Part 1 - Modeling the Current State

DIABETES

What is Diabetes?

Diabetes is a disease that occurs when blood glucose (also called blood sugar) is too high.

It occurs when the body does not make enough or any insulin (a hormone made by the pancreas) or doesn't use insulin well.

Insulin helps glucose from food get into the cells to be used as energy. A lack of insulin means glucose stays in the blood and doesn't reach the cells.

DIABETES HAS NO CURE

Steps can be taken to manage diabetes and stay healthy. Different treatments are prescribed based on the type of diabetes.

7th cause of death **in the United States in the year 2017**

Types of Diabetes

1 Type 1 Diabetes

In this type of diabetes, the body does not make insulin. **The immune system attacks and destroys the cells in the pancreas that make insulin.**

Usually diagnosed in children and young adults.
People with type 1 diabetes need to take insulin every day to stay alive.

2 Type 2 Diabetes

In this type of diabetes, the body does not make or use insulin well.

Can develop at any age, but mostly occurs in middle aged and older people.

It is the most common type of diabetes.

3 Other types

Gestational diabetes - Develops in women when they are pregnant.
Monogenic diabetes - an inherited form of diabetes
Cystic fibrosis-related diabetes

Stats

415 million people are living with diabetes across the world.

The figure is expected to rise to **642 million people** living with diabetes worldwide by **2040**

46% of people with diabetes are **undiagnosed**

1/11 of the world's adult population has diabetes

What does a diabetic person measure?

Blood Glucose level

A person with diabetes measures the blood glucose level. Doctors call high blood glucose hyperglycemia.

They can do this with blood glucose meters with a finger prick or continuous glucose monitoring (CGM) which includes a sensor and a reader.

How do they manage blood glucose levels?

By taking insulin

Apart from diet, exercise and medication to lower blood glucose levels, a diabetic person may need to **take insulin.**

They can do this with a needle or syringe, insulin pens, pumps, inhalers (only for rapid-acting insulin), injection port or jet injector.

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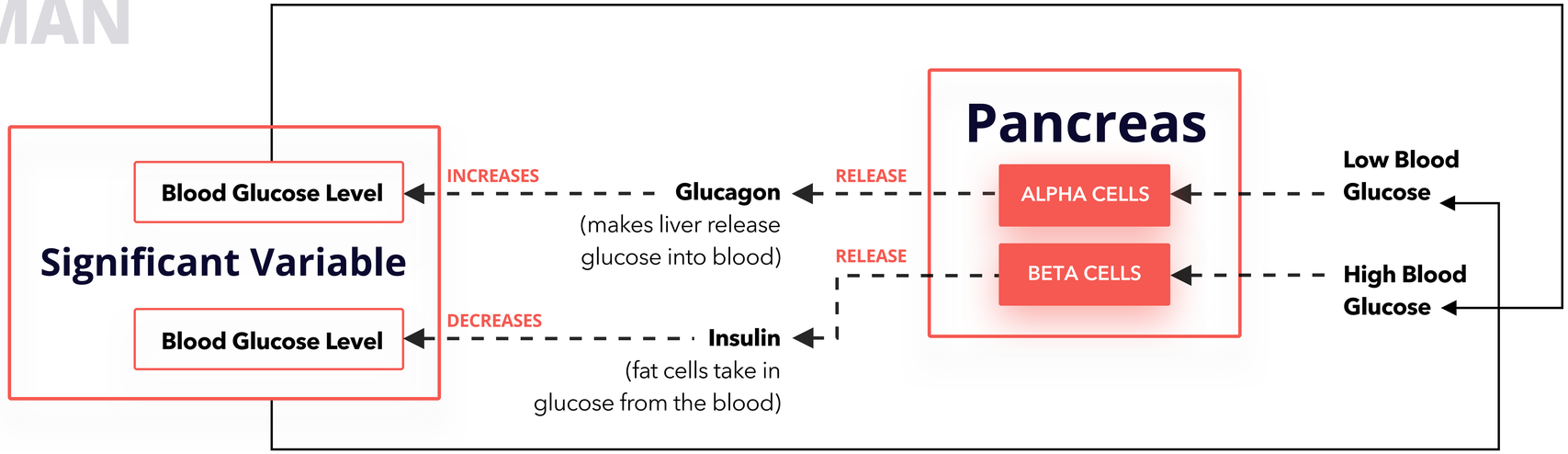
A HEALTHY HUMAN

For a healthy human, the pancreatic endocrine hormones insulin and glucagon help in maintaining the blood glucose level within a very narrow range.

