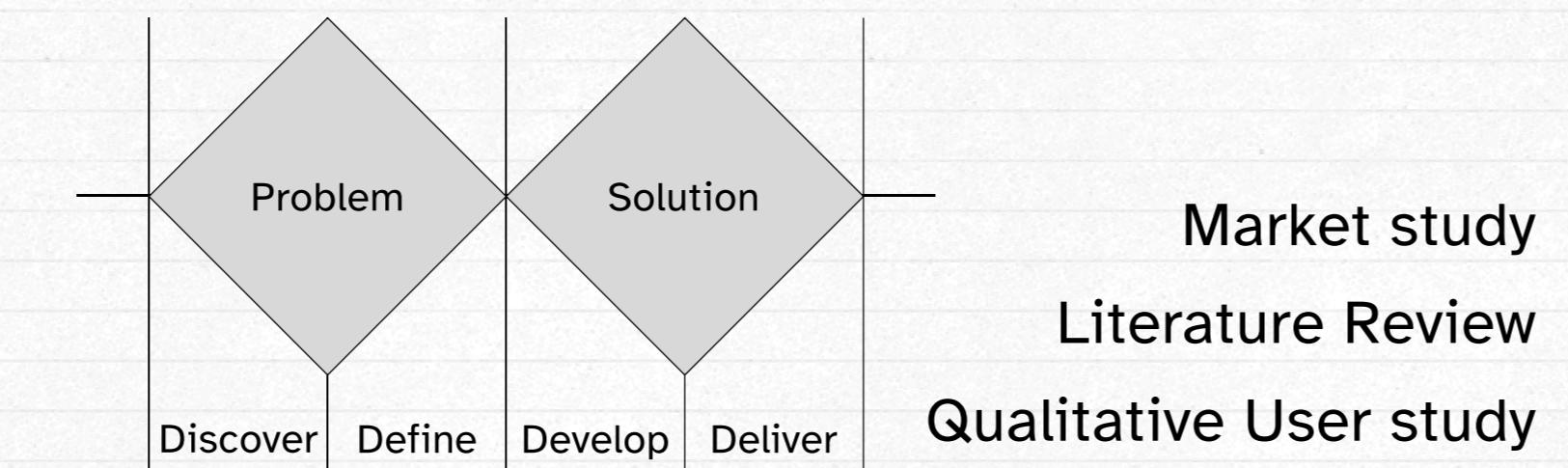


SMARTDOSE

Aiding Self Administration of Insulin by Integration of Memory in Insulin Pens.

METHODOLOGY



USER INSIGHTS

Users encounter difficulties in consistently administering insulin due to various factors, such as forgetfulness, lack of seriousness, and context.

Users skip insulin doses when they need to attend brief social functions.

Users demand privacy when self-administering insulin and prefer not to face inquiries about it.

Users typically adhere to the initial product they have used and resist change. GG



QUESTIONS

Existing products and their drawbacks.

Previous Innovations and ideas

Reasons for failure/success of previous innovations.

Amount of people affected.

Specific User Pain Points.

Type of product needed.

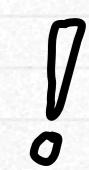
Area of intervention.

User Insights.

Are we qualified to solve the problem?

56.2%

of adults missed at least one bolus insulin dose in the last month



REASON FOR MISSING DOSES

Forgetfulness

Lack of Awareness

Fear of Hypoglycemia

Technical Issues

OBSERVATION

Users desire to self-administer insulin independently, effortlessly and discreetly, without apprehension of judgment, in any location.

LIPO-HYPER-TROPHY

64%

Caused by repeated insulin injections on the same site.

Effects:

Diabetes-related ketoacidosis (DKA), a potentially life-threatening complication of diabetes.

High blood sugar (hyperglycemia).

Low blood sugar (hypoglycemia).

Need for higher doses of insulin.

Poor results on the glycosylated hemoglobin (A1c) test (high A1c level)

MARKET ANALYSIS



Insulin Pens

provide no reminders or dosage guidance



INPENs

integrating the insulin pen with a smartphone app

reliance on smartphone connectivity for optimal functionality

Hyperglycemia (High Blood Sugar)

Risk of Diabetic Ketoacidosis (DKA)

Poor Long-Term Control

Cognitive Impairment

EFFECTS OF MISSING DOSES

3 ROADS

2 Not Taken



Objective: Redesign Insulin Pens to remind users when to take insulin and make them understand the importance of taking insulin, while also remembering the previous site of injection.

Main Problems: Location, Memory, Cost, SCAMPER competitor features.

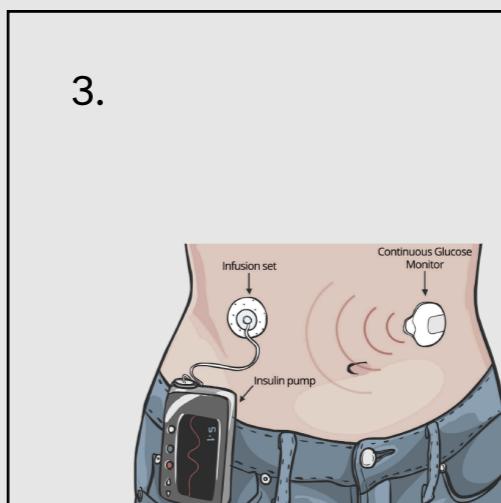
How Might We redesign Insulin Pens to remind users when to take insulin and encourage proper insulin administration behaviours, while also helping them remember the previous site of injection, without the use of external integrations.

PROBLEM DEFINITION



Objective: Develop a user-friendly product for self-administration of inhalable insulin.

Inhalable insulin is still in the Research and Development phase, making the design of an administration product crucial for future opportunities.



