SURVIVE

A low-cost medical device which could de-poison patients in seconds for farmer suicides and suicide cases in India.

3 GOOD HEALTH AND WELL-BEING

GOOD HEALTH AND WELL-BEING

A product design project, in an aim to make life saving accesible to remote areas and more time efficient in extreme situations.

This was project was in a pursue to understand the healthcare conditions for rural living people in India where the majority of population lives (70 %) compared to healthcare services in urban areas where only 30% of the population lives.

Rural health care in India faces a crisis unmatched by any other sector of the economy. To mention just one dramatic fact, rural medical practitioners, who provide 80% of outpatient care, have no formal qualifications for it.

Research

After meeting and interacting with various people and helathacare systems at different stages one problem which was constant was about the farmer suicide cases in rural side of the country....

Research **areas**

Local clinics in the village

Sub-Centre

Primary Healthacre Centre

Medical College

Hospitals in Kurukshetra

District Hospital

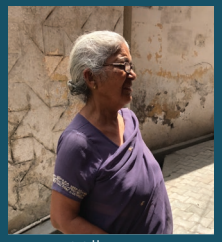
Research **Respondents**

Dr Veera (City Hospitals)

Aasha Worker

Doctor (Small Clinics in Umri Village)

Clinician (City Hospitals)



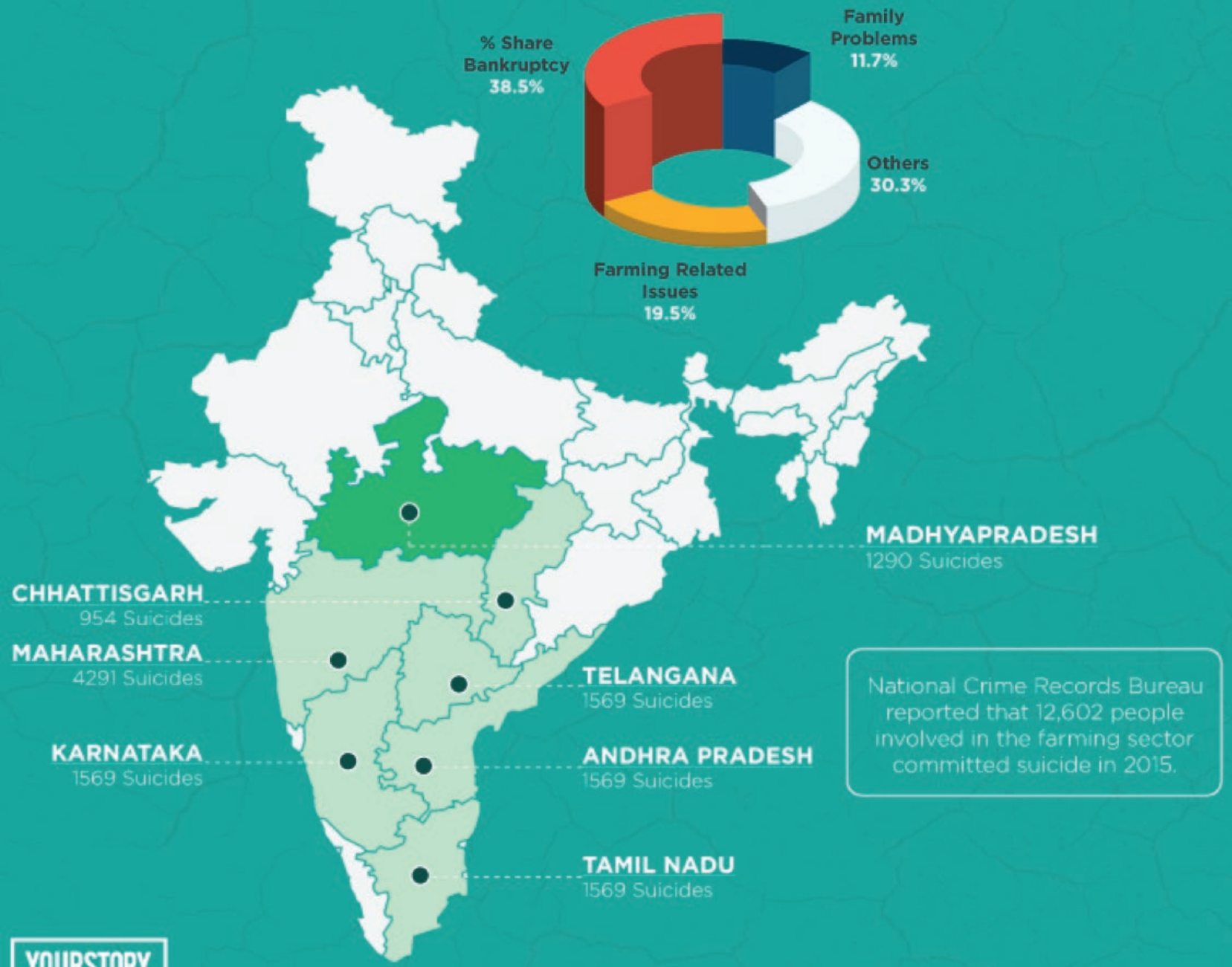
Villager

Clinician (Subcentre Umri Village)

DR Nagpal (Nagpal Nursing Home, Kurukshetra) **Handles 2-3 suicide patients everyday**.

The doctor whom I talked, To confirm and update often throughout the project, sharing my progress and getting feedbacks for every decision taken.

FARMER SUICIDE IN INDIA

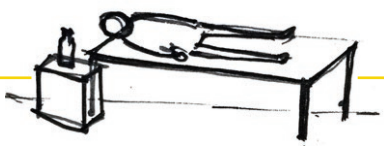


Source: Accidental Deaths and Suicide in India, National Crime Records Bureau, 2015

45 farmers commit suicide each day in India

Research

What happens to these patients ? The process of **gastric lavage** for theese patients.



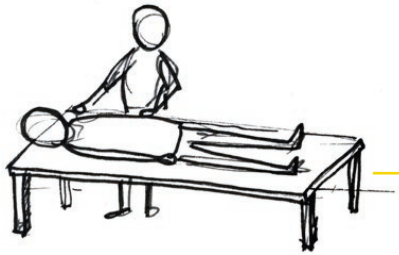
Initial stage when the patient has consumed poison.

Taken to local clinics.

Doctors refuse to treat such patients.

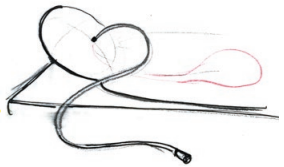
Taken to subcenters here again they get refused to be treated.

Finally travel to city to cicvil hospitals.

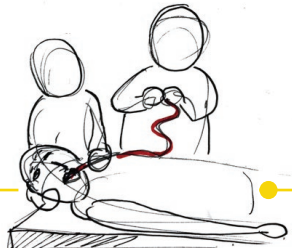


Once the patients reaches the doctors lay down the patient on the bed and ready for **Gastric Lavage**.

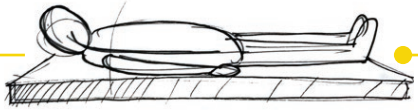
Saline water or the prepared solution is sucked into the 50 ml syringe.



Tube inserted and ready for the process of gastric lavage.



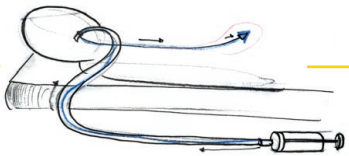
The doctor now inserts the pipe into the stomach.