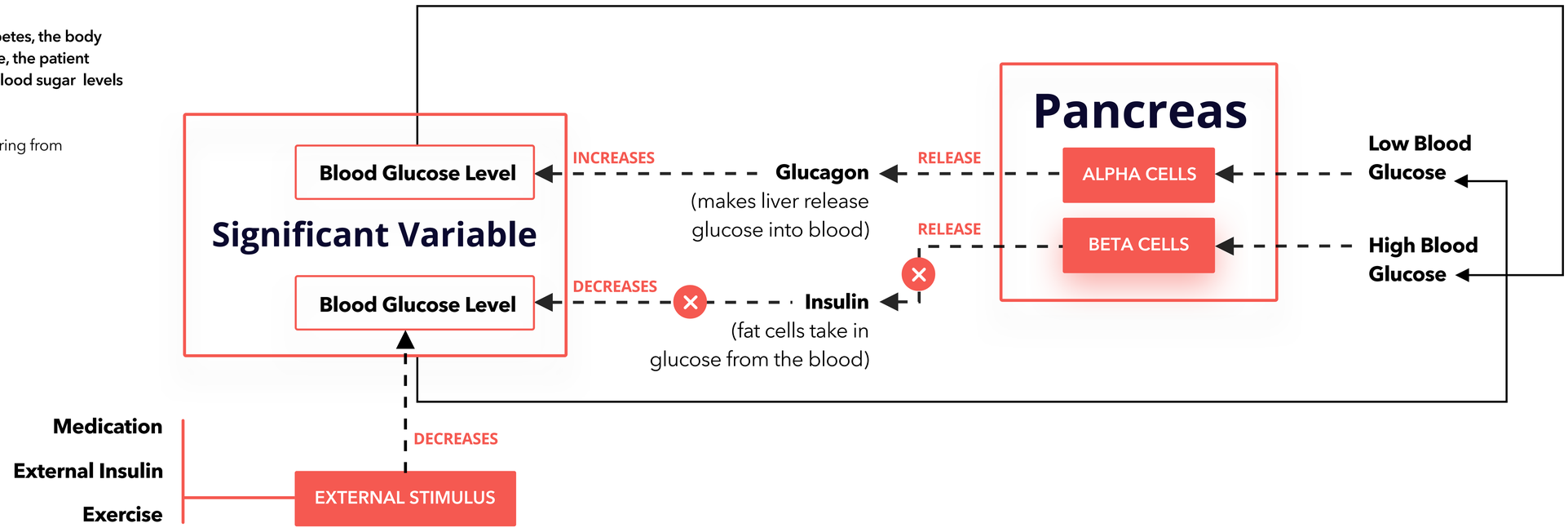
This is a feedback loop for a healthy human with proper insulin generation within the body.



A DIABETIC PERSON

For a person suffering from chronic diabetes, the body does not produce enough insulin. Hence, the patient needs external insulin to decrease the blood sugar levels when it gets high.

This is a feedback loop of a person suffering from Chronic Type 2 diabetes.



