



**Smart Health**  
A care that never quits

## **Smart health Application description & objectives v1.4**

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We wanted to save people lives using AI to predict diseases risk ahead for that reason we started the Smart Health Monitoring project.

We started with predicting Cardiovascular diseases which is now integrated in our prototype and currently we are working towards diabetes prediction.

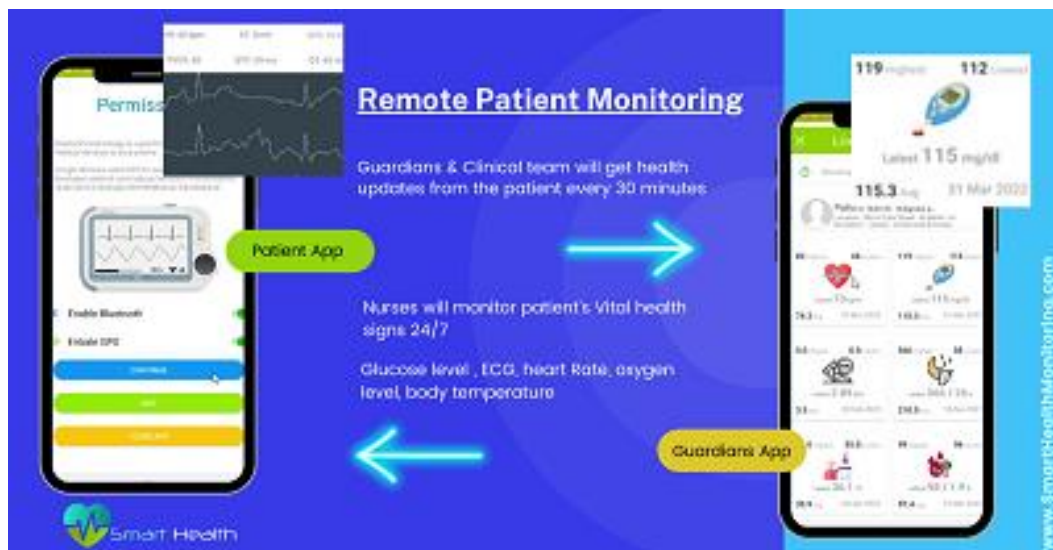
The care for diabetes can total to **over 4,500 USD annually while diabetes complications cost reach up to 6000 USD.**

The app is part of a project to save people lives by reducing the risk of complications for diabetes and cardiovascular diseases patients. We utilize the presence of our app with diabetes patient to discover family members who are in the pre-diabetes stage by using AI then guide them on life style improvements & weight loss.

Cardiovascular disease is the most costly complication of type 2 diabetes mellitus. Moreover, an estimated 86% of patients with type 2 diabetes mellitus get cardiovascular disease which is a cause of death.

One app can connect medical devices, patients and clinical teams. Communication between patient & clinicians, vital health measurement storage & retrieval are made simple and easy.

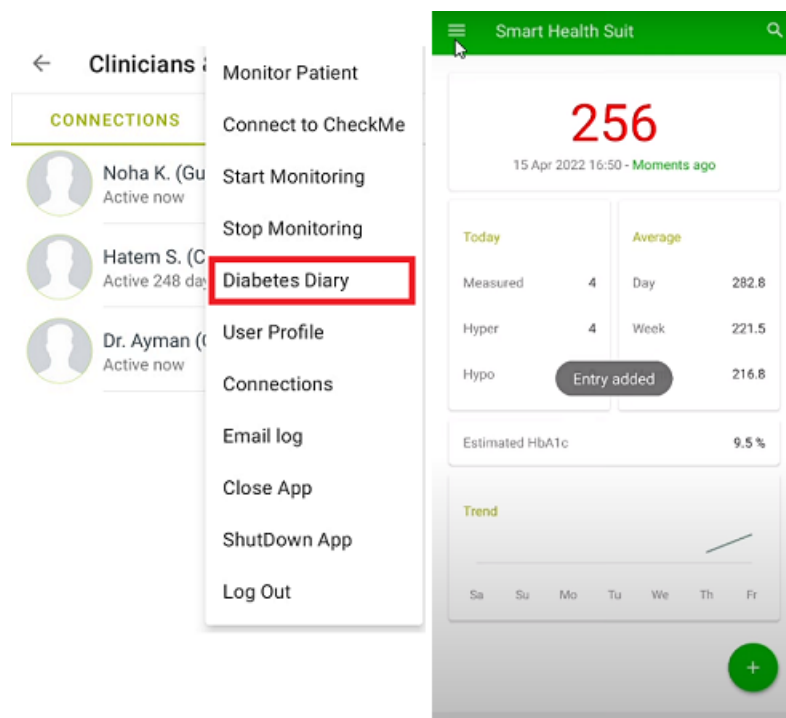
The app comes with an all-in-one FDA approved medical device (it is called Checkme) that is connected with our app through Bluetooth to measure their vital signs + ECG. Those measurements are automatically sent to clinicians or guardians registered on the patient app.



