Project Name: Self-Health: Online Patient Follow-up System

Abstract

Telehealth is defined by the World Health Organization as "providing health services when patients and treatment providers are separated by distance." In this project, we aim to ensure the disease follow-up of 3 chronic diseases that are Hypertension, Cardiovascular Diseases, Chronic respiratory diseases in addition to this, COVID-19, to patients who are isolated in their homes and continue their treatment. In order to provide this service, we developed a mobile application and a medical device that works in a coordinated manner. In this way, patients in the high risk group will be prevented from being affected by hospital environments, and the follow-up of COVID-19 patients receiving treatment at home will be easier. It has been determined that medical device companies are currently developing systems that allow patients and doctors to see them remotely by making the devices used in hospitals portable.

Research on patent and utility models particularly made in Turkey show that there is a trend towards specific diseases or injuries for follow up systems. As a result, it is predicted that new studies in this field will increase as time passes. Especially the global impact of the COVID-19 pandemic, which started locally in December 2019, has greatly increased the need to receive home healthcare services. The medical device which was developed within the scope of our project named *Self-Health* will consist of a main unit and provide a kit to which the relevant sensors are connected according to the patient's request. In this way, patients will be able to get all the test equipment they need, instantly the data from the sensors will be processed with the microprocessor and transferred to the mobile device with a Bluetooth module. Both the patient and the doctor will be able to instantly access these data on their own screen and make video calls via the mobile application. In this way, routine examination and regular controls of patients will be done more efficiently. Thus, patients only in emergencies will have the need to visit the hospital.

Introduction

The COVID-19outbreak, which has affected the world since December 2019, has caused difficulties in the health system of many countries. As a result, people avoid being examined in hospitals due to the risk of coronavirus. Studies show that it is dangerous for chronic patients with a high rate of exposure to coronavirus to go to the hospital. Table 1 shows the hospitalization rates of some chronic diseases due to COVID-19. ("COVIDView, key updates for week 33," 2020)
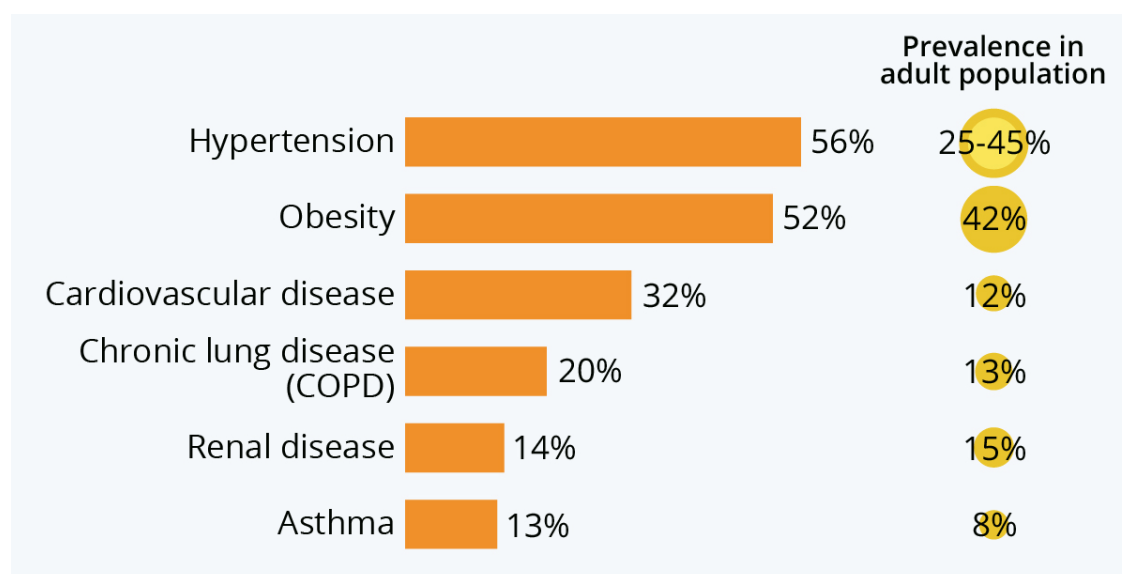

Table 1: Common Underlying Medical Condition in Adults Hospitalized for COVID-19

Person with the following conditions are at increased risk of a lot of illness from the virus that leads to COVID-19:("Coronavirus disease 2019 (COVID-19)," 2020)

- Cancer

- Chronic kidney disease

- Severe Obesity (BMI ≥ 40 kg/m2)

- Sickle cell disease

- Smoking

- Type 2 diabetes mellitus

- COPD (chronic obstructive pulmonary disease)

- Heart conditions, such as heart failure, coronary artery disease, or cardiomyopathies

- Immunocompromised state (weakened immune system) from solid organ transplant

- Obesity (body mass index [BMI] of 30 kg/m2 or higher but < 40 kg/m2)

Furthermore, people from any age with the following conditions can be at an increased risk for a lot of illness from the virus that causes COVID-19:("Coronavirus disease 2019 (COVID-19)," 2020)

- Hypertension or high blood pressure

- Thalassemia (a type of blood disorder)

- Type 1 diabetes mellitus

- Asthma (moderate-to-severe)

- Cerebrovascular disease (affects blood vessels and blood supply to the brain)

- Cystic fibrosis

- Liver disease

- Overweight (BMI > 25 kg/m2, but < 30 kg/m2)

- Pregnancy

- Pulmonary fibrosis (having damaged or scarred lung tissues)

- Immunocompromised state (weakened immune system) from blood or bone marrow transplant, immune deficiencies, HIV, use of corticosteroids, or use of other immune weakening medicines