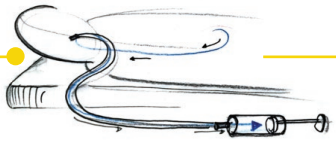
The neck angle of the patient is maintained by a nurse.

The tube (Ryles) is applied with cream to start inserting the tube into the stomach.

There liquid solution used for stomach flushing is prepared.



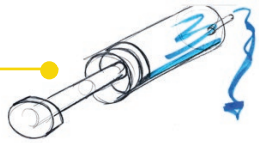
This solution is forced into stomach with pressure to clean the contents.



The solution along with gastric contents are sucked out back.

The entire liquid id disposed into the disposing bag.

This entire process continues around half an hour to an hour depending upon the poison and the intensity of poison.

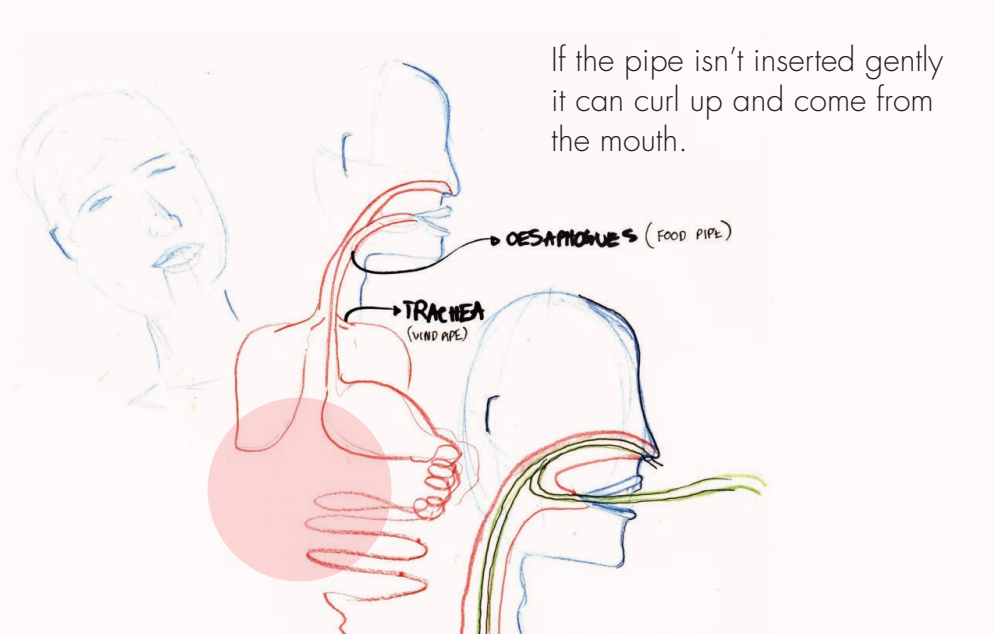


Until and unless the final liquid sucked comes out clean and pure without any impurity.

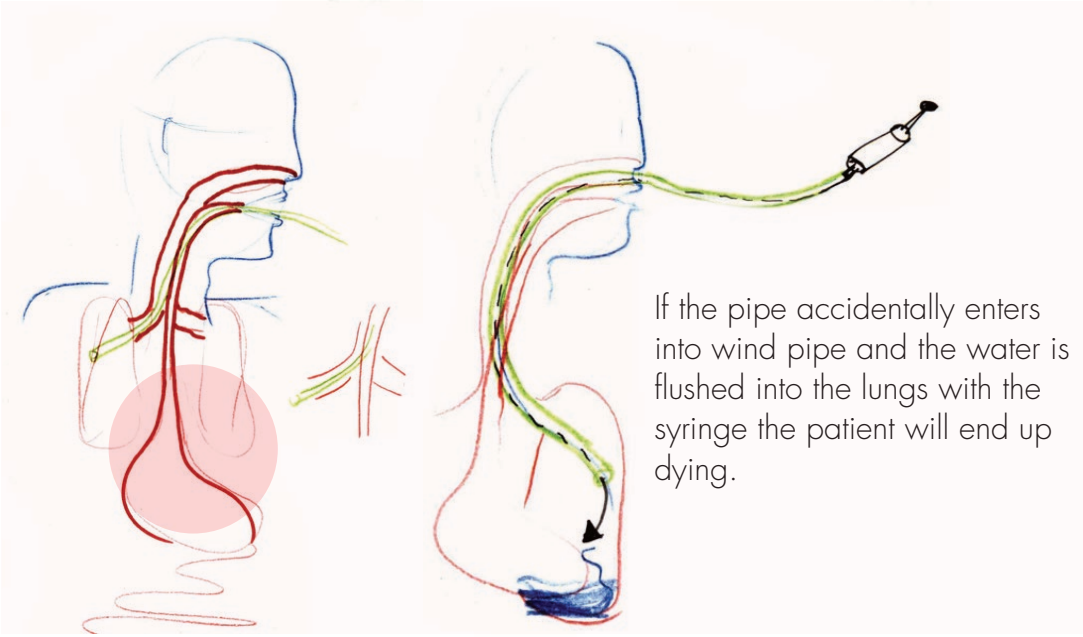
What all are the loopholes in this system ?

- There is no service offered to the patient in the village itself due to multiple reasons
- There is no proper **transportation** for the patient to go and be admitted in the nearby city hospital where he could be treated accordingly
- Even when the patient reaches the hospital in the city the **existing process of poison removal** is very **time consuming** and **very lengthy and a riskful** process the time the process gets over the poison has entered into the circulatory system of the patient and he ends up dying.