Checkme have a mini-monitoring mode which allows for continuous measurement for heart rate, Oxygen level and temperature combination for patients.

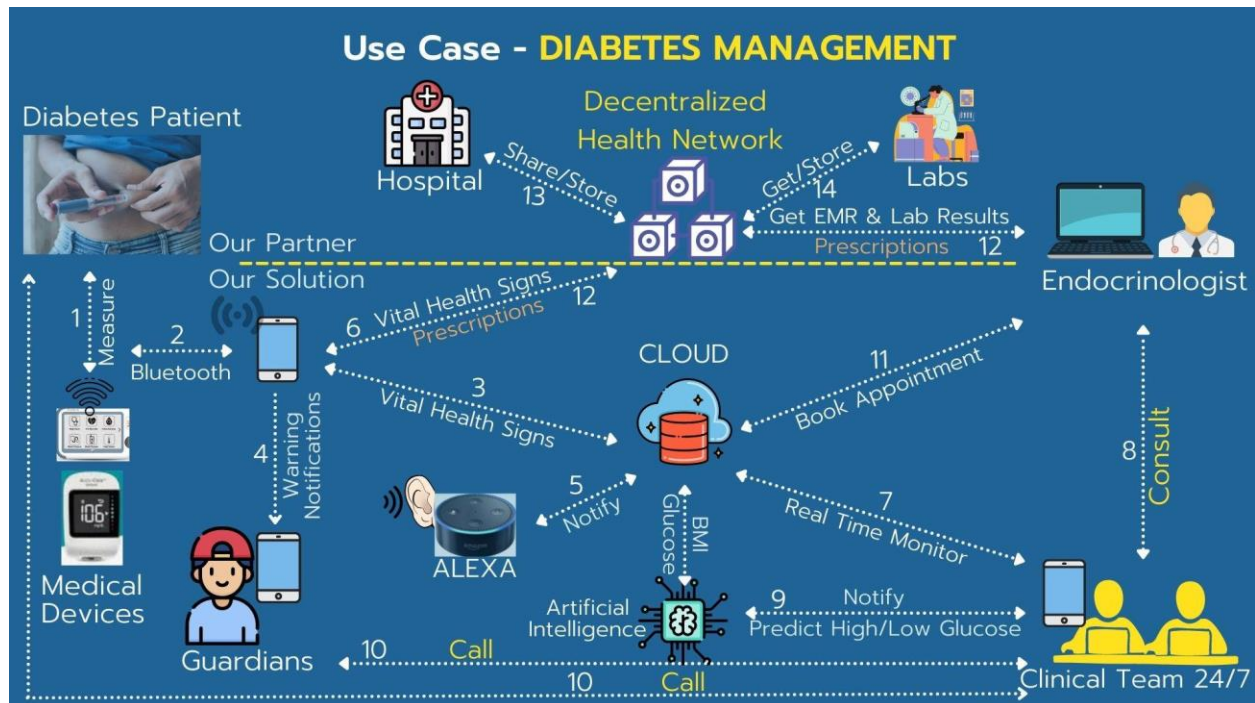
The app will keep patients under close monitoring from the clinical team and the clinical team can see all the vital signs history of the patients along with their carbohydrates intake, insulin intake and their HbA1c averages that the user key-in in their diabetes diary section of the app.

Diabetes dairy enables glucose level measurement tagging (ex. After food or fasting, morning or at night) which helps Endocrinologists in their diagnoses and for insulin prescription. The image below is for the diabetes dairy section of the app.