- Neurologic conditions, such as dementia

Problem Description

According to the results of the many studies, it is seen that many patients are at risk due to the COVID-19virus. WHO recommends that these chronic patients stay away from crowded environments where they may come into close contact with patients infected with corona. ("Advice for the public on COVID-19 – World Health Organization," n.d.) Certainly, hospitals where coronavirus patients are treated are at the top of these environments. However, each chronic patient should always be followed up with periodic measurements and examinations. For example, blood pressure values of blood pressure patients should be monitored and periodically examined by the patient's doctor. ("Hypertension," 2019) However, considering that hospitals carry risks for chronic patients during the pandemic period, it has become a need to monitor these patients remotely. Apart from this, it can be said that regular follow-up of chronic patients in normal times is of great importance. For example, for chronic patients, it is vital that medicines are taken at the right doses and at the right times. However, it is observed that chronic patients have problems using their medication regularly. The relevant data on this issue is given in Table 2: ("CDC grand rounds: Improving medication adherence for chronic…" 2019)
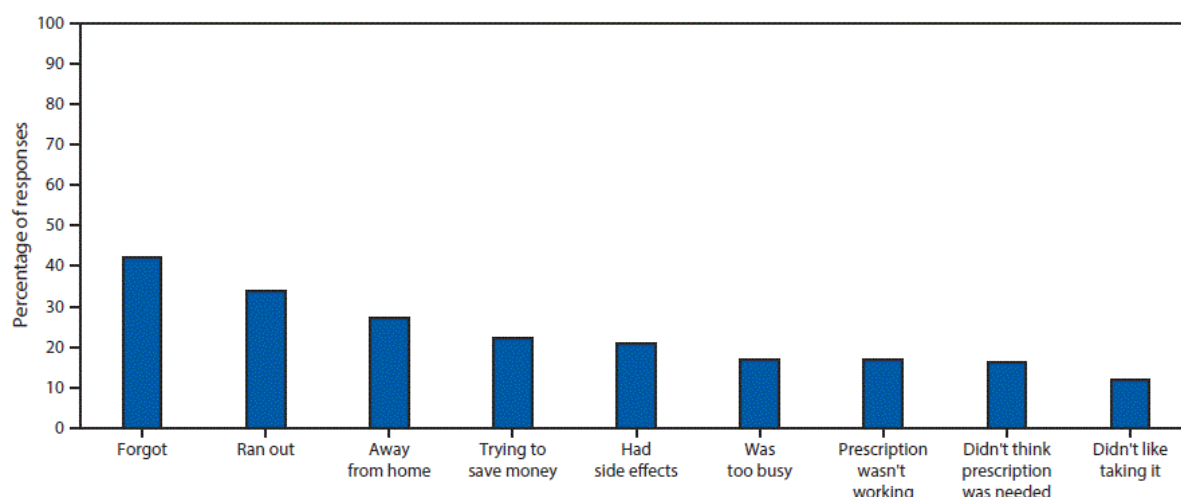

Table 2: Self-reported Reasons for Non-adherence to recommended Medication Regimens

From the data in Table 2, it is understood that there is a supreme need for regular measurements of chronic patients as well as monitoring their medications. In the light of the data given above, it is understood that the measurements of chronic patients and drug taking data at all other times, especially during the pandemic period, are vital in terms of preventing the disease from progressing. Some studies have been done before regarding some of these needs.

Related Works

Studies in this field are known as the studies in the field of "telehealth". The World Health Organization(WHO) defines telehealth as "providing health services when patients and treatment providers are separated by distance". ("Telehealth,"n.d.) Again, WHO reported that there are some obstacles to developing programs to provide health services in order to expand telehealth services. These can be summarized as:

- Financial deficiency

- Infrastructure deficiencies (equipment or connectivity)

- Lack of legislation or regulations covering telehealth services ("Telehealth," n.d.)

The outstanding studies that have been developed despite these obstacles are briefly mentioned below:

1. TytoCare

A doctor with TytoCare can examine these all: the heart, lungs, throat, ears, skin, abdomen, heart rate, body temperature, and diagnose and treat common conditions. TytoCare can also be used by the healthcare provider to monitor chronic conditions and monitor the health of a patient after surgery or a procedure. ("About us | TytoCare medical exams and Telehealth visit platform," 2020)

2. SteadyMD

SteadyMD is a fully online based service that defines itself as "a completely new approach to primary health care". It provides its service in the form of subscriptions. It can provide care and treatment for ailments that are easier to track, such as colds, flu, minor injuries and infections, stress management, blood pressure, and allergies. Measurement kits are not used, only the patient's communication with the doctor is provided. (*SteadyMD*, 2018)

3. Anwell

Anwell is a tele-health service that aims to complement primary health care. Users can receive optional healthcare services by downloading the free mobile application and choosing a suitable doctor. (*ANWELL tlač a kopírovanie Bratislava*, n.d.)

4. AliveCor

AliveCor, which aims to save lives and transform cardiology by providing smart, personalized heart data to clinicians and patients anytime, anywhere, consists of a mobile application and a kit integrated into this mobile application. Thanks to the kit, electrocardiogram (ECG) can be acquired and atrial fibrillation, bradycardia, tachycardia or normal heart rhythm can be detected. (*AliveCor*, n.d.)

5. Lumify

It is a device and mobile application developed by Philips that turns the smart device (only Android devices, USB type C and B) into a portable ultrasonography device. ("Lumify | Philips healthcare," n.d.) Many of these products enable the patient and the doctor to communicate online and provide the follow-up of various measurements with the integrated circuit system. However, these products have been developed mostly to diagnose diseases. Studies similar to Lumify and AliveCor focused on a specific area with a specific health kit.

Proposed Solution

Self-Health brings a different perspective to the telehealth service. It provides periodic follow-up services to chronic patients who are diagnosed and need continuous follow-up instead of diagnosing patients. It performs this service by performing various measurements related to the diseases, drug follow-ups and presenting these data to doctors. At the same time, it informs the doctor about the subject in necessary cases such as exceeding the reference values related to the diseases and enables the patient and the doctor to have a video call. The features of *Self-Health* in providing this service can be listed as follows:

- To ensure the best follow-up of chronic patients who need to be examined in hospitals, especially during the pandemic period, from their homes

- To facilitate the follow-up of COVID-19 patients who are isolated in their homes

- Ensuring that chronic patients take their vital medicines regularly

- Portable and ergonomic design

- Instantaneous access of measurement data by both doctor and patient via mobile app

The diseases expected to be followed up in this project and general information on them are given below:

1. COVID-19 (body temperature, spirometer and pharmaceutical track)

2. Hypertension (blood pressure follow-up and pharmaceutical track)

3. Cardiovascular Diseases (ECG, blood pressure and pharmaceutical track)

4. Chronic respiratory diseases (spirometer and pharmaceutical track)

1. COVID-19

Overview

Most of the people who are infected with the COVID-19 virus will have respiratory illness and recover without any special treatment. Older people and those who have medical conditions like cardiovascular disease, diabetes and chronic respiratory disease are more likely to develop serious illness. The main transmission factors of COVID-19 virus are droplets of saliva or nasal discharge. When an infected person talks, sneezes or coughs, it is important to follow respiratory etiquette. ("Coronavirus," 2020)

Treatment

COVID-19 vaccine has not yet been developed and there is no specific antiviral treatment. As the virus causes respiratory failures, the first step in the treatment is regarded to be oxygen therapy. Also, intensive care therapy is used to deal with the complex forms of the disease. In addition to these, some countries are trying some medications on patients. ("Features, evaluation, and treatment of coronavirus (COVID-19) - StatPearls - NCBI bookshelf," 2020)

Disease Follow-up

Coronavirus patients go into isolation to reduce the transmission of the virus. Patient follow-up is very important in this isolation process. ("Advice for the public on COVID-19 – World Health Organization," n.d.) Patient's fever and respiratory data should be followed in this period. *Self-Health* allows the doctors to remotely monitor the fever and respiratory data of patients who are isolated at home and whose treatment is ongoing, while at the same time monitoring the medications used to support the patient's treatment. For this, the system includes a body temperature sensor and a spirometer.

Equipment to be used to Monitor the Disease in the System

- *Body Temperature Sensor*

- *Spirometer:* Spirometer is a device that measures the function of the lung in itself. ***Self-Health*** spirometer does not make a clear diagnosis about lung function, but informs the doctor about the ventilation volume of the lung. In this way, a superficial respiratory test is actually performed and the doctor obtains important information about the patient's respiratory capacity.

2. Hypertension

Overview

Blood pressure is the force exerted by circulating blood against the walls of the body's arteries, the major blood vessels in the body. When blood pressure is too high than the normal values, it is called hypertension.

What are the factors of risk for hypertension?

Risk factors include unhealthy diets (excessive salt consumption, a diet high in saturated fat and trans fats, low intake of vegetables and fruits), being physically inactive, tobacco and alcohol, and being overweight or obese. Non-modifiable risk factors include a genetic history of hypertension, age over 65 years and having diseases such as diabetes or kidney disease. ("Hypertension," 2019)

Treatment

Reducing hypertension prevents heart attack, stroke, and kidney damage, as well as other health problems. Below is information on how to prevent and control hypertension:

Prevention

- Reducing salt intake (to less than 5g daily)
- Eating more fruit and vegetables
- Doing physical activities
- Reducing use of tobacco

- Reducing alcohol consumption

- Limiting the intake of foods high in saturated fats

- Reducing foods with trans fat

Management

- Being in a good mental health

- Regularly follow-up blood pressure

- Regular treatment for high blood pressure

- Managing other medical conditions ("Hypertension," 2019)

Number of Patients with Hypertension

According to WHO:

- An estimated 1.13 billion people worldwide have hypertension, most (two-thirds) living in low- and middle-income countries.

- In 2015, 1 in 4 men and 1 in 5 women had hypertension.

- Hypertension is the leading cause of premature death worldwide

- One of the global goals of non-communicable diseases is to reduce the prevalence of hypertension by 25% by 2025 (baseline 2010)

Disease follow-up

According to the World Health Organization, regular blood pressure control should be done to keep hypertension under control. In addition, pharmacological treatment (drug treatment) seems to be very effective in lowering blood pressure and preventing the consequences of cardiovascular diseases in most patients. (1) Therefore, it is vital that these patients use their medications regularly. *Self-Health* measures blood pressure data of blood pressure patients and graphs them for use by the doctor. When the patient's blood pressure values exceed the reference value, the doctor is informed by the mobile application. In addition, it is ensured that the patient takes his medicines at the right times. By monitoring the drug and blood pressure values at the

same time, it can be evaluated by the doctor whether the drug used is successful in treatment. ("Hypertension," 22)

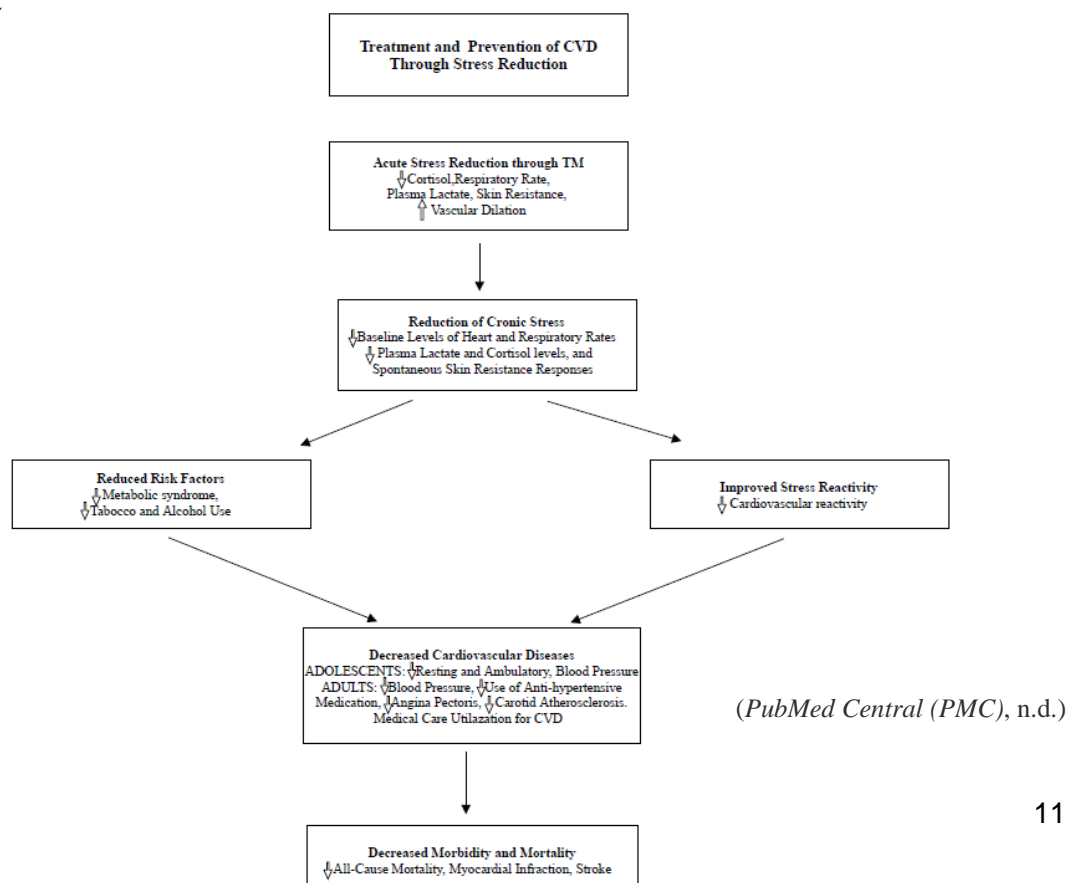**Equipment to be used to Monitor the Disease in the System**