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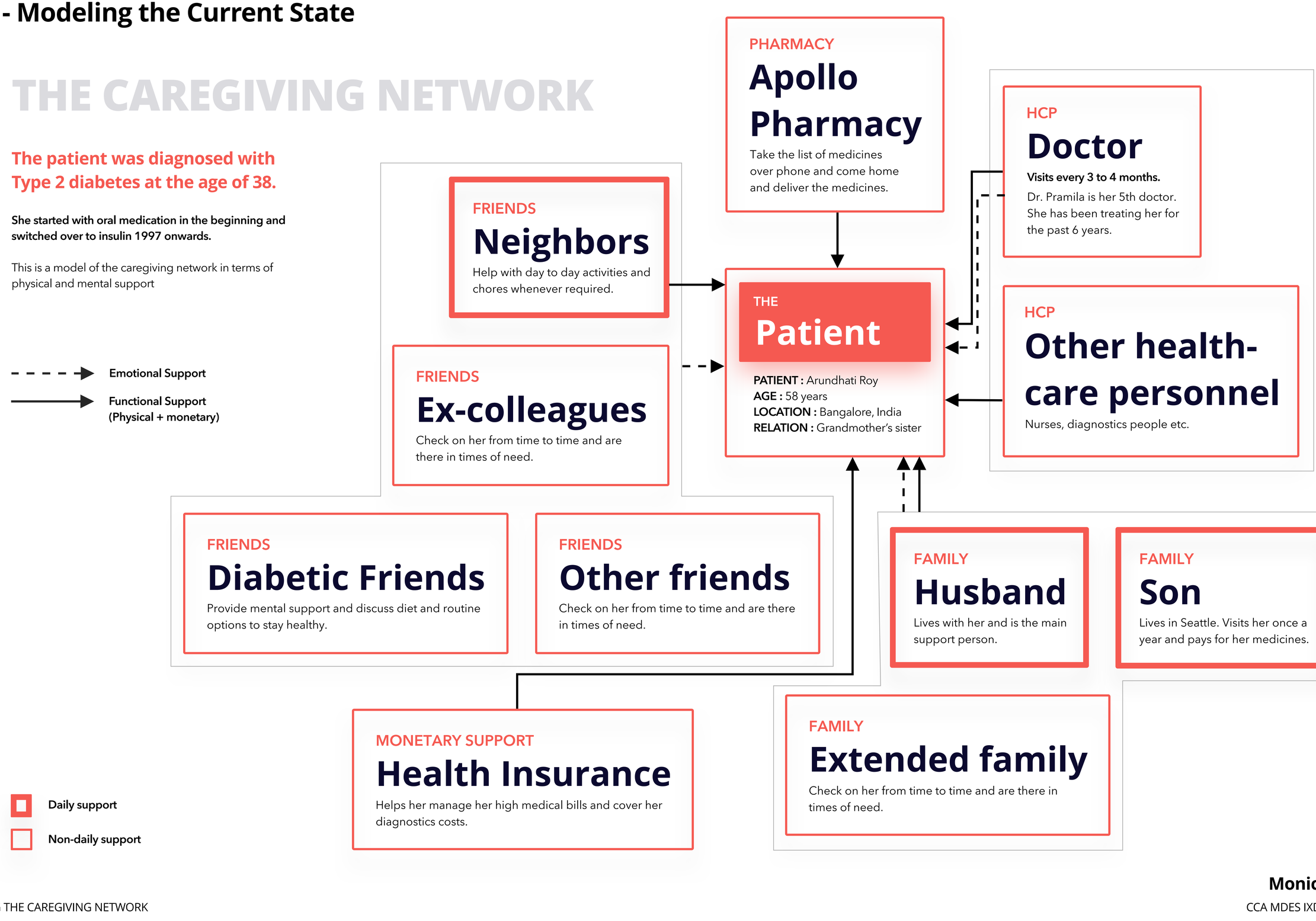
THE CAREGIVING NETWORK

The patient was diagnosed with Type 2 diabetes at the age of 38.

She started with oral medication in the beginning and switched over to insulin 1997 onwards.

This is a model of the caregiving network in terms of physical and mental support



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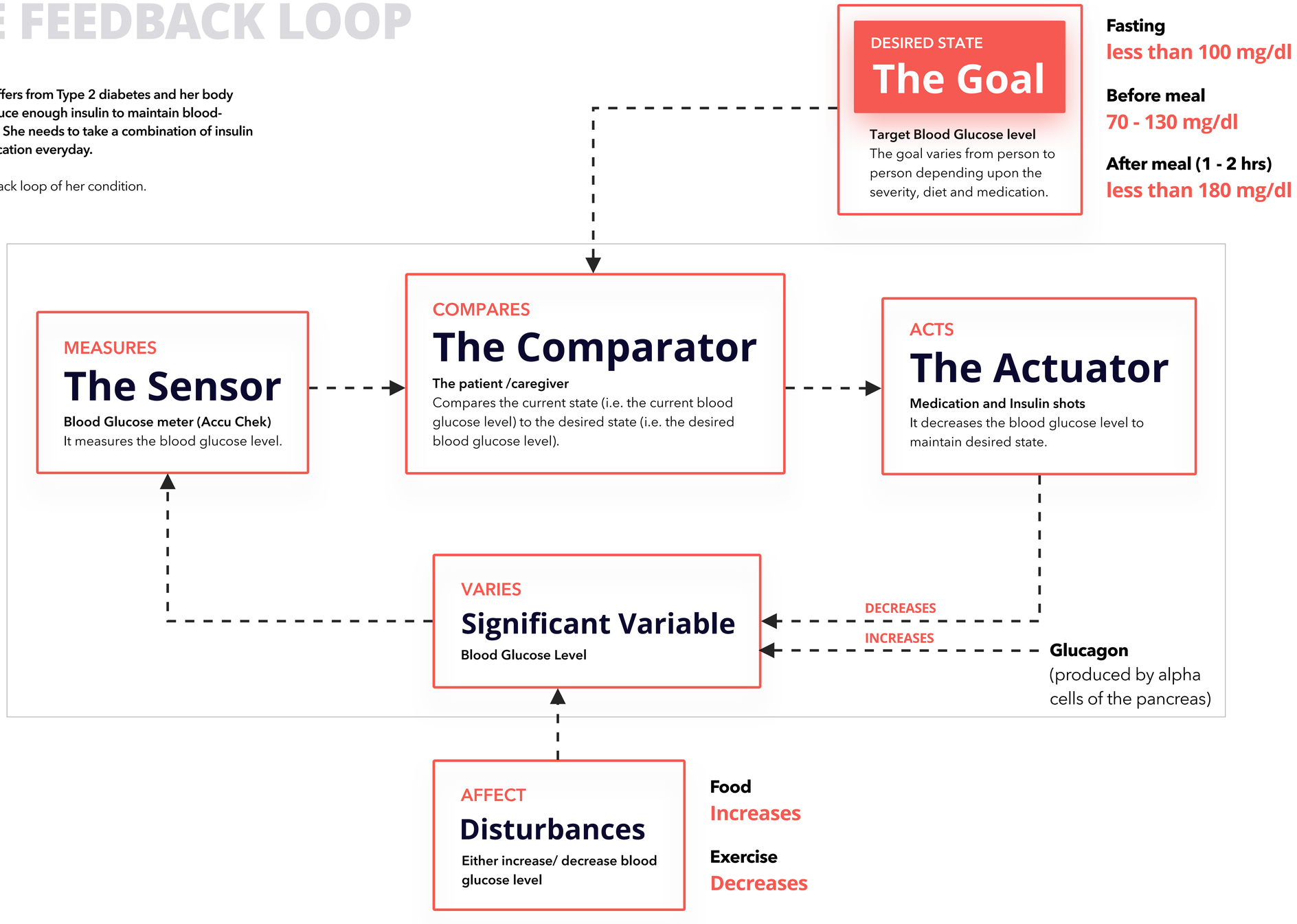
THE FEEDBACK LOOP