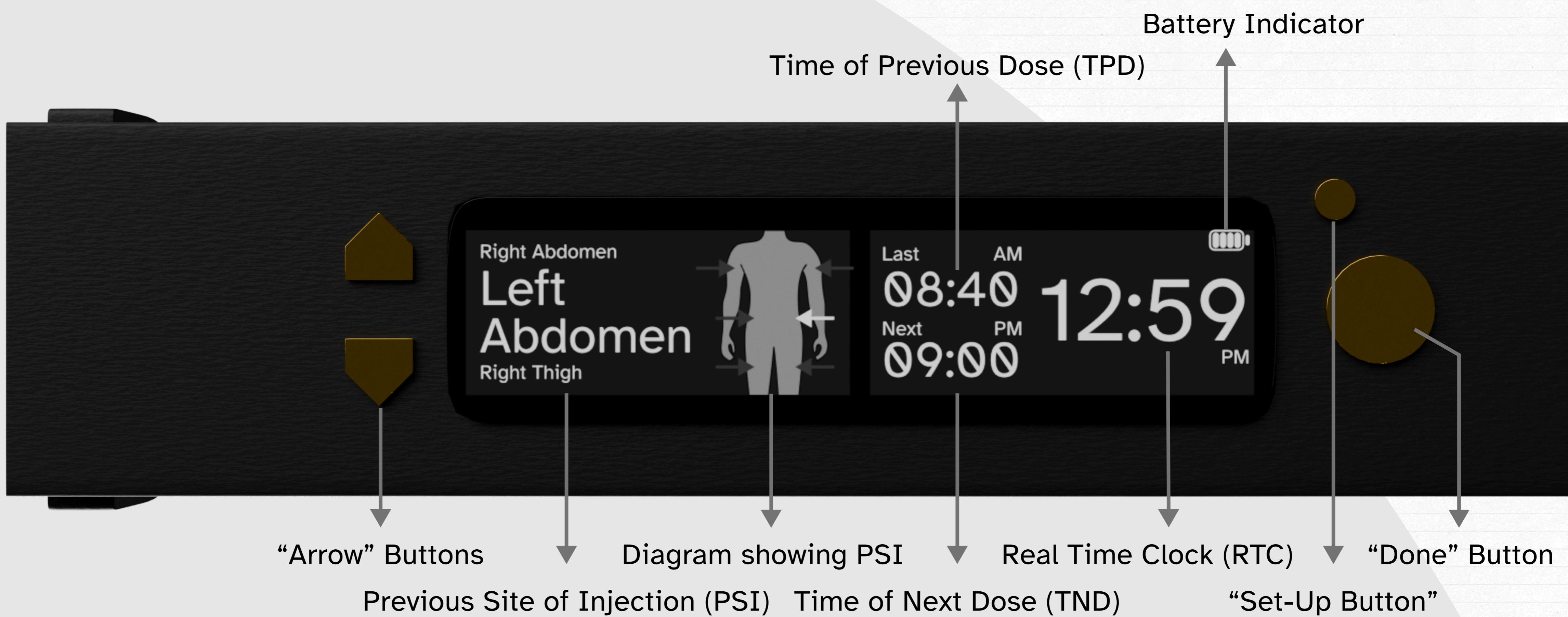
Objective: Redesign Insulin Pumps to decrease stereotypes related to the same, and make its operation understandable to even the illiterate populace.

Main Problems: Negative perception, high cost, lack of awareness.

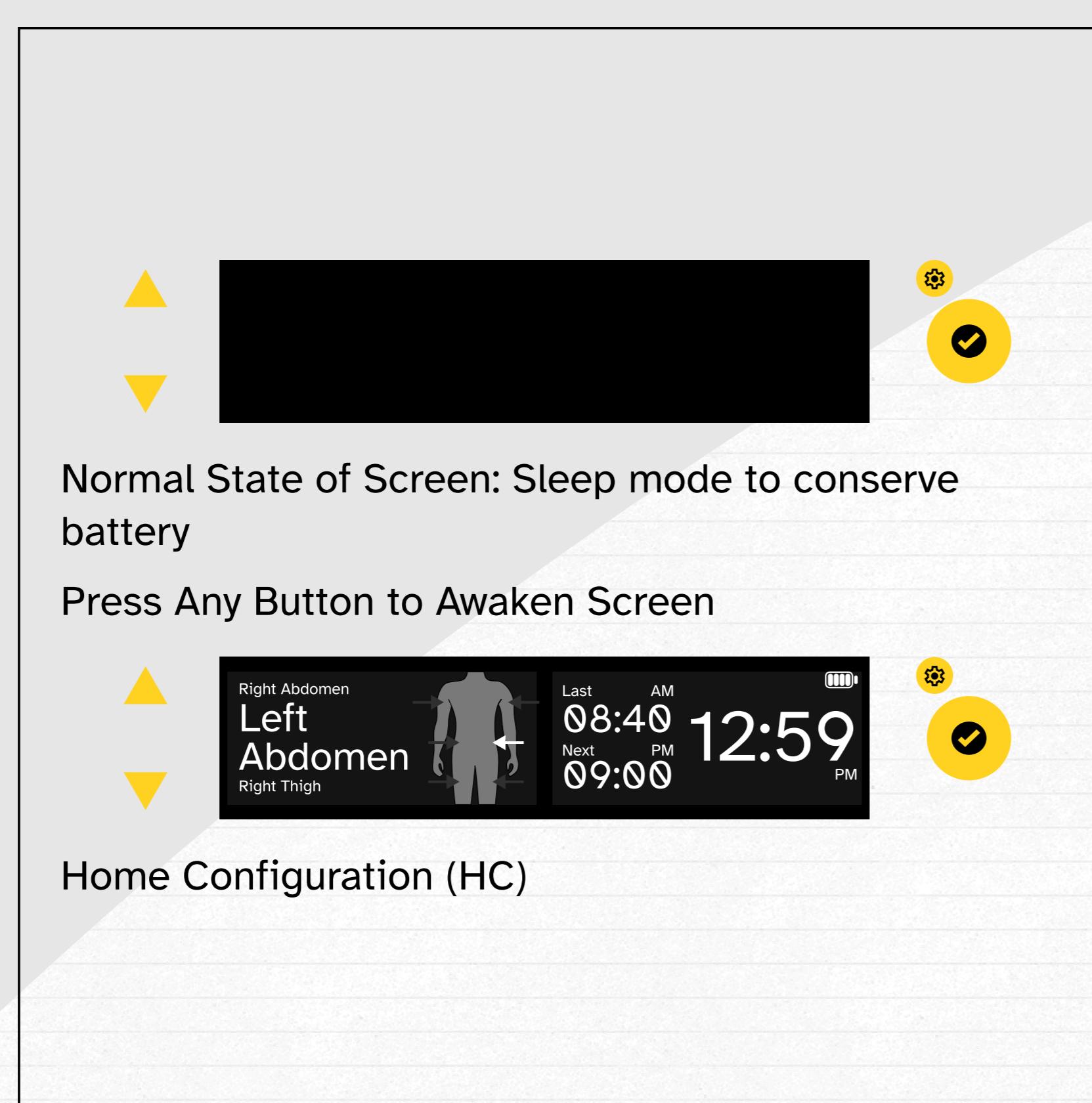
Course Code:	DS3001
Course Name:	Engineering Design - Including Design and Fabrication Project
Mentor:	Dr. Avinash Chandra Pandey
Team:	DFP-05
Members:	22BDS015 Giridhara Prashad 22BCS049 Ashwathy Santhosh 22BCS151 Sathwik Malyala 22BCS234 Vishnu Bhargav 22BEC126 Vishnu Urugonda 22BSM044 Chethan Porika