- *Blood Pressure Measurement*

3. Cardiovascular Diseases

Overview

Cardiovascular diseases (CVDs) are the most fatal diseases globally, taking approximately 17.9 million lives every year. CVDs are a group of diseases of the heart and blood vessels and include coronary heart disease, cerebrovascular disease, rheumatic heart disease and other conditions. Some individuals who are at risk of CVD may demonstrate raised blood pressure, glucose, and lipids as well as being overweight and obesity. Appropriate treatment of the people who are at highest risk of CVDs can prevent premature deaths. Availability of non-communicable disease medicines and basic health technologies in all primary health care facilities is an essential key to ensure that people at risk receive treatment and counselling. ("Cardiovascular diseases," 2019)

Treatment

Treatment and Prevention of CVD
Through Stress Reduction

Acute Stress Reduction through TM
⇓Cortisol,Respiratory Rate,
Plasma Lactate, Skin Resistance,
⇑ Vascular Dilation

Reduction of Cronic Stress
⇓Baseline Levels of Heart and Respiratory Rates
⇓ Plasma Lactate and Cortisol levels, and
Spontaneous Skin Resistance Responses

Reduced Risk Factors
⇓Metabolic syndrome,
⇓Tabocco and Alcohol Use

Improved Stress Reactivity
⇓ Cardiovascular reactivity

Decreased Cardiovascular Diseases
ADOLESCENTS:⇓Resting and Ambulatory, Blood Pressure
ADULTS: ⇓Blood Pressure, ⇓Use of Anti-hypertensive
Medication, ⇓Angina Pectoris, ⇓Carotid Atherosclerosis.
Medical Care Utilazation for CVD

(PubMed Central (PMC), n.d.)

Decreased Morbidity and Mortality
⇓All-Cause Mortality, Myocardial Infraction, Stroke

Disease Follow-up

Many data of a patient with cardiovascular disease should be kept under control, as is stated in Table 1 in the treatment title. *Self-Health* keeps track of heart rate, blood pressure, heart rhythm and respiratory function data from these data. In addition, the medication that the patient needs to continue regularly can be followed up without skipping the dose. As a matter of fact, it was emphasized in the 'treatment' sections that regular drug treatment is also important in treatment. In this way, many data of the patient can be kept under control by the doctor and possible complications can be prevented.

Equipment to be used to Monitor the Disease in the System

- *Heart Rate Sensor*

- *Blood pressure measurement*

- *Spirometer*

- *ECG:* ECG, which is used for the diagnosis of cardiovascular diseases, is a device that graphically records the electrical activity that occurs during the contraction of the heart. A weak electrical activity occurs during the contraction and relaxation of the atria and its ventricles, also known as the heartbeat. This activity contains a lot of data about the heart rhythm, frequency and propagation. *Self-Health* ECG, on the other hand, provides periodic information to the doctor about the heart rhythm without recognizing the diagnostic purpose.

4. Chronic Respiratory Diseases

Overview

Chronic respiratory diseases (CRDs) make effect on the airways and other structures of the lung. Some of the most common CRDs are chronic obstructive pulmonary disease (COPD), asthma, occupational lung diseases and pulmonary hypertension. In addition to smoking

tobacco, other risk factors may be listed as air pollution, occupational chemicals and dusts, and frequent lower respiratory infections during childhood.

Treatment

Treatment for different chronic respiratory diseases vary and the ideal solution for treatment is the reduction and avoidance of risk factors. Although there is no cure for neither asthma nor chronic obstructive disease (COPD), treatments can reduce symptoms and improve the quality of life. Appropriate management of asthma with medications and regular follow-up can control the disease and reduce deaths. People with persistent symptoms need daily, long-term medication. ("Chronic respiratory diseases," 2019)

Disease Follow-up

As mentioned in the 'Treatment' section, treatments differ for each chronic respiratory disease. While some of these can be treated with drugs, COPD and asthma patients cannot be treated. However, these patients also use drugs throughout their lives to improve their quality of life. In addition, oxygen saturation is monitored and spirometry measurements are made, especially in COPD patients, to make inferences about whether the lung is functioning or not and for other examinations. *Self-Health* monitors chronic respiratory patients with oxygen saturation measurement (38) and spirometer system as well as drug monitoring. ("ABC of oxygen: Oxygen therapy in chronic lung disease," 26)

Equipment to be used to Monitor the Disease in the System

- *Oxygen Saturation Measurement*
- *Spirometer*

Number of Patients with Chronic Respiratory Disease

According to WHO data, 235 million people in the world are chronic respiratory patients.

Medical Device and Mobile App

We propose the following solution in order to solve the aforementioned problems, first the patients need to be equipped with our device after, they need install our mobile app and enjoy the benefits of telehealth in the comfort of their home.

What are the features of the Medical Device?

The medical device contains a microprocessor, a Bluetooth module, a battery, a charge input, sensors (temperature, blood oximeter, ECG, load cells, spirometer, RGB led). Its sizes are 320 mm width, 260 mm length and 60 mm height.