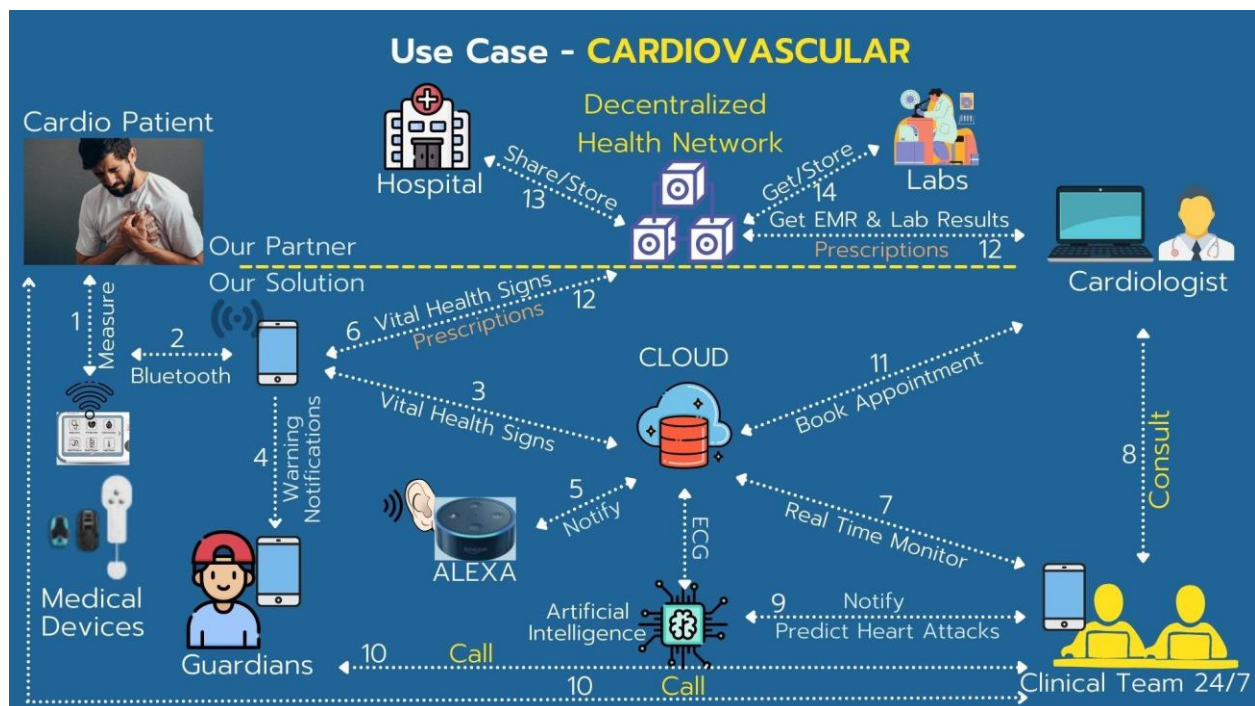


Human nature makes people start to see physicians when they are in pain or feel sickness and not when they experience light symptoms. AI prediction models can be handy here to help predict pre-diabetes using BMI, family history and fasting glucose level, while heart attacks can be predicted using ECG or blood pressure, cholesterol and glucose level (more pictures can found in the AI section below).

The following diagram show the whole patient monitoring cycle for diabetes patients



The diagram below show the whole patient monitoring cycle for cardiovascular diseases patients



We made AI models to predict cardiac arrest and we are in the process of linking it to our app. You can see them on the links below:

1) [High Risk] Cardiovascular diseases Prediction using AI:

<https://youtu.be/0797Foqn4II>

2) [Low Risk] Cardiovascular diseases Prediction using AI:

<https://youtu.be/s9SgSawY7pw>

## **AI Prediction Work**

We have a working prototype inside our smart health app that can predict if a patient is in risk of get a cardiovascular disease based on blood pressure, age, gender, fasting glucose level, smoking status and alcohol intake (see the images below from the app).

We have the knowledge to build AI healthcare prediction models and started working on diabetes prediction models based on BMI and fasting glucose measurements.

The current cardiovascular diseases model was trained using a 70,000 patient dataset and our model uses Gradient Boosting algorithm that gave an AUC (Area under the curve) of 80%. The prediction is performed on the cloud, we use Flask framework & python language on Heroku servers so please enable internet on your phone before trying the prediction.

The image on the most right shows the result of a prediction.