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USER INTERFACE AND EXPERIENCE

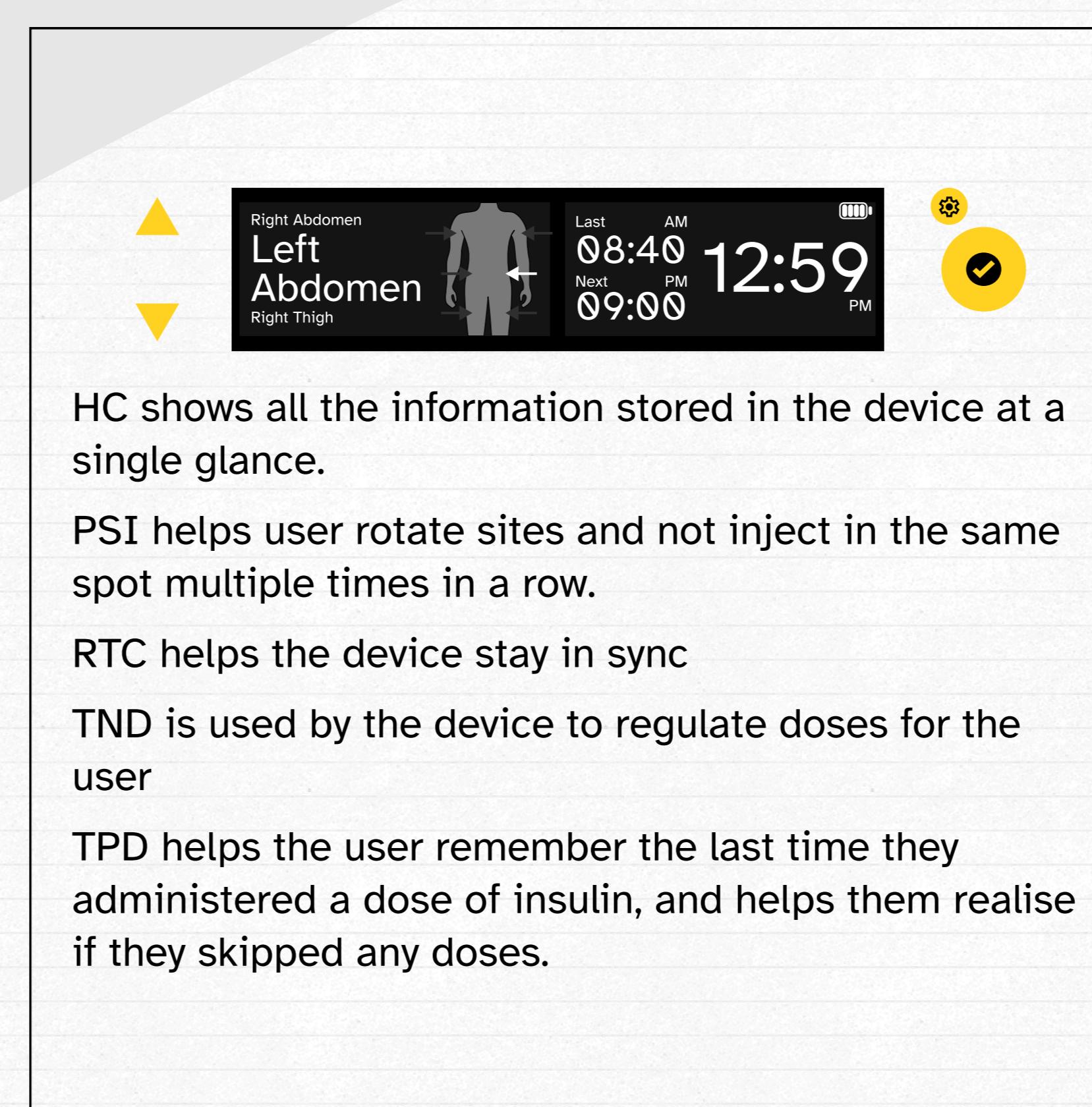


Normal State of Screen: Sleep mode to conserve battery

Press Any Button to Awaken Screen



Home Configuration (HC)



