

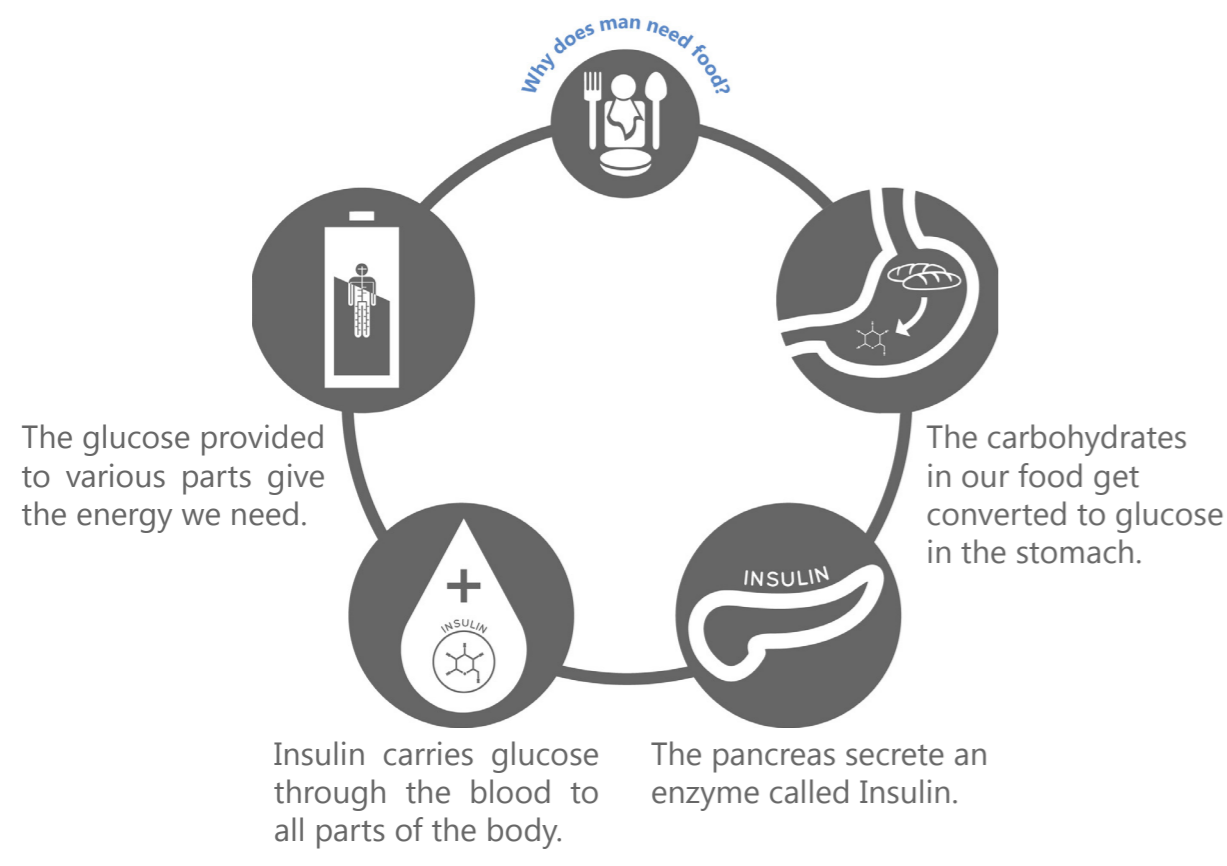
# INSUL•AIDE

A Diabetes Management System

A classroom project by  
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The purpose of this study was to attempt a human centered design of a diabetes management system. Emphasis was put on the interface and the interaction between the user and the products, taking into account the varied social and psychological needs of the patient. The design focuses on simplifying tasks and improving communication with the doctor, for real time evaluation of the patient's needs. The aim of the project is to promote an empathic and user centric approach to designing self-care medical systems, providing data security and rapid response systems for emergency situations, as well as, helping patients blend in to society rather than stand out.

## WHAT IS DIABETES?



**TYPE1 Diabetes**  
Results from complete lack of insulin production by the body, and hence, complete dependency on an external source.

**TYPE2 Diabetes**  
Results from an insufficient production of insulin by the body, resulting in a partial dependency on insulin, and/or significant lifestyle changes.