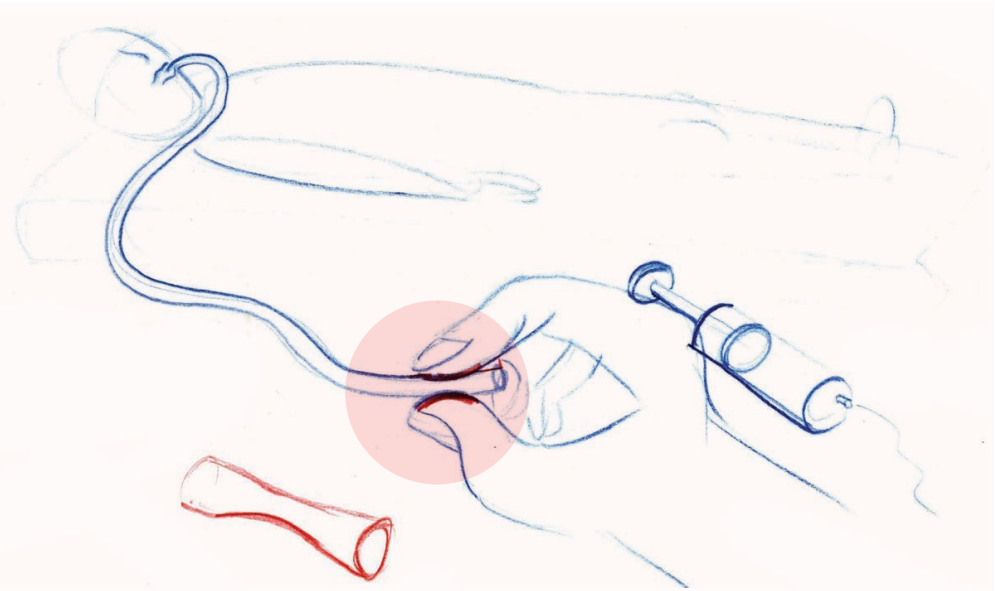
Insights and Oppurtunity areas



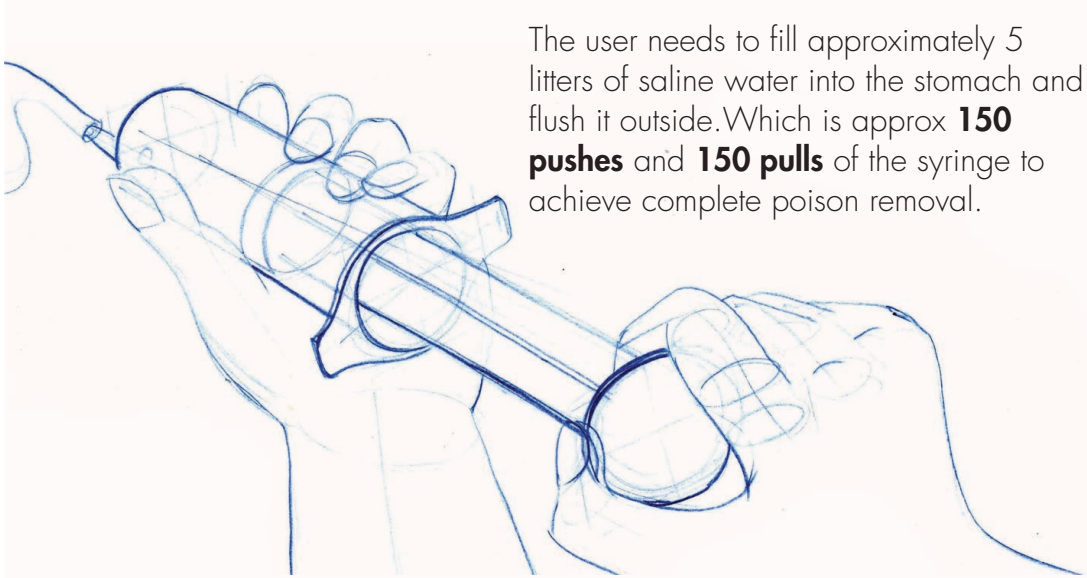
If the pipe isn't inserted gently it can curl up and come from the mouth.



If the pipe accidentally enters into wind pipe and the water is flushed into the lungs with the syringe the patient will end up dying.



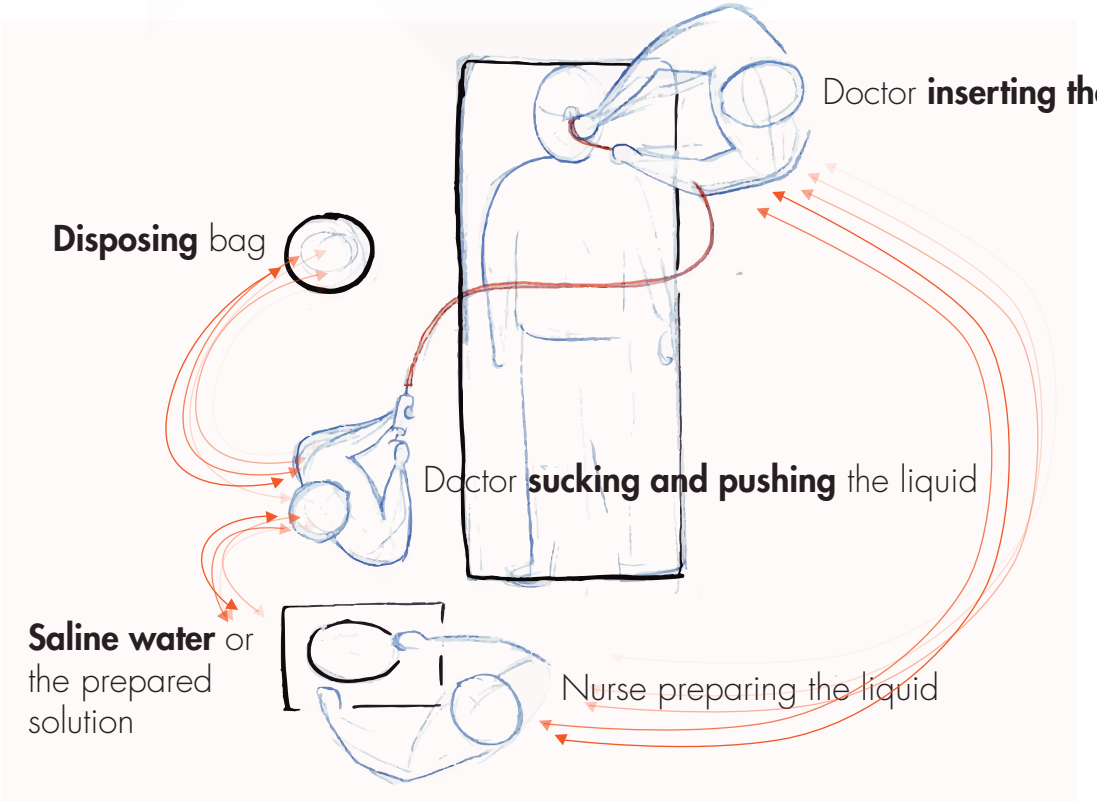
Everytime the Syringe is detached from the pipe which goes into the stomach the user **should tightly hold the inlet of the pipe** so that no **air bubbles gets into the stomach which could complicate the patients life**.



The user needs to fill approximately 5 litters of saline water into the stomach and flush it outside.Which is approx **150 pushes** and **150 pulls** of the syringe to achieve complete poison removal.

These numbers will change according to the poison and the amount of poison consumed and the time after it is being treated.

Insights and Oppurtunity areas



The entire process involves constant movement of the user from one place to another which in turn increases the operation time **where each second matters to the patient here**.

Why Gastric Lavage is an important process ?

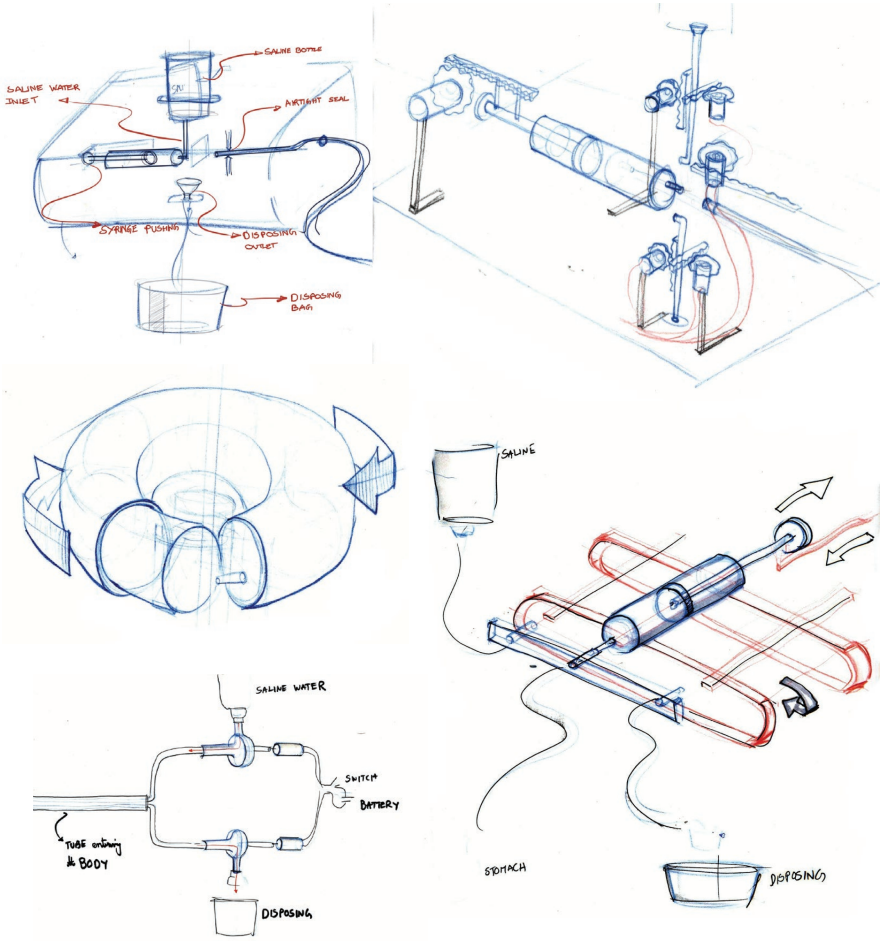
- The best possible method even when the patient consumes the most dangerous poison as it completely cleans out the stomach clean.
- An immediate first aid which could save the patient in intense crucial stages
- When the poison is dangerous and cases were the Antidotes(medicines) don't work on the patient this method helps in getting life back to the patient.