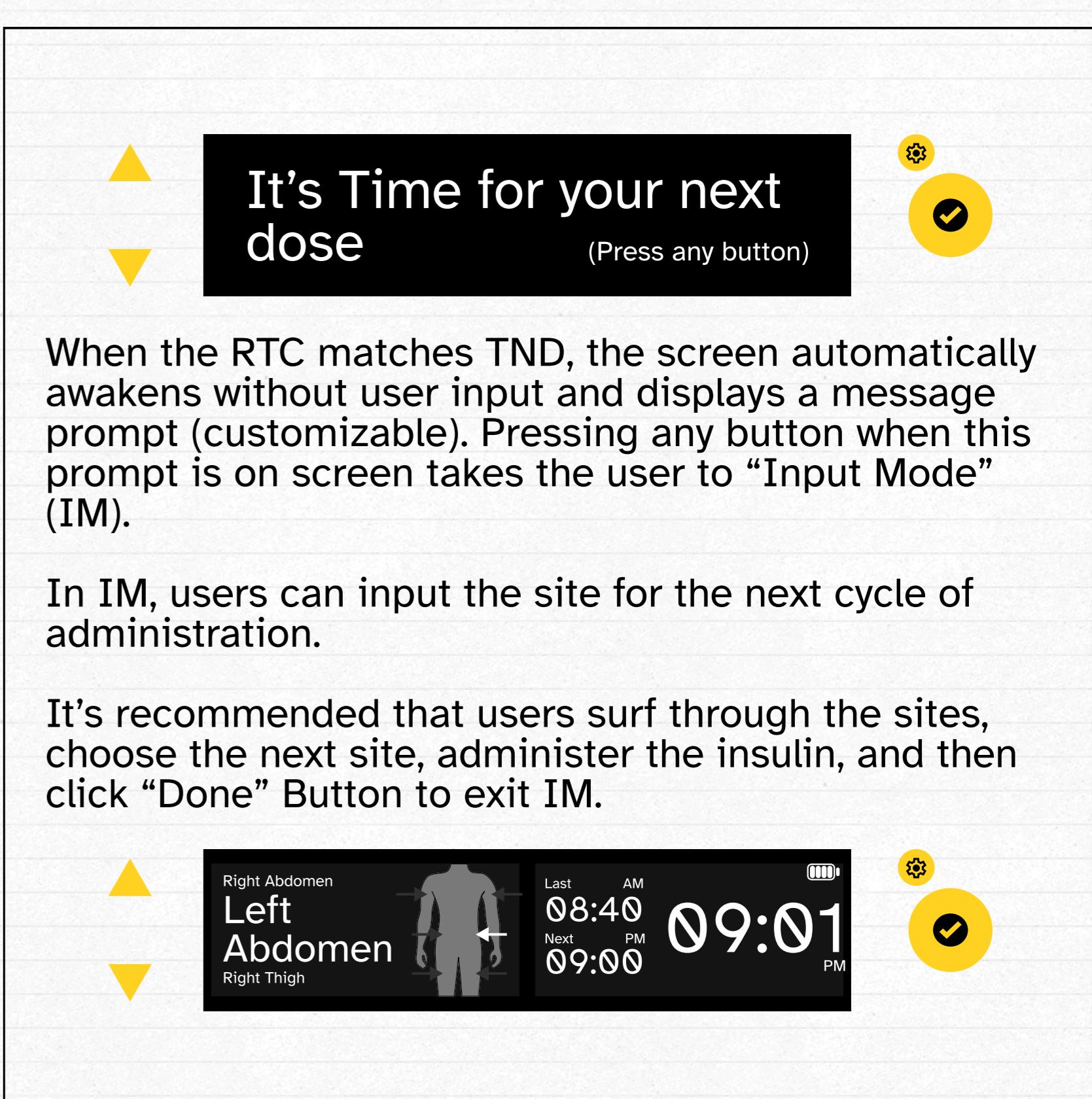
HC shows all the information stored in the device at a single glance.

PSI helps user rotate sites and not inject in the same spot multiple times in a row.

RTC helps the device stay in sync

TND is used by the device to regulate doses for the user

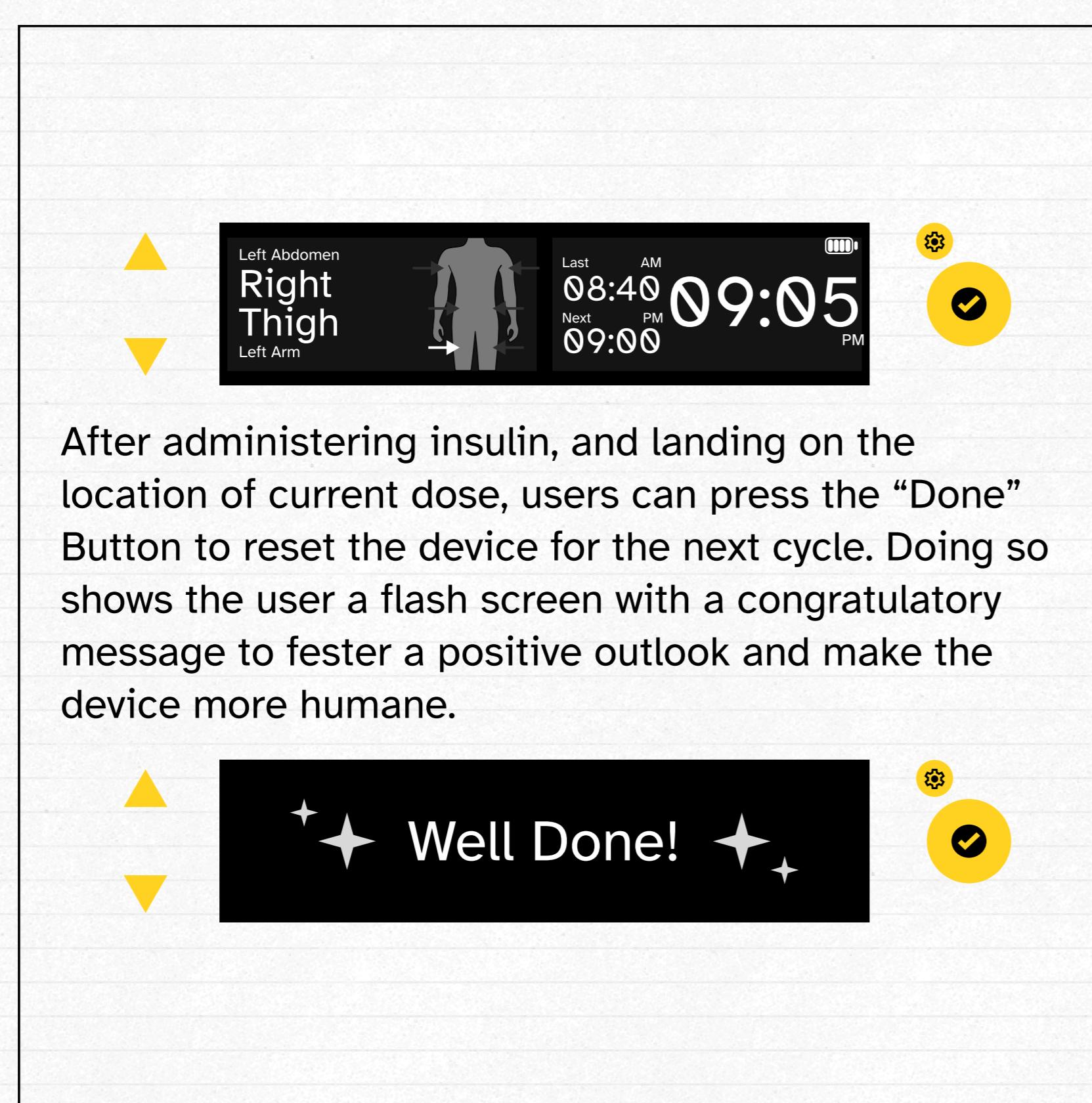
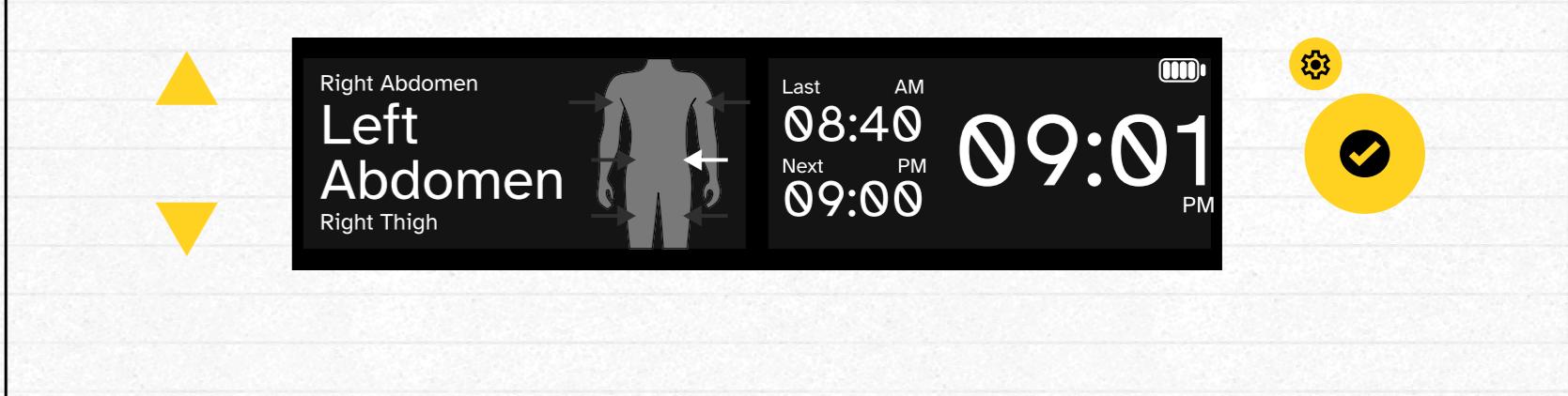
TPD helps the user remember the last time they administered a dose of insulin, and helps them realise if they skipped any doses.