How does the medical device work?

The medical device is able to get many data from users from its diverse sensors. For example, the pill boxes are designed in order to detect the number of medicines in it. For instance, if the time is up to take medicine, beside notifications from application, an alarm light will be appeared in the RGB led of the wanted medicine. After that, when the patient takes from there a pill, the sensitive load cells will measure it and the alarms will be closed and the system will understand that the patient took the medicine.

**How does the medical device look like?**

The *Self-Health* medical device is designed in order to contain components of the most frequent diseases. Also, a cell phone stand is included in the design so that patients can easily talk with the doctor (Picture -2) and see his/her health records (Picture -3).

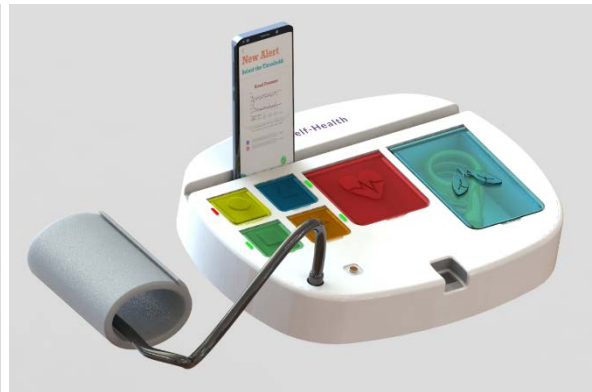According to Picture -1 the components of the device are as follows:

A- The blood pressure measuring device (For blood pressure follow-up)

B- Different colored drug boxes for different treatments. (For pharmaceutical track)

C- ECG device

D- Spirometer

E- Body temperature measuring device

F- Pulse Oximeter
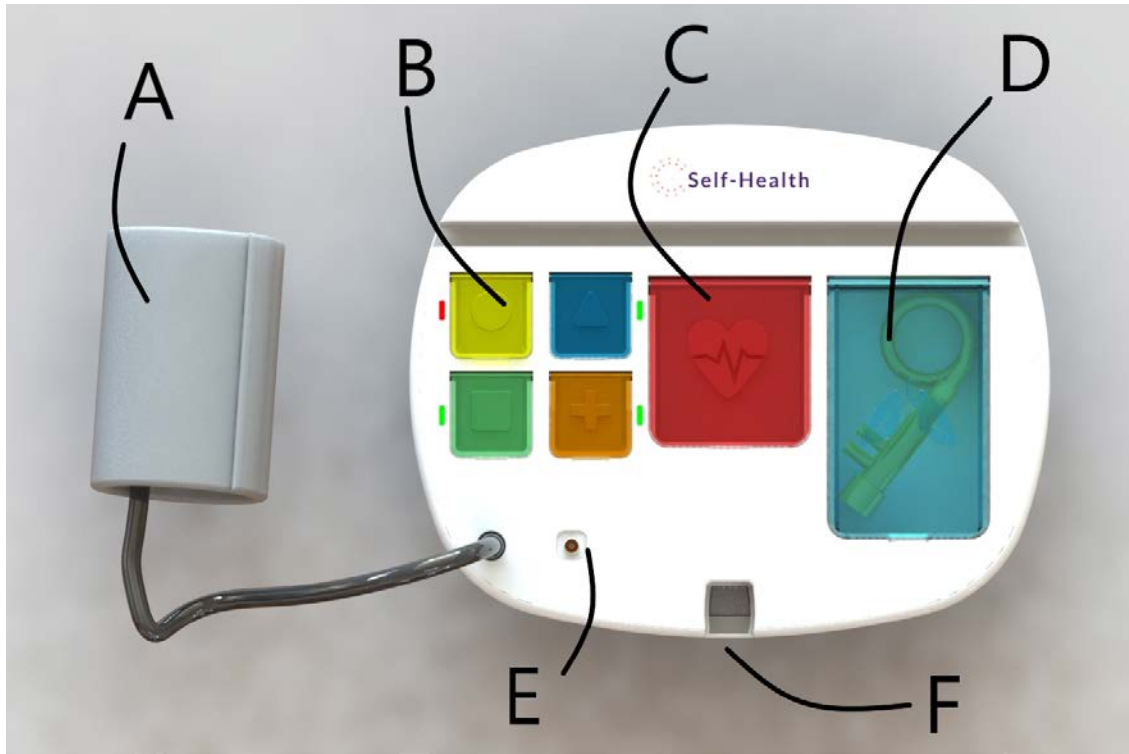
Picture -1
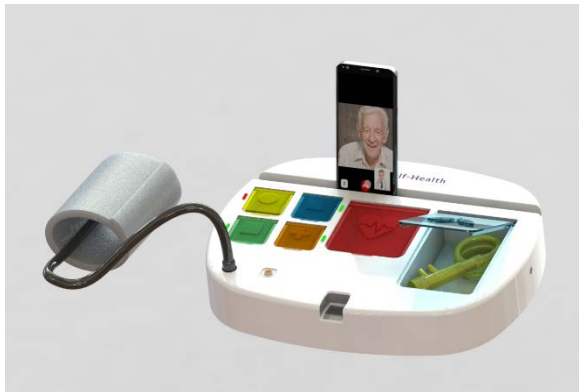
Picture -2

Picture -3

How Does the Mobile App Work?