Where else is this process of gastric lavage and poison treatment is prevalent ?

- Cases of food poisoning
- Over consuming of alcohol patients
- Over consumption of medicines, Misdosages of medicine
- Child poisoning

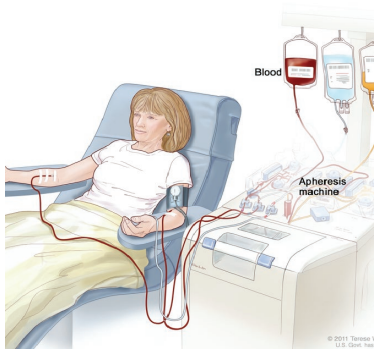
Ideations

1 Initial Basic Ideations

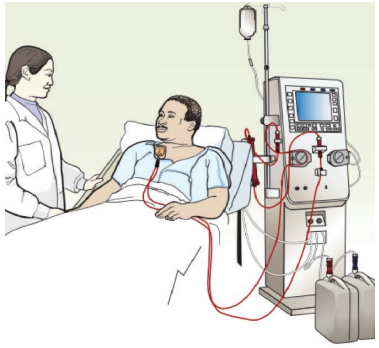


Started with these **complex mechanism** but all these concepts needed to change the entire system of existing working but according to the insights if I could design something which could use the existing syringes would be better.

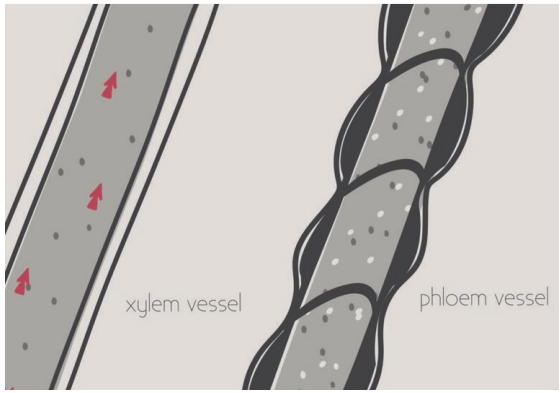
2 Two Pipe Mechanism



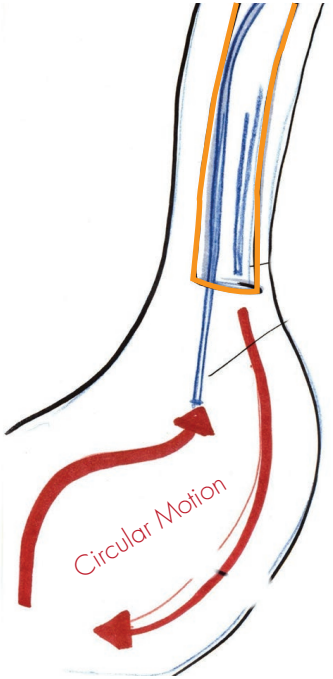
Blood Transfusion



Dialysis



Plants Tranportation System



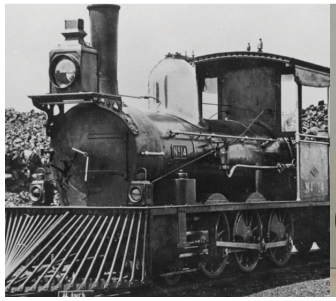
Thinner pipes increase the pressure which help flushing the stomach better according to bernoulli's theorem.

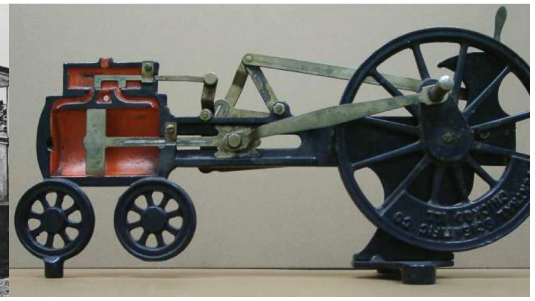
It will create a circular motion inside the stomach due to this alignment of the small pipes inside.

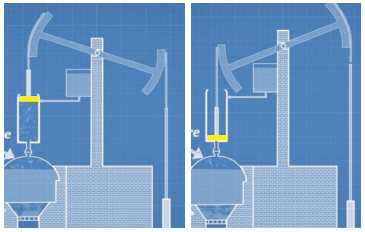
If there is 2 pipes where in one continuously there is a supply of saline water into the stomach and on the oher simultaneously the same amount of poison along with the flushed saline water getting out of the stomach and getting disposed which is similar to the transportation system of the living plants all around us and to Blood tranfusion and Dialysis.