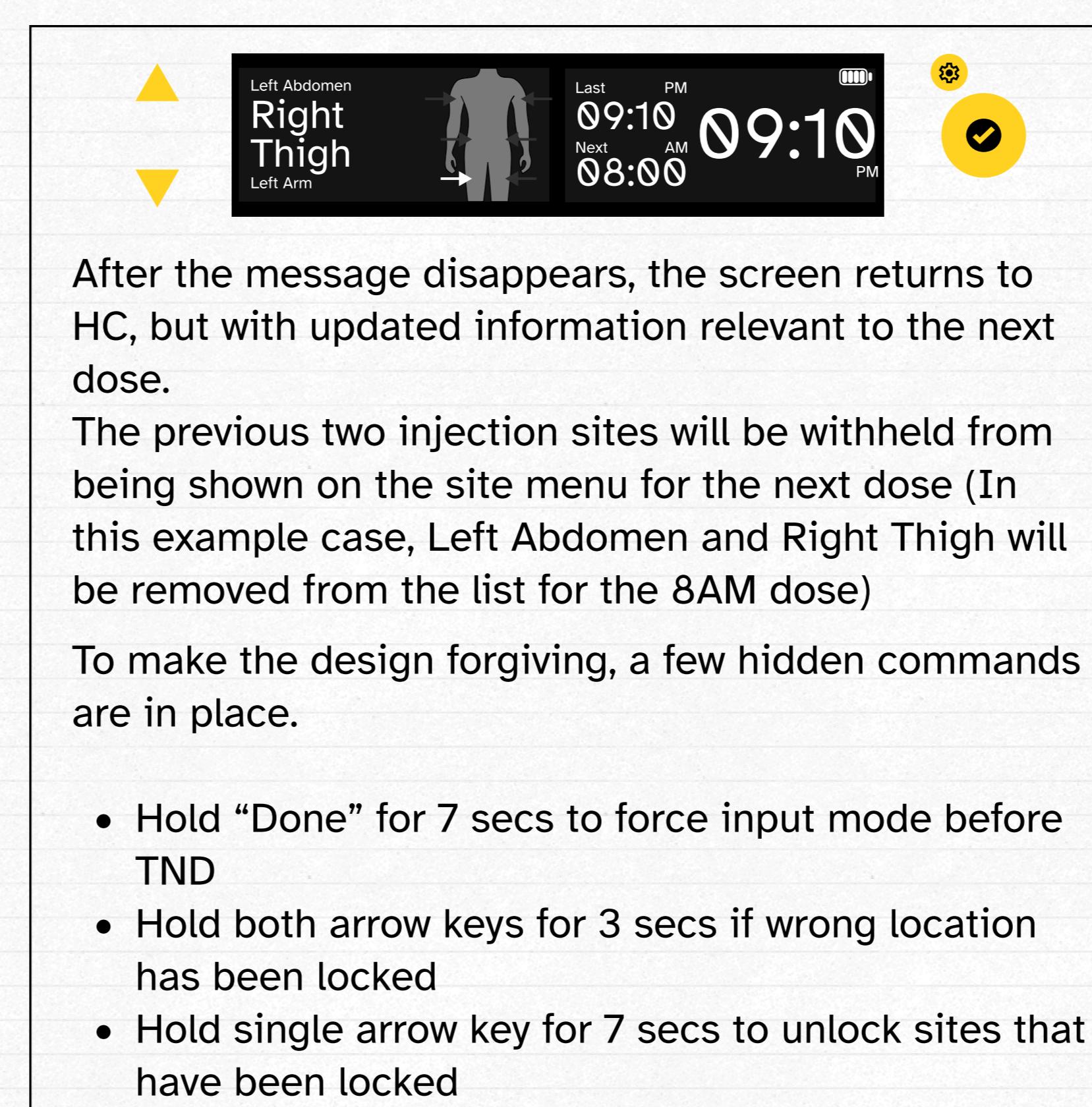
When the RTC matches TND, the screen automatically awakens without user input and displays a message prompt (customizable). Pressing any button when this prompt is on screen takes the user to “Input Mode” (IM).