The image displays three sequential screenshots of a mobile application titled "Cardiovascular Diseases".

- Left Screenshot:** Shows the input form. It includes fields for Age (ex. 47), Height in cm (Range 140 to 210 cm), Weight in Kg (Range 50 to 200 Kg), Systolic Blood Pressure (ex. 120), Diastolic Blood pressure (ex. 80), Cholesterol level High range > 160 mg/dL, and Glucose Level High > 126 mg/dL. Below these are radio buttons for Gender (Female selected, Male) and a checkbox for Smoking.
- Middle Screenshot:** Shows a privacy notice dialog box. The text reads: "AI healthcare predictions don't substitute human doctors. They just enhance what they already can do by taking on certain tasks. We prioritize data privacy to the max. And we won't save any personal identifying information about you. Only health data might be saved on our server to improve our AI predictions." At the bottom are "STOP" and "PROCEED" buttons. A numeric keypad is visible in the background.
- Right Screenshot:** Shows the form after the dialog. It includes radio buttons for Female (selected) and Male, a checkbox for Smoking (No selected), and a checkbox for Alcoholic (No selected). Below these is a red warning message: "You might be at risk of getting a cardiovascular disease". At the bottom are two large buttons: "PREDICT" (blue) and "CLOSE" (yellow). A numeric keypad is also visible.

## **Main features:**

- 1) Predict cardiovascular diseases using AI models.
- 2) Connect with Checkme device to measure patient vital health signs + ECG
- 3) Usage of NEWS early warning scores for patients to detect deterioration in physiological area [app update in progress].
- 4) Ability to do live chat with clinical monitoring team
- 5) Diabetes diary to record insulin intake, carbohydrates consumption, meal details & HBA1C calculation.
- 6) Connection between clinicians / guardians and patients based on request / approval method.
- 7) Patient vital signs and location can be sent to clinicians & guardians in real time.
- 8) Estimated values for HbA1C with visualization.
- 9) Visualize blood glucose in graph and tag glucose measurements (ex. Fasting or 2h after meal, morning or at night).

## **Glossary:**

**Cardiovascular disease** : A type of disease that affects the heart or blood vessels.

**Gradient boosting Algorithm:** is a machine learning technique used in regression and classification tasks, among others. It gives a prediction model in the form of an ensemble of weak prediction models, which are typically decision trees

**Prediabetes stage:** It is start of the road having diabetes disease and can be recognized by fasting glucose level of 100 to 125 mg/dL (5.6 to 6.9 mmol/L )

**Vital signs** : are a group of the four to six most crucial medical signs that indicate the status of the body's vital functions. These measurements are taken to help assess the general physical health of a person, give clues to possible diseases

**Artificial intelligence (AI)** : uses mathematical and statistical methods to predict the value or status of something of interest. Artificially intelligent computer systems are used extensively in medical sciences. Common applications include diagnosing patients, end-to-end drug discovery and development, improving communication between physician and patient, transcribing medical documents, such as prescriptions, and remotely treating patients.

**ECG**: An electrocardiogram (ECG) is a simple test that can be used to check your heart's rhythm and electrical activity. Sensors attached to the skin are used to detect the electrical signals produced by your heart each time it beats.

**Diabetes**: With diabetes, your body either doesn't make enough insulin or can't use it as well as it should. Diabetes is a chronic (long-lasting) health condition that affects how your body turns food into energy

**Remote patient monitoring (or remote health monitoring)**: allow providers to monitor, report, and analyze their patient's acute or chronic conditions from outside the hospital or clinic setting. They enable real-time understanding of a patient's disease state, enabling the provider to make proactive clinical decisions.

**Clinical Care**: used to help people to know what care to expect for a particular clinical condition and to help them to make informed decisions about treatment in collaboration with their health professional.

**NEWS (national early warning score)**: assessment to obtain the score for the evaluation of the patient. It is based on the aggregation of the six physiological parameters, four of them are respiration rate, temperature, systolic blood pressure, pulse rate and the other two which are also known as fifth vital sign and are level of consciousness or new confusion and oxygen saturation.



**Checkme : All-in-one vital signs monitor for doctors, caregivers, and patients.**

Integrates ECG/EKG, ECG Holter, SpO2 (oxygen saturation), PI (perfusion index), NIBP (Non-Invasive Blood Pressure), body temperature, and pedometer in one device with a palm-sized design.