Mobile app of the *Self-Health* is designed to communicate with the hardware that processes physical sensors. The app and hardware communicate in such a way that the only thing the user needs to do is to connect the device to the phone via Bluetooth connection. When a measurement is needed, the user will just plug the sensor in the device and will do the measurements according to the steps shown on the screen. We think that any kind of user should be able to check what he/she wants easily. Therefore, we kept the design of the application and hierarchical design of the pages as smooth as possible. Application flow is explained below:

Sign-in Page

Applications have different functionalities for patients and for doctors. Since, doctors and patients have different kinds of accounts. Initial page of the application is a Sign-in page for patients. If the user has a doctor account, he or she can go to the Sign-in Page for doctor by clicking the "Doctor Account" button on the right-bottom corner of the screen. If the user doesn't have an account, he or she can go to the Sign-up page by clicking the sign-up button on the left bottom corner of the page. If the user has a patient account, he or she can enter the app by entering necessary information.
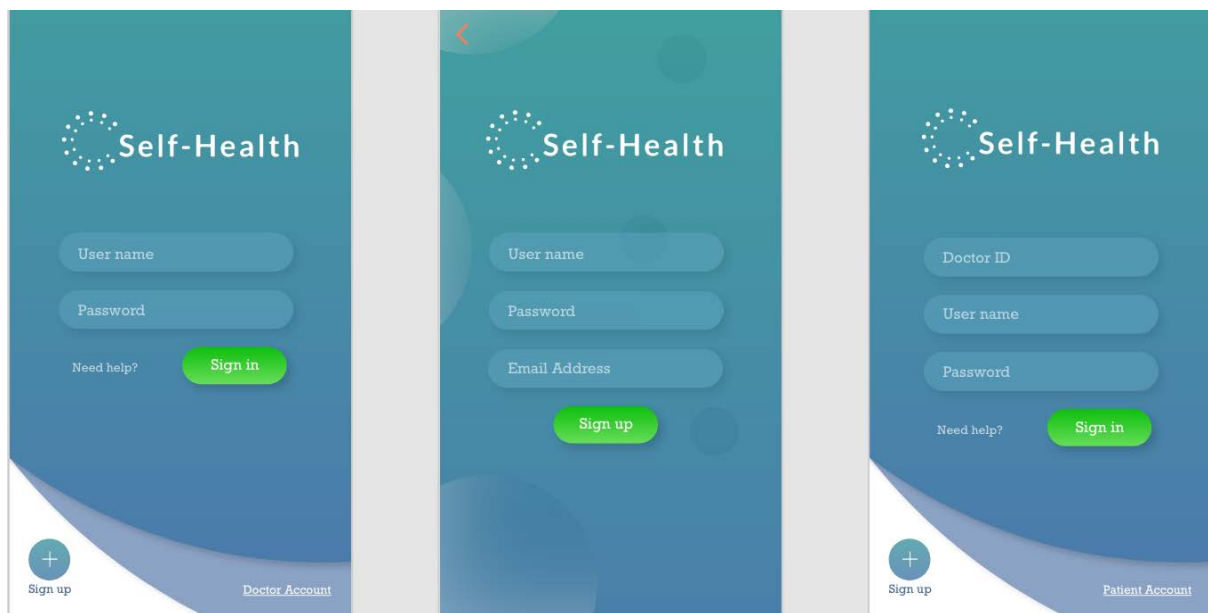

Home Page

In the design of the homepages, it is aimed that users can reach every attribute of the application easily. In the patient point of view of the application, users can see their appointments (closest appointment preferred), medicine reminders and measurements. With basic hierarchical design of the application, users can go to these pages by clicking to see more detailed information and to change information.
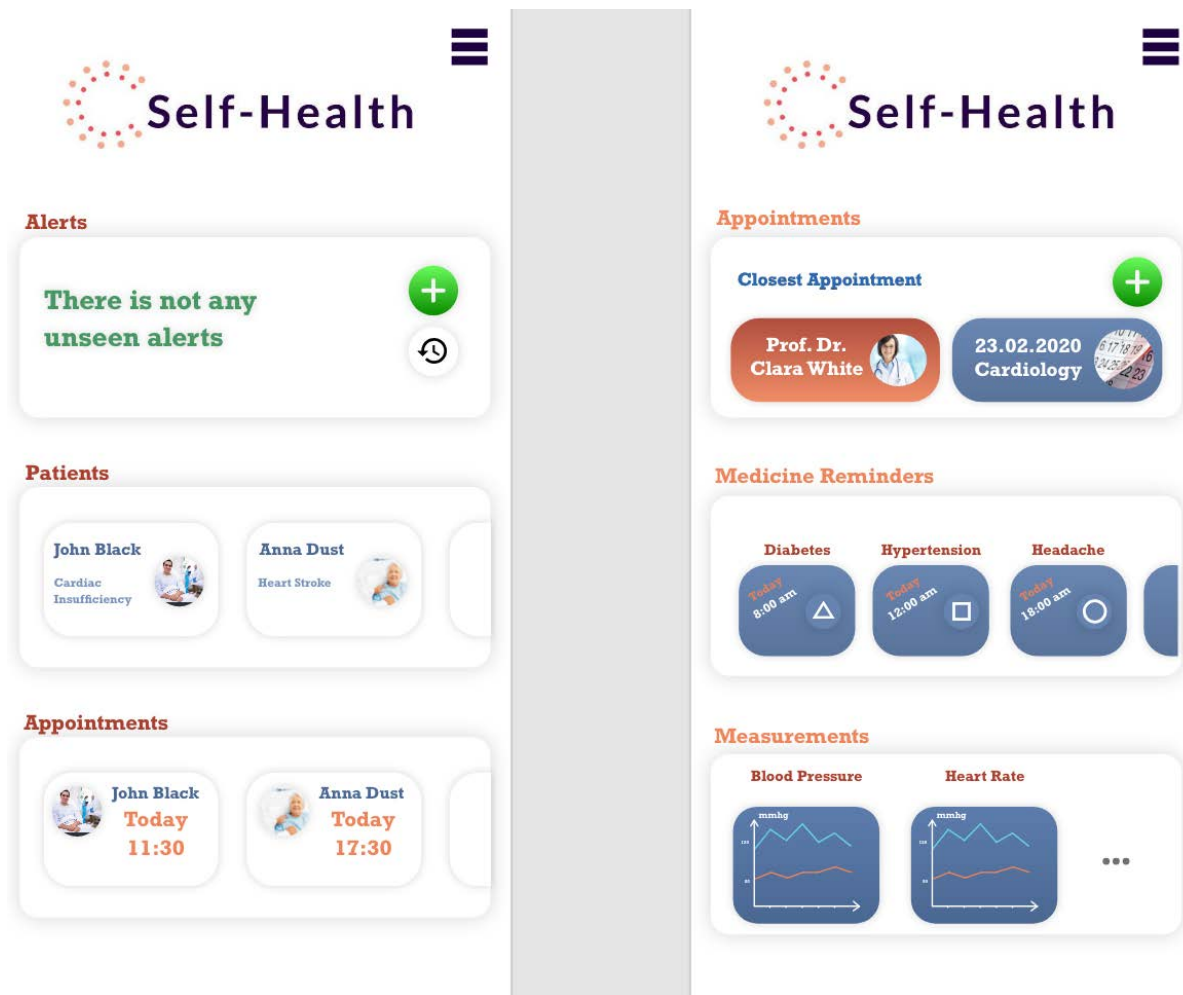
Doctor homepage on the left and Patient homepage on the right

- In the Appointments page, scheduled appointments are listed from top to bottom. In addition, users can make new appointments by navigating to the new appointments page. Users can also see the history of their appointments by clicking and navigating the history of appointments button.