In IM, users can input the site for the next cycle of administration.

It's recommended that users surf through the sites, choose the next site, administer the insulin, and then click “Done” Button to exit IM.



After administering insulin, and landing on the location of current dose, users can press the “Done” Button to reset the device for the next cycle. Doing so shows the user a flash screen with a congratulatory message to foster a positive outlook and make the device more humane.

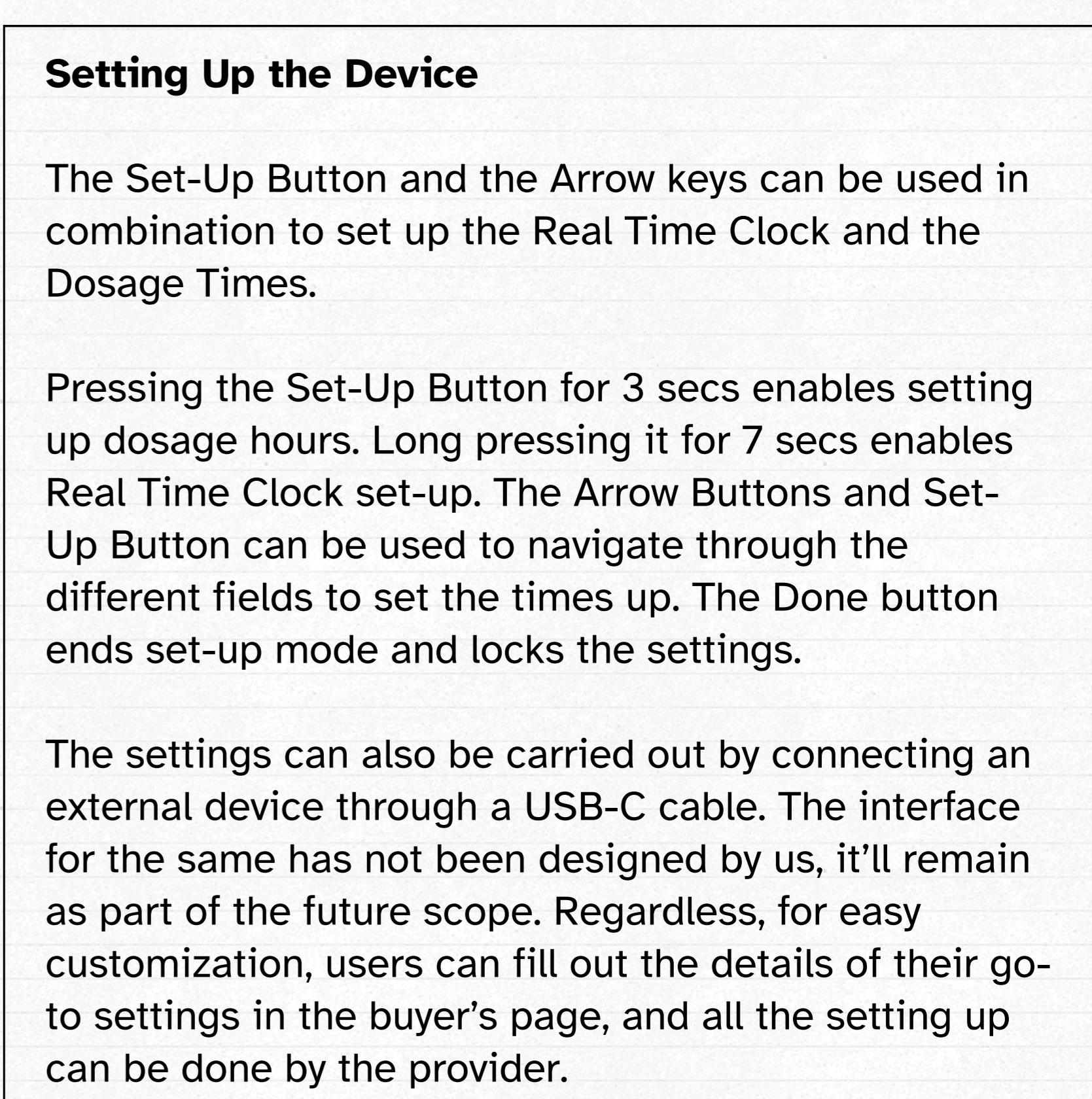


After the message disappears, the screen returns to HC, but with updated information relevant to the next dose.

The previous two injection sites will be withheld from being shown on the site menu for the next dose (In this example case, Left Abdomen and Right Thigh will be removed from the list for the 8AM dose)

To make the design forgiving, a few hidden commands are in place.