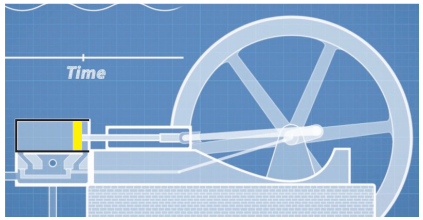
3

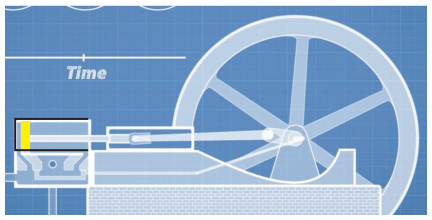
Main Mechanism

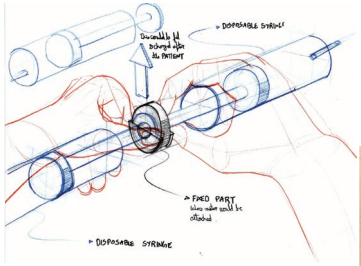


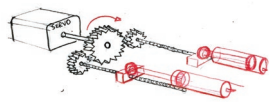


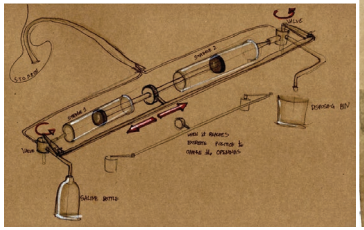


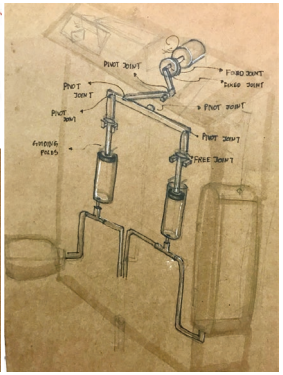










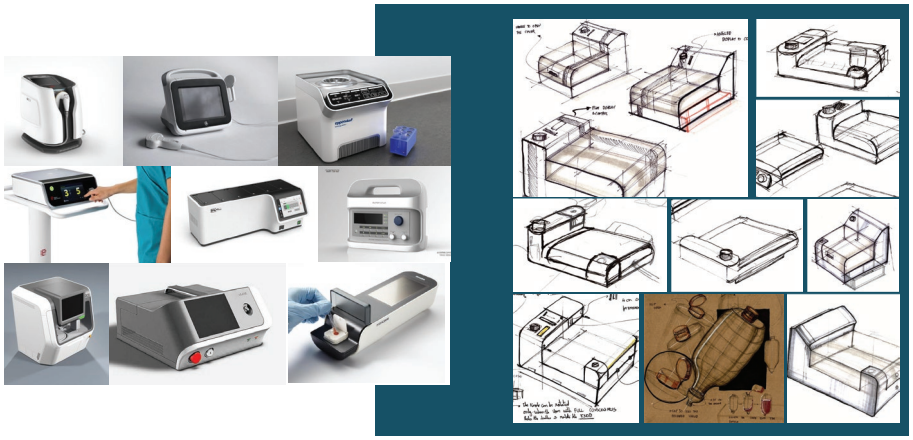


A new technology inspired from the way the Oil Rig Factorie's oil pulling out mechanism works and the way the Steam Engine in the past used to work.

Converting the circular movement from the motor into 2 syringe suck and push movement which could inturn automate the entire process constantly.

5

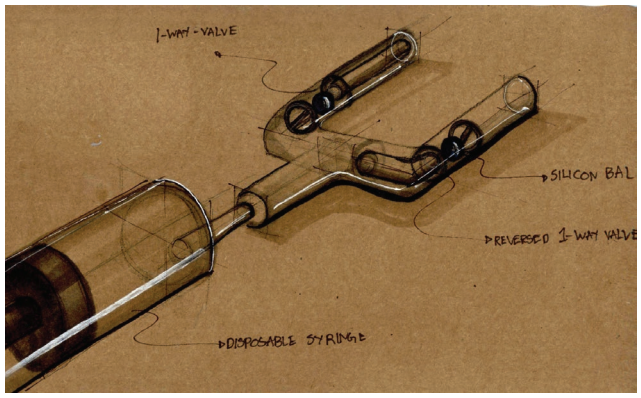
Form Development

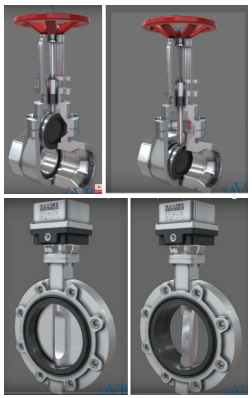


The mechanism looks complex & the user using this device will be under intense cognitive load so the form of the product should be very simple and make the user feel "ya chill things will get fine".

4

Valve Mechanism

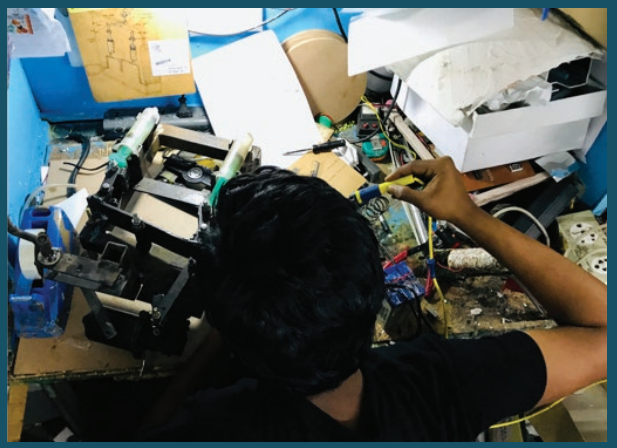




Once the main mechanism was finalised the next was to design a valve. This speciallly designed valve which has two 1-way valve, helps in alternating the path for sucking and pushing.

Prototyping

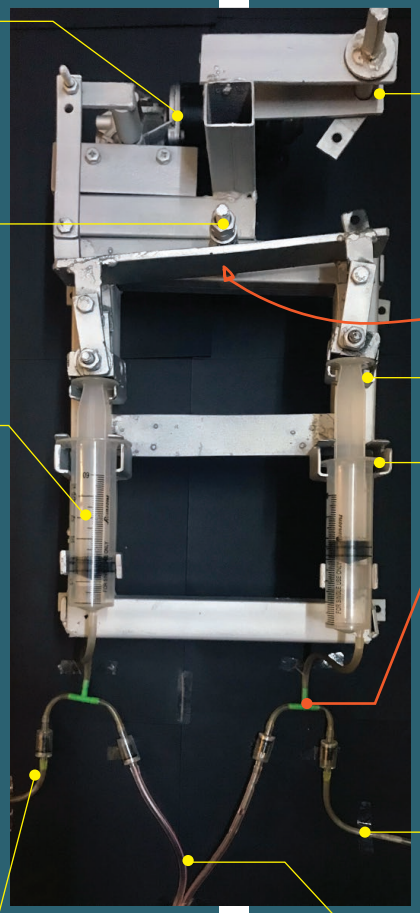
Mechanical & Electrical



The final concpet was taken for protoyping after tested with initial rough prototypes. Steel frames and pieces welded together for the main body of the product. Electrical components like a car wiper motor etc used to regulate the product and control according to the need of the user.

Final Concept

Technology, Amalgamation & Innovation



Electric Motor
(powered by both ac current & Battery)

