pitch black environment, therefore I can see the veins and see my equipment (what a boon!). It can even transilluminate an adult hand effectively. It is conveniently mobile, easy to clean, and it fits handily into the palm of my patients' hands. My coworkers are always wanting to borrow it.
Well worth the money.

- Dr Hemlata, Tamil Nadu

GET YOUR *CANNUSSIST* TODAY

For Sales enquiry contact:

[redacted]

Regd office: [redacted]

Contact: [redacted]

or write to us on: [redacted]

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