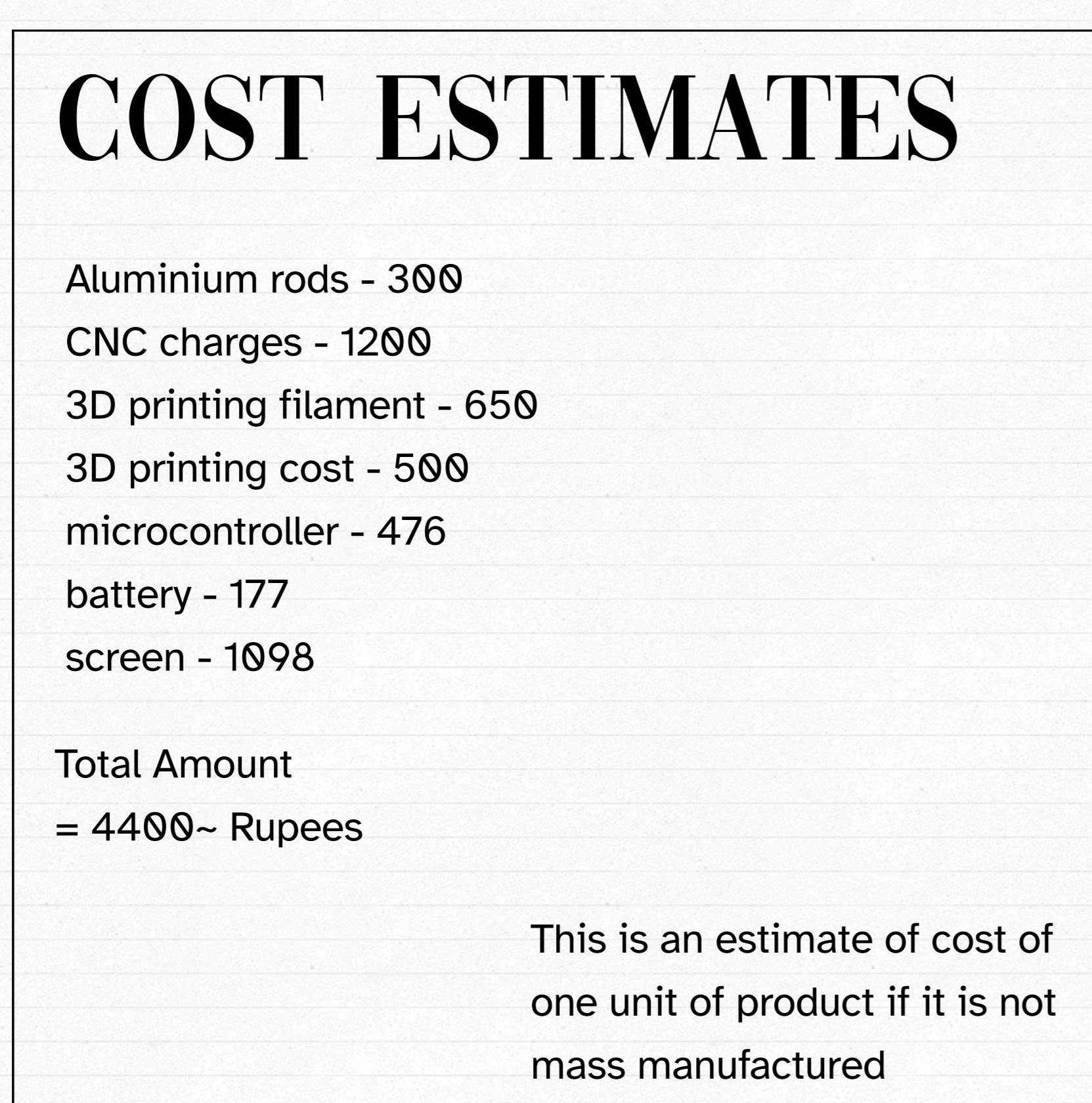
- Hold “Done” for 7 secs to force input mode before TND
- Hold both arrow keys for 3 secs if wrong location has been locked
- Hold single arrow key for 7 secs to unlock sites that have been locked



Setting Up the Device
The Set-Up Button and the Arrow keys can be used in combination to set up the Real Time Clock and the Dosage Times.

Pressing the Set-Up Button for 3 secs enables setting up dosage hours. Long pressing it for 7 secs enables Real Time Clock set-up. The Arrow Buttons and Set-Up Button can be used to navigate through the different fields to set the times up. The Done button ends set-up mode and locks the settings.

The settings can also be carried out by connecting an external device through a USB-C cable. The interface for the same has not been designed by us, it'll remain as part of the future scope. Regardless, for easy customization, users can fill out the details of their go-to settings in the buyer's page, and all the setting up can be done by the provider.