Emergency Hand Cranking

Axis of Movement

Syringe

Syringe Holders

Pipe pushing towards Disposing Bag

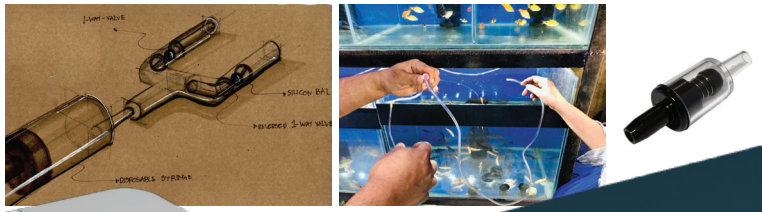
Pipe sucking from Saline Bottle

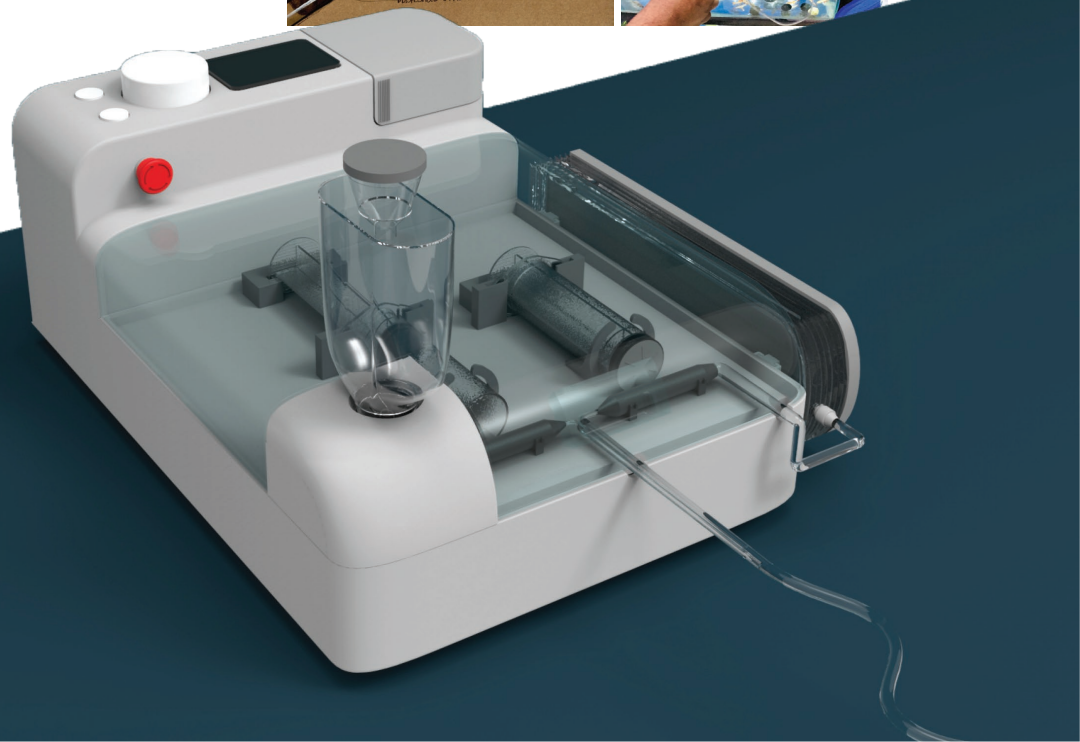
Both the pipes into the patient's Stomach

Inspired from the Oil Rig Factory Mechanism

Specially Designed Valve -

Inspired from the 1 way-Valve used in Aquariums

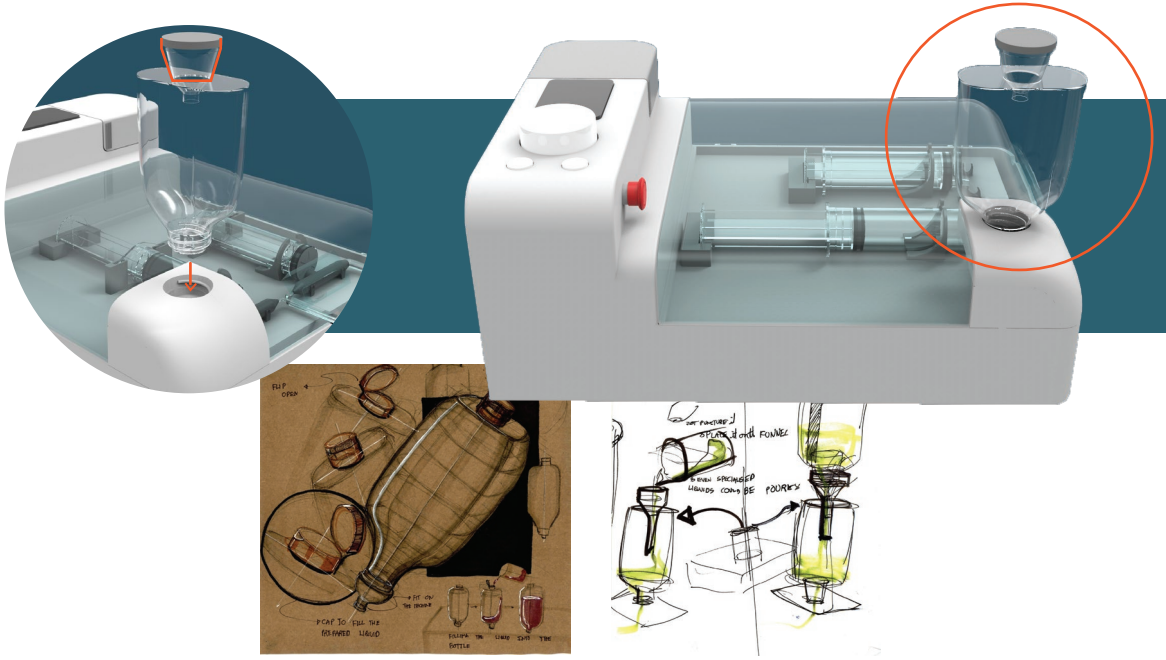


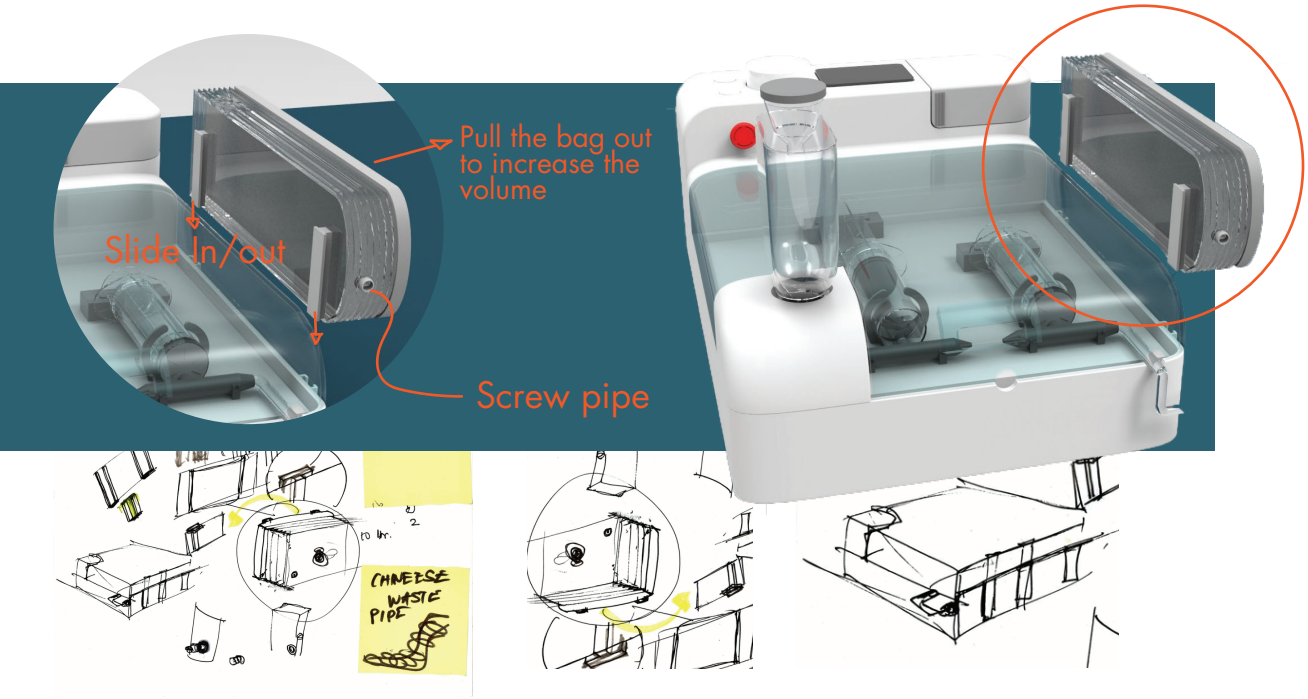


Saline Bottle Attachmment

Retrofittable & Versatile

This attachment could be screwed into the compartment when needed and the in the top there is a funnel like shape, could be used to pour the own liquid created by the user or an existing saline bottle could be punctured and place upon for the operation.