The patient suffers from Type 2 diabetes and her body does not produce enough insulin to maintain blood-glucose levels. She needs to take a combination of insulin and oral medication everyday.

This is a feedback loop of her condition.



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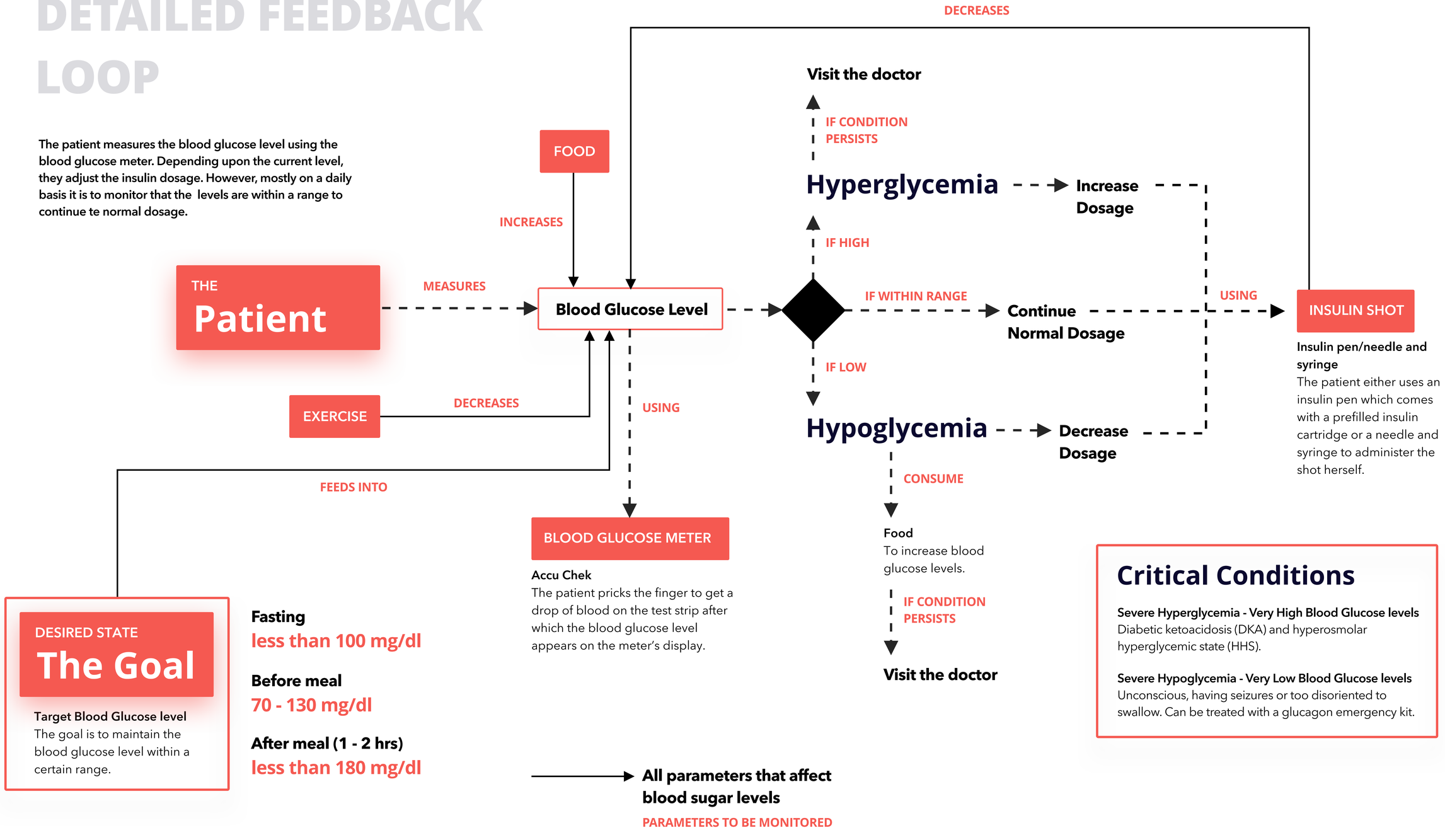
DETAILED FEEDBACK LOOP