Aluminium rods - 300

CNC charges - 1200

3D printing filament - 650

3D printing cost - 500

microcontroller - 476

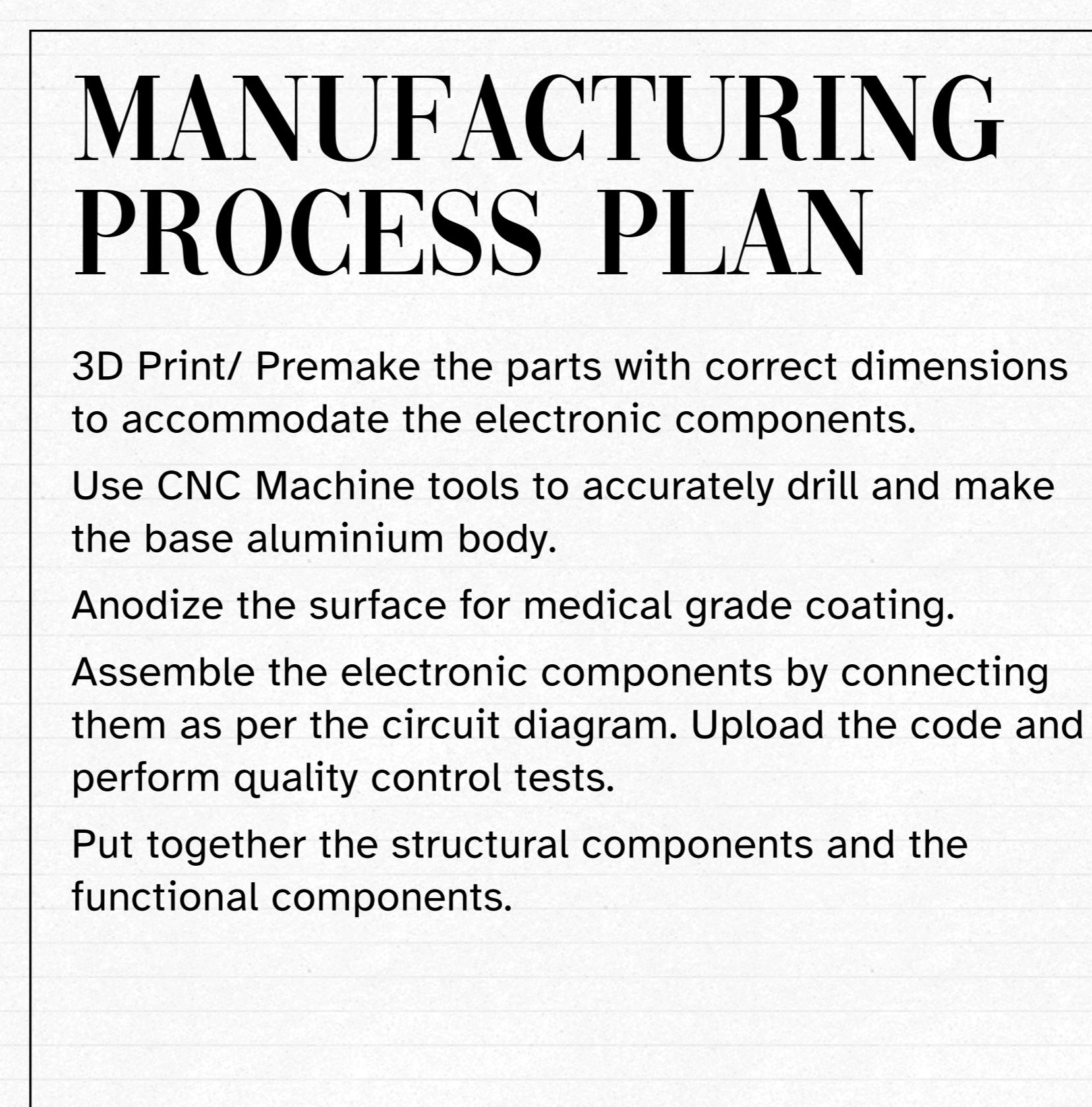
battery - 177

screen - 1098

Total Amount

= 4400~ Rupees

This is an estimate of cost of one unit of product if it is not mass manufactured



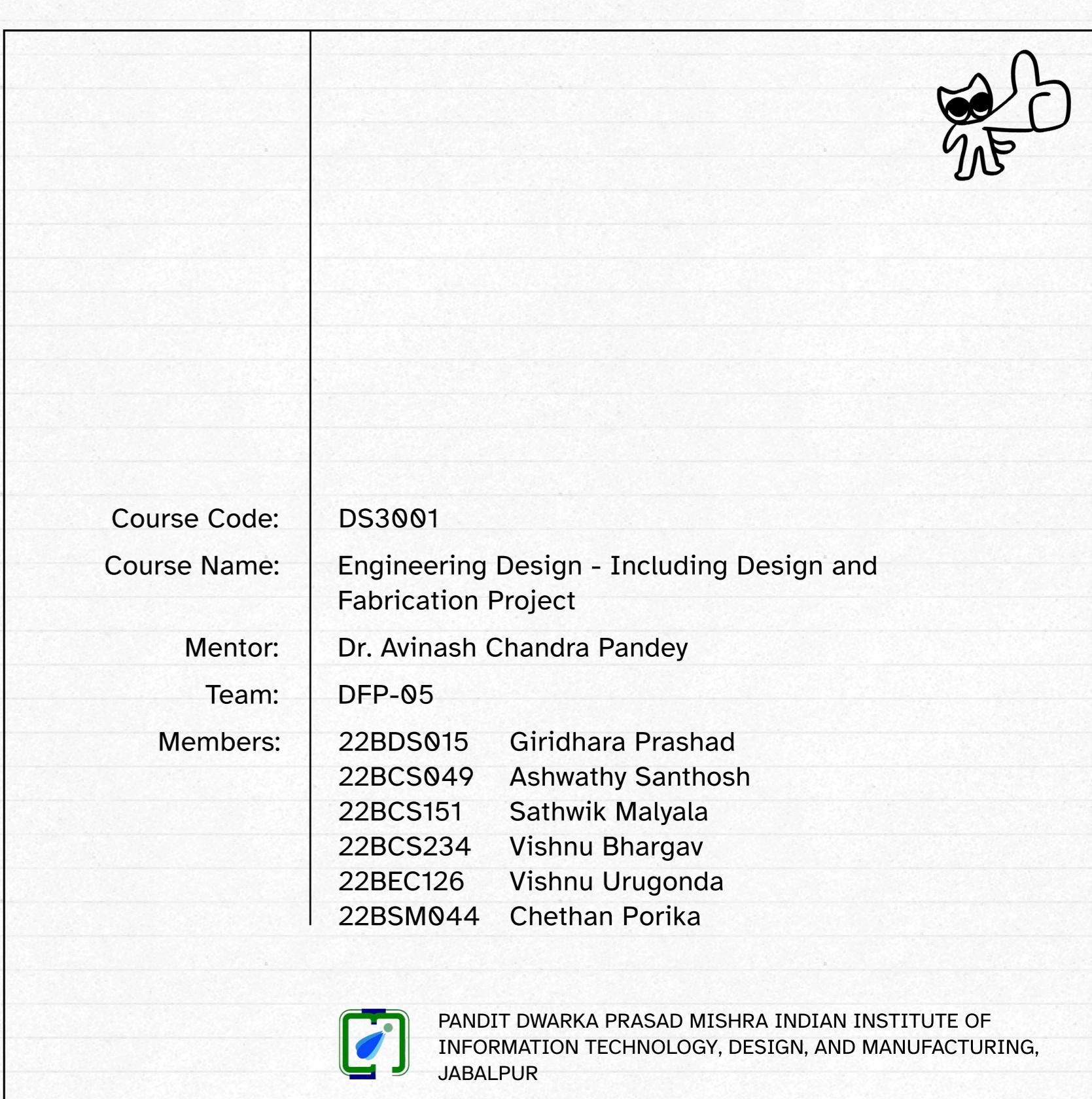
3D Print/ Premake the parts with correct dimensions to accommodate the electronic components.

Use CNC Machine tools to accurately drill and make the base aluminium body.

Anodize the surface for medical grade coating.

Assemble the electronic components by connecting them as per the circuit diagram. Upload the code and perform quality control tests.

Put together the structural components and the functional components.



Course Code: DS3001

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