Poison Disposing Bag

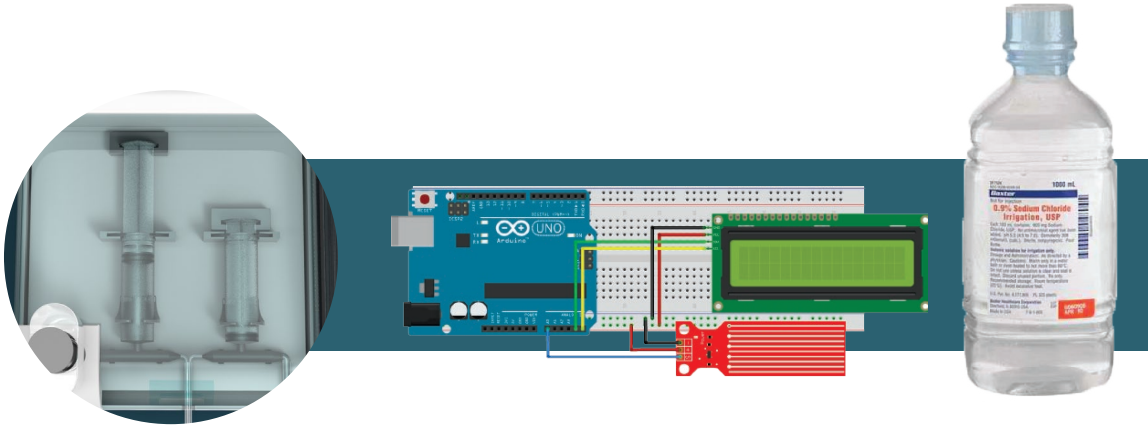
Safe & Secure

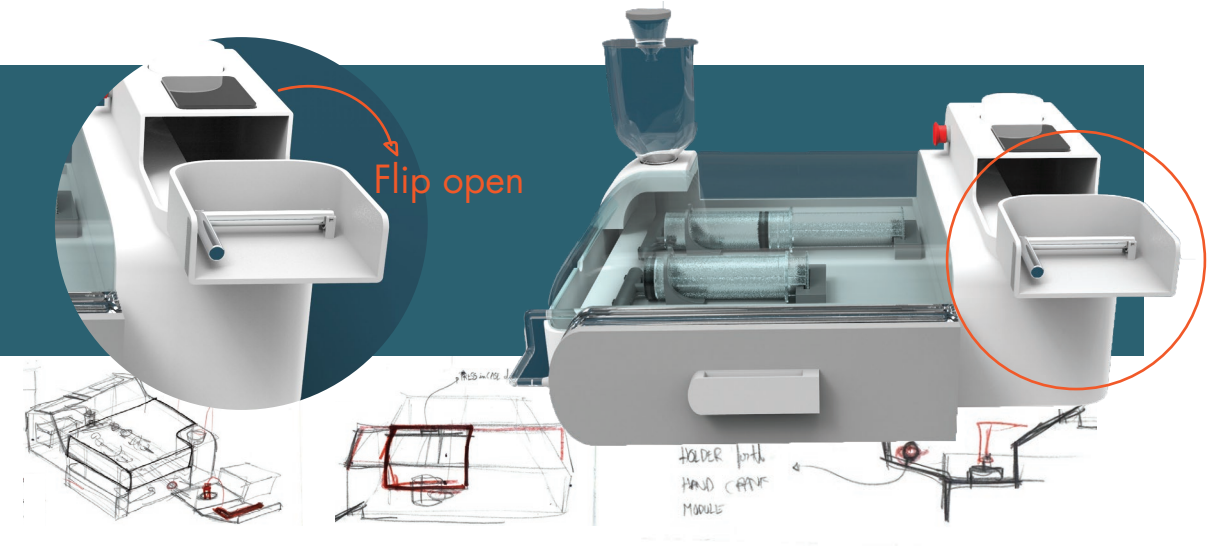
For every new patient these disposable bags could be just slided into the compartment and be screwed with the pipe to the machine and once the operation is over it can be sealed and kept for forensic purposes or can be disposed. The bag could extend its volume as per the requirment.

Automatic Cutoff Mechanism

Trustworthy & Reliable

Insights from the research demanded need for an automatic cutoff once the procces was done. So this product comes with a mechanism which can detect the conductivity of the poisonous liquid with a water level sensor and run till the conductivity reaches the conductivity of the pure solution passed into the stomach.





Emergency Hand cranking

Emergency Alternatives

Emergency Hand cranking compartment which can be opened when needed and the handle could be taken out and used for hand cranking during powercuts, when the batteries are drained out.

In case of a power-cut (High chances of power cut in Villages)

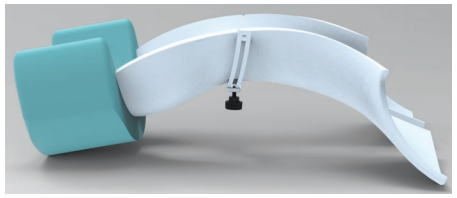
Runs on Power socket

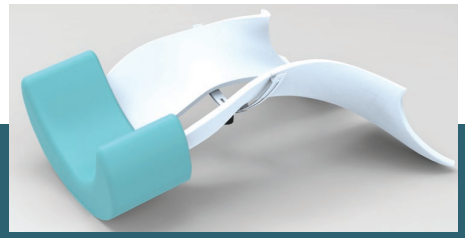
Batterry Back up as well

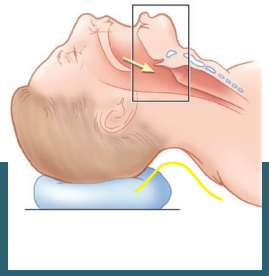
In extreme emergencies it can Hand Cranked

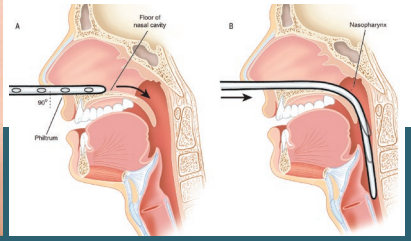
Other attachments specially Designed to help the process of pipe insertion

According to the Insights from doctors, these 3 attachments are designed along with the main product for helping the user to do a more safer, easier & efficient pipe Insertion. The aim was to create set of additional products which would aid the rural health worker in pipe insertion with minimum training required to use the products .







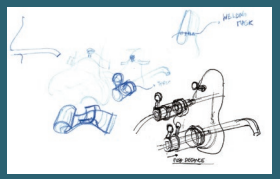


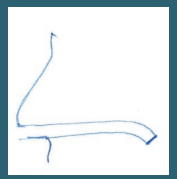
Neck angle maintaining attachment

This product helps in maintaining the angle of the neck which plays a very crucial role in the process of pipe insertion.

Nose angle maintaining attachment

This product helps in maintaining the angle of insertion of pipe into the nose which would make the pipe insertion very simple.