## EXISTING DEVICES FOR INSULIN MANAGEMENT



## PROBLEMS ASSOCIATED WITH CURRENT SOLUTIONS

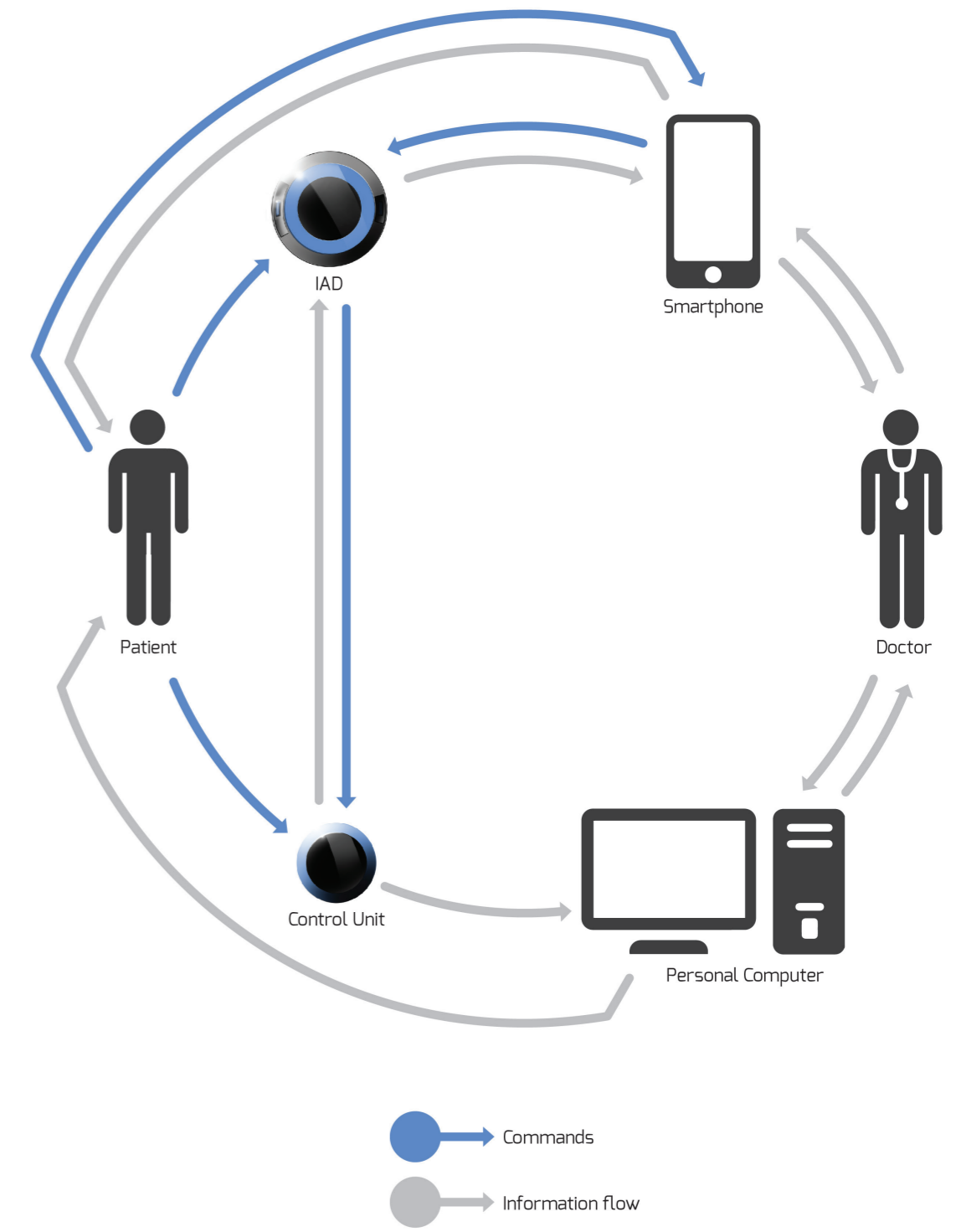
- Needlephobia**  
Invasive and painful nature of blood glucose monitoring and insulin administrations is detrimental to people suffering from a fear of needles.
- Constant Monitoring**  
Diabetics need to constantly monitor their blood sugar levels, and take appropriate measures to normalize it.
- Human Error**  
Human error in judgement and measurement can lead to subsequent catastrophic results.
- Social Alienation**  
Social interactions change when people know that a person is dependent on a medical device.
- Patient Doctor Meetings**  
Patients need to frequent their diabetologist to learn ways of adopting to body and lifestyle changes.