- In the Medicine Reminders page, users can see the closest medicine that they should take. In addition, they can add more reminders to follow. These reminders are tagged by some symbols (which are the symbols that are on the medicine boxes of the device) in order to follow the medicine taken by the patient.
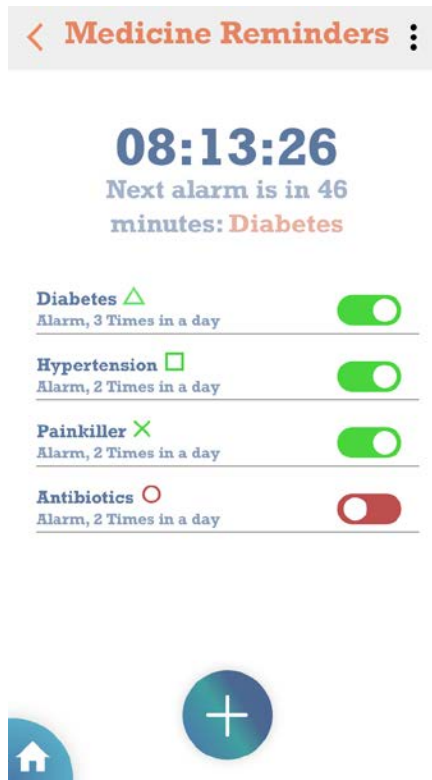
Medicine Reminders page

- In the Measurements page users' measurements related to their diseases are recorded. These measurements are at the same time shared with their doctor. (It is mentioned below.) On this page users can add a new measurement by clicking the add measurement button and selecting the measurement type or can view their past measurements by simply clicking on the related measurement. On the other hand, in the doctors' point of view, users can see alerts that have been raised, their patients and their appointments on the homepage. Again thanks to the simplicity of the hierarchical design, users can navigate through those pages for detailed information.

- An Alert is some kind of alarm that doctors set up for the patients that are on follow. Doctors set up these alarms such that if a specific measurement exceeds a specific threshold, they are immediately informed. In the alerts page, doctors can see active alerts that they set for their patients. In this page, they can set new alerts for their

patients or arrange an existing alert. Steps of setting a new alert from alerts page is shown below:
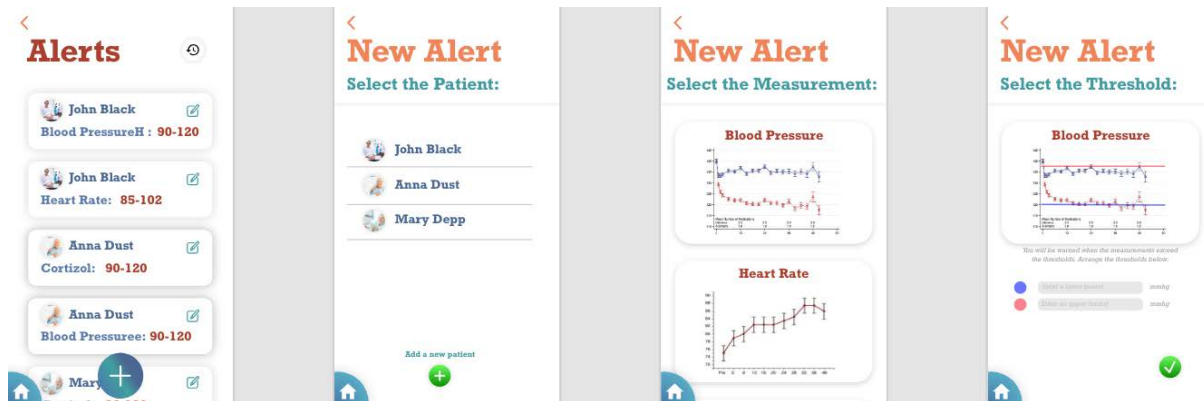

(from left to right) setting a new alert for a patient

- In the patient's page, users can see the list of patients that are on their concern from top to bottom. In this page, users can navigate to a patient's page by just clicking on their name. Users also can add a new patient to follow by clicking add a new patient. By clicking a specific patient's name, users are navigated to that patient's page. On that page, doctors can see detailed information about the patient such as their medication routine and their specific measurements. Navigation of patient's page is showed below:
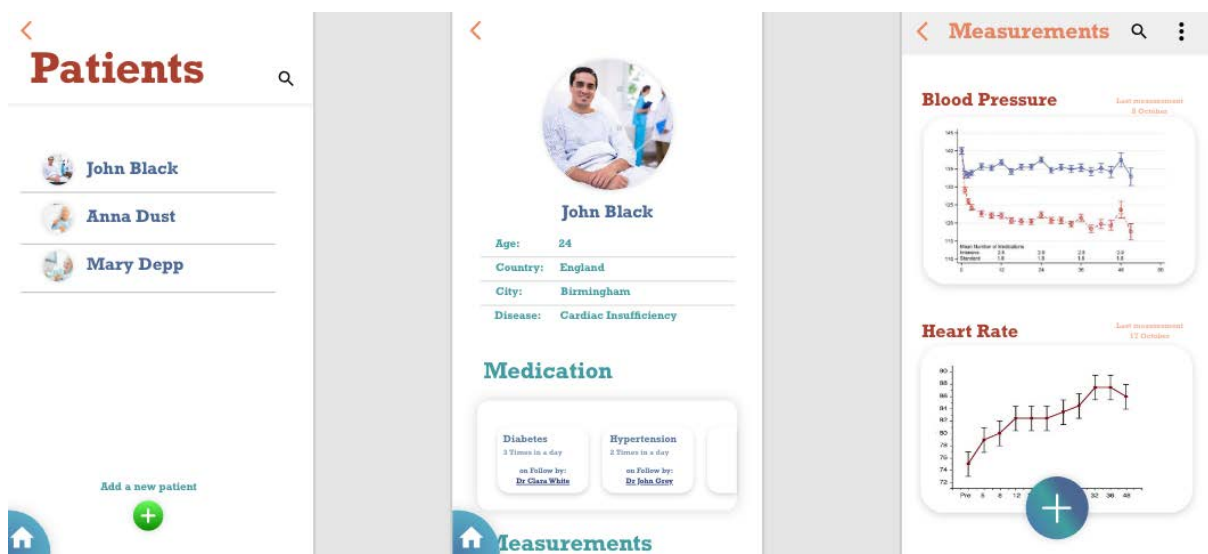
(from left to right) navigating to detailed measurements of a patient.