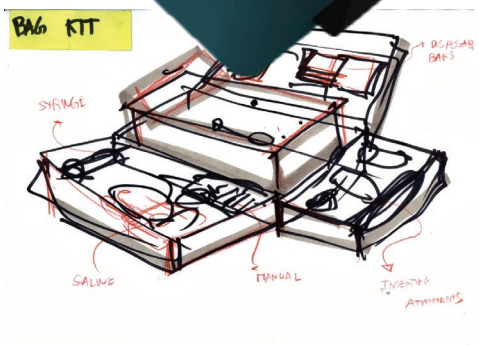


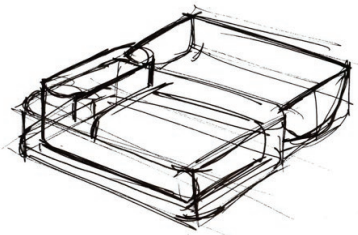
Constant pipe insertion attachment

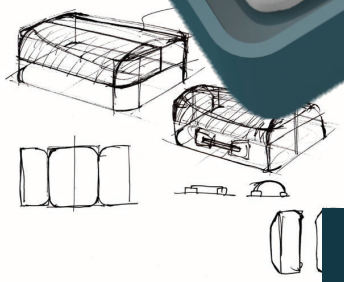
Pipe should be entered very gently inside so this small attachment would work like a mechanical pencil which would gently push in the pipe into the nose along with perfect nose angle and the neck angle which will make sure the pipe is placed exactly in the stomach.

The entire kit with the carry case

Which would be used by the rural health workers for emergency first aid treatments. This would help the health worker to carry all the necessities at one go to the patient without any Hassles & Delay.

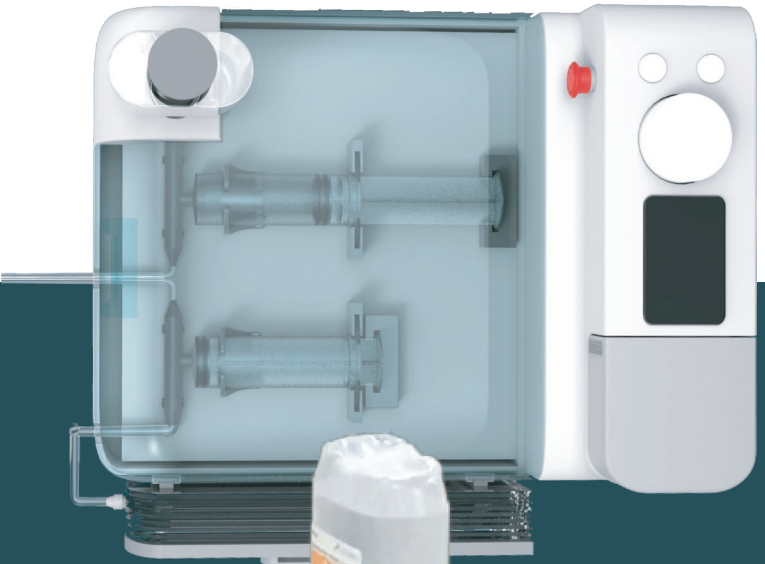


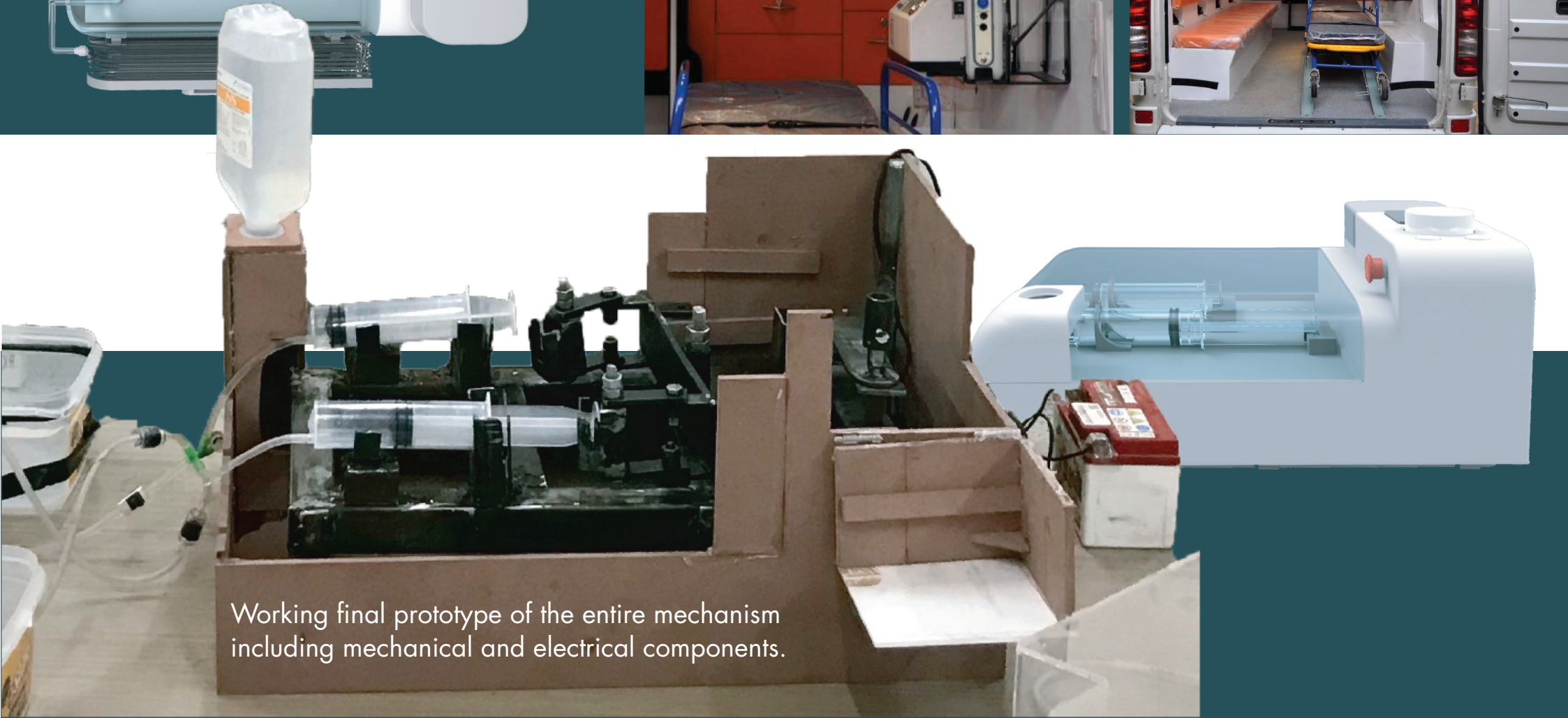




Bag Straps could be stretched out when there is a necessity, in cases of emergency the Aasha worker could move and reach the situation area carrying the product more easily.

Product in Ambulance





Working final prototype of the entire mechanism including mechanical and electrical components.

What makes Survive special ?

- First of its kind to cater such a problem which is very crucial for Indian Villages.
- A completely automated gastric lavage process to drastically reduce the time and efforts of the treatment where every second in very crucial to save the patients life
- A normal process of Gastric lavage takes around 40-45 min but with this product the entire process is done in 2-3 minutes.
- A complete system of products which makes treatment in village possible as well as in Multiple contexts like Ambulances & Hospitals.
- The product comes with a automatic cutoff mechanism and speed control for the rigth patient.
- It has a complete system of products Designed including the Neck Attachment, Nose Attachment, and Pipe Inserter which together makes pipe insertion easier & treatment in villages possible by rural Health Workers in Emergency to save lives every day.