## POTENTIAL FUTURE DEVICES FOR INSULIN MANAGEMENT

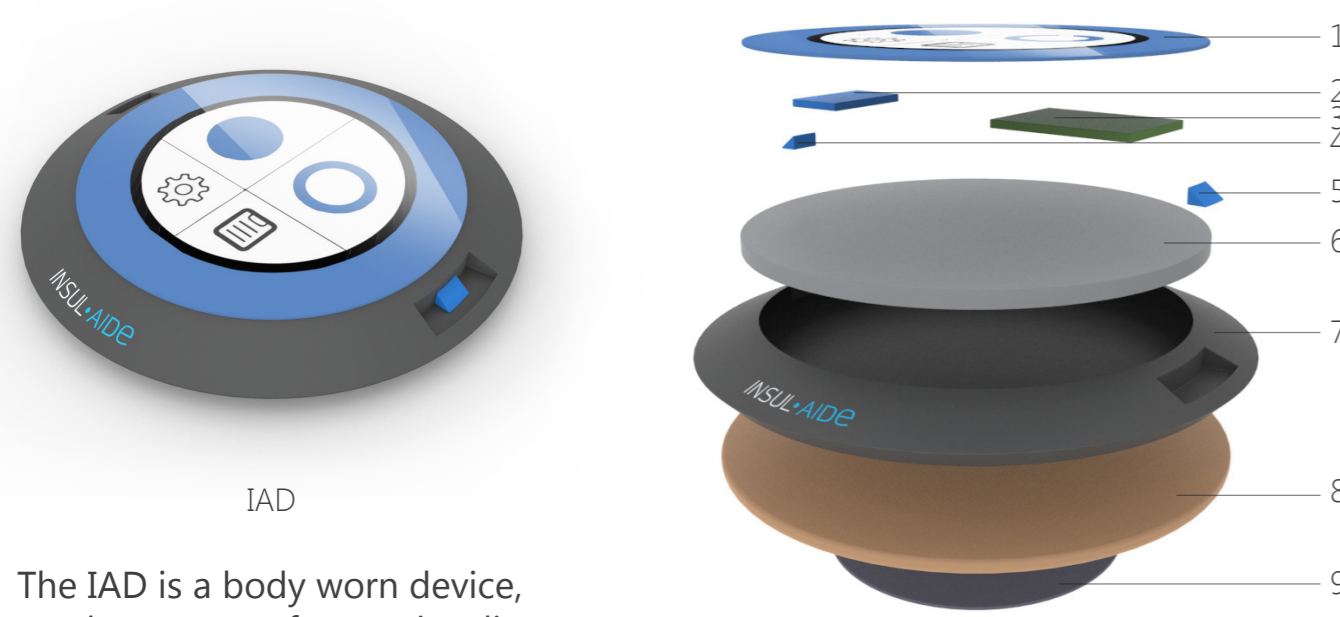


## INSUL•AIDE SYSTEM AND ITS COMPONENTS

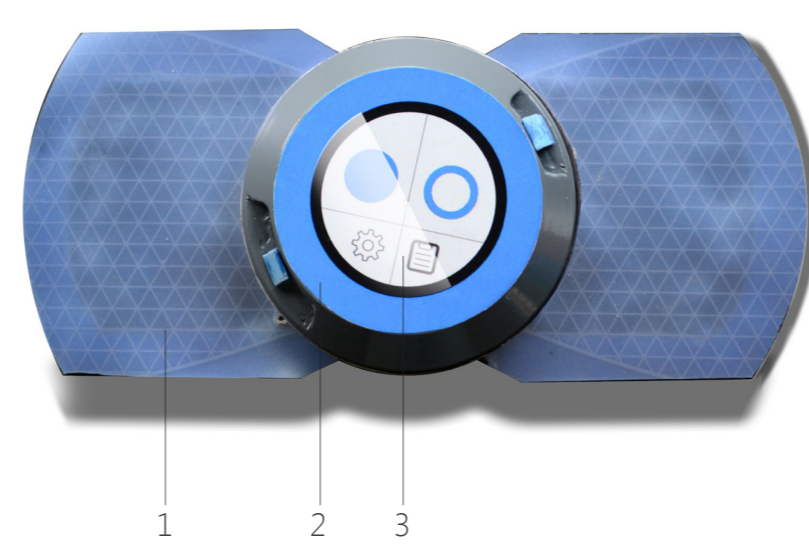
**INSUL AIDE** is a diabetic patient's self-care kit for blood sugar testing, insulin administration, recording medication, medical appointments, alarms, and storing and sharing information with the doctor. The system consists of two devices for the patient, an actuating unit for blood glucose testing and insulin administration (IAD), and a control unit for discrete access to the IAD, and storing and sharing data with the doctor. The control unit may be of two types; either a dedicated wearable device, or a smartphone application.