- In the appointments page, different from patients' point of view, doctors have the button to start a video call. Video call button is locked until the appointment time. They can navigate to the measurements page during the video call.
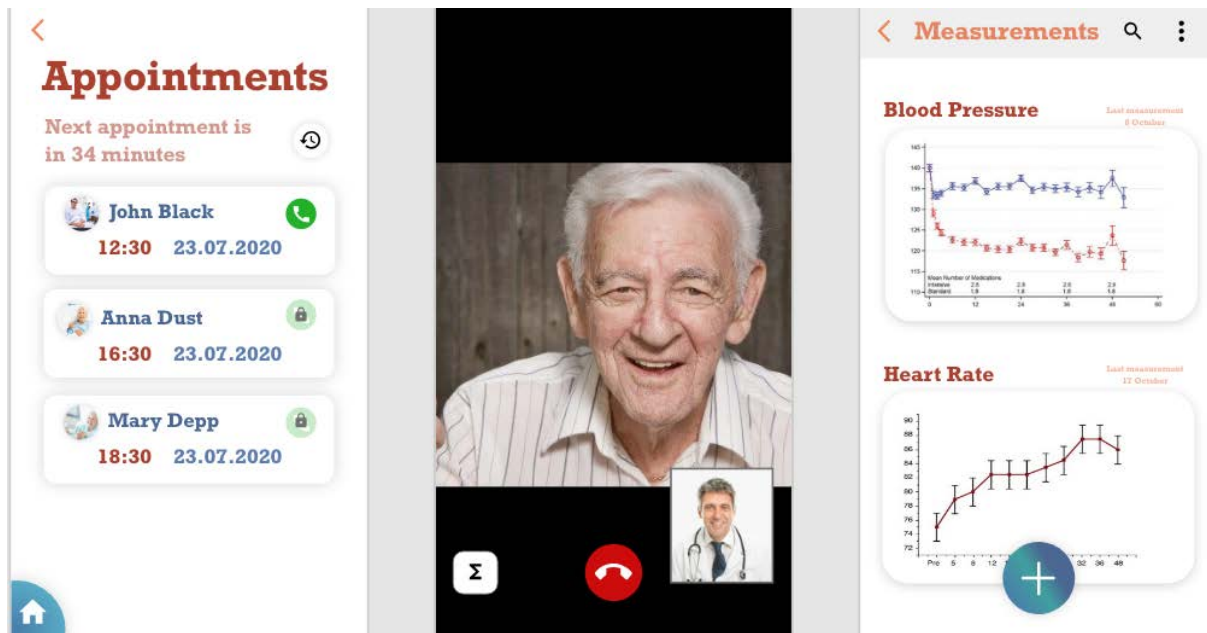
(from left to right) Appointments and video call pages step by step

How Does *Self-Health* Follow-up Patients: A typical scenario

Self-Health has set up a system that can follow up to 4 different medicines for patients with chronic diseases and COVID-19 treatment in its target audience. Let's explain the working logic of the system with an example: Let's assume that the doctor prescribes his patient to take a certain pharmaceutical twice a day. The reference values that the doctor prescribed will be taken at what time the drug will be taken, when the measurements about the disease should be made, and the patient's measured values should not exceed the 'drugs and follow-up' section of the mobile application. The patient who puts the drug in the relevant part of the *Self-Health* device needs to take the medicine from the chamber and use it when the mobile application alarm starts. When the lid of the relevant chamber is opened, the system assumes that the patient took his medicine and records the time and date. The patient uses the necessary sensor to measure

and the measured value is recorded in the 'measurements' section with date and time in the mobile application. The doctor can see these values graphically at any time. In this way, it can track whether the patient has taken the medicine at the right times and the values related to the disease. The doctor may warn the patient when there is a lack of medication use. However, the system sends a notification to the doctor when results other than the reference values appear in the patient's values. If the doctor wishes, S/he can schedule an appointment with his patient or make warnings on the chat screen.

Conclusion

As stated in the methods section, *Self-Health* will provide follow-up for patients who have chronic diseases and for patients in isolation due to the pandemic outbreak of COVID-19. These include chronic ailments; hypertension patients, cardiovascular patients, chronic respiratory patients.

These diseases are chosen to be followed, because of the following:

- These patients are among the dangerous group if the COVID-19 virus is infected. ("Coronavirus disease 2019 (COVID-19)," 2020)

- A very serious number of people have these diseases:

- An estimated 1.13 billion people worldwide have hypertension ("Hypertension," 2019)

- 235 million people suffer from Chronic respiratory diseases in the world ("Chronic respiratory diseases," 2019)

- Congestive Heart Failure, which is only one of the cardiovascular diseases, is seen in 6.2 million people in the USA alone. ("Heart failure," 2019)

- Selected diseases are among the leading causes of death in the world. Considering the disruption of the follow-up of these patients during the pandemic period, *Self-*

Health aimed to follow them, with the concern that the mortality rates might increase.

- Cardiovascular diseases are the number 1 cause of death.17.9 million people die each year because of them. And it means %31 of all deaths globally. ("Cardiovascular diseases," 2019)