The patient measures the blood glucose level using the blood glucose meter. Depending upon the current level, they adjust the insulin dosage. However, mostly on a daily basis it is to monitor that the levels are within a range to continue te normal dosage.



Insulin pen/needle and syringe
The patient either uses an insulin pen which comes with a prefilled insulin cartridge or a needle and syringe to administer the shot herself.

Accu Chek
The patient pricks the finger to get a drop of blood on the test strip after which the blood glucose level appears on the meter's display.

Target Blood Glucose level
The goal is to maintain the blood glucose level within a certain range.

Critical Conditions

Severe Hyperglycemia - Very High Blood Glucose levels
Diabetic ketoacidosis (DKA) and hyperosmolar hyperglycemic state (HHS).

Severe Hypoglycemia - Very Low Blood Glucose levels
Unconscious, having seizures or too disoriented to swallow. Can be treated with a glucagon emergency kit.

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A DAY IN HER LIFE

Quotes

"My family, ex-colleagues and friends have shown huge support."

"Some days I wish I didn't have to follow such a strict schedule."

"It is very necessary to stay positive. Health remains better when you stay positive."

"I don't think I will live to see a cure. I have learn't to live with it."

Problems

- Pain from finger prick and insulin shot
- Need to follow a strict diet
- Blood sugar might get too high
- Pain from finger prick and insulin shot
- Might wake up due to low blood sugar

Experience

Timeline

6:30am	7:00 - 7:15am	(40 - 45mins) Morning Walk	8:30 - 8:45am	10:30 - 10:45am	12:30 - 1:00am	3:30 - 3:45pm	5:15 - 5:30pm	8:30 - 8:45pm	10:00 - 10:30pm	Middle of the night
Wake up			First Breakfast after taking insulin	Second Breakfast	Lunch		Evening snacks	Dinner		

Diet

1 cup tea with milk	Salad/oats/ fruits/	1 roti with sabzi	Proper portioned meal	Black Tea	Coffee and biscuits	Proper portioned meal	1 Glass of Milk	Chocolate/ snacks

Check blood sugar level

- Before Breakfast
- Before Dinner
- Sometimes in the middle of the night

Medication

- INSULIN SHOT — Before Breakfast — Ryzodeg - 27 units
- ORAL MEDICATION — After Breakfast — Carbophage XR 500mg - 1 pill
- ORAL MEDICATION — Before Lunch — G10 20mg - 1 pill, Dianorm 80mg - 1/2 pill
- INSULIN SHOT — Before Dinner — Novorapid penfill - 10 units, Tresiba flex touch - 5 units
- ORAL MEDICATION — After Dinner — Carbophage XR 500mg - 1 pill

Opportunities

- MONITORING — Non-invasive blood glucose monitoring
- MONITORING — Real time blood glucose monitoring
- TREATMENT — Non-invasive/oral administration of insulin
- TREATMENT — Automatic administration of insulin
- SUPPORT — Tool to help her manage her schedule more effectively
- SUPPORT — Ecosystem/tool to help her stay positive.
- CURE — Stimulating insulin generation in the body
- CURE — Monitoring insulin generation in the body

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