## IAD (INSULIN ADMINISTRATION UNIT)



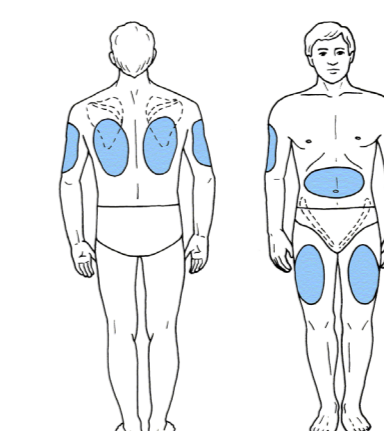
- 1 - Touch Screen with a Scroll Ring
- 2 - Bluetooth Adapter
- 3 - Processing Unit
- 4 - Insulin Delivery Button
- 5 - Blood Glucose Test button
- 6 - Rechargeable Power Source
- 7 - Product Casing
- 8 - Insulin Cartridge-cum-Patch
- 9 - Patch cap



- 1 - Washable, reusable, gel-based butterfly-wing body attachment
- 2 - Touch Screen Navigation
- 3 - Touch Scroll Ring



A cymbal transducer array is a small setup which uses metal cymbals to generate ultrasound. Ultrasound can help make the skin permeable to insulin molecules, and, at a different frequency, can be used to measure blood glucose concentration.

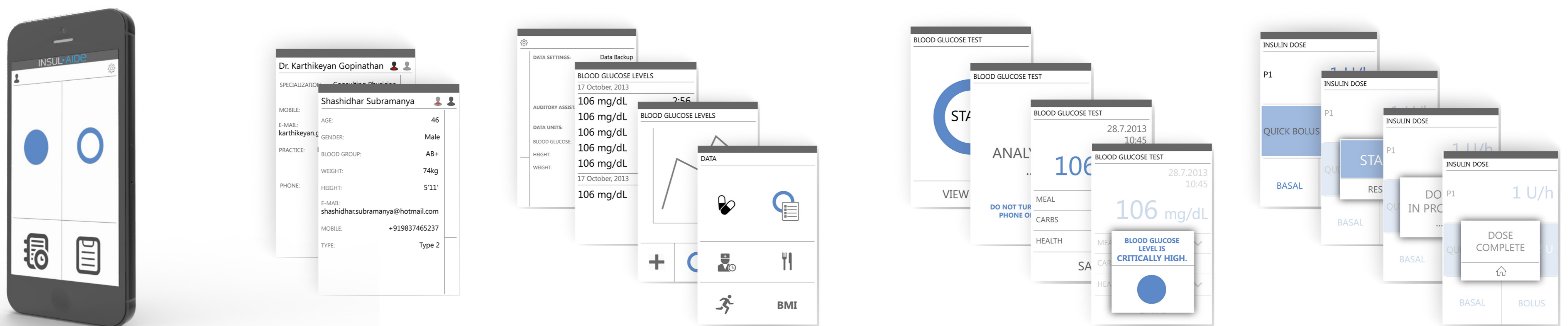


Transdermal insulin delivery requires a medium of fat cells to synchronize the entry of glucose and insulin into the blood stream. This layer of fat is found on certain parts of the body. Due to the nature of this method of insulin delivery, it is advised to rotate the site of delivery, to prevent the pores from getting blocked by insulin. To facilitate the attachment of the device at various parts of the body, the device is attached to the skin using gel based pads, which can be washed and reused.



The two physical buttons act as the actuating commands, and can be used in a set combination for Glucose checks, and insulin doses. The need for physical buttons arises from the risk of touch screen buttons getting accidentally pressed, leading to complications.

## SMARTPHONE APPLICATION



The Application not only acts as a control unit, but also raises alarms, stores reminders, medical appointments, blood glucose records, and insulin delivery records. The app is a dedicated network for the patient and the doctor, and a convenience in terms of connectivity, data storage, transfer, and feedback.

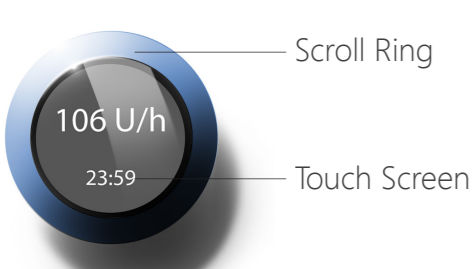
Every user will have the user's profile as well as the assigned doctor's profile, and contact details

The patient can store and update data such as insulin logs, medication, food details, doctor appointments, exercise routines, and the patient's Body Mass Index

As the IAD conducts a Blood Glucose Test, the App will show the progress in real time, and also advise the patient for further action based on the results.

Similarly, the patient can track the progress of an Insulin Dose in real time on the App, to discretely ensure smooth functioning of the system, and be prepared for any further action that may be required.

## CONTROL UNIT



The Control Unit is a small discrete device, that helps transfer data from the IAD to a personal computer, or data back up device. It is accessible only to the patient, hence avoiding the risk of unforced tampering or hacking of data. The data is intended to be transferred to the doctor for real time monitoring of the patient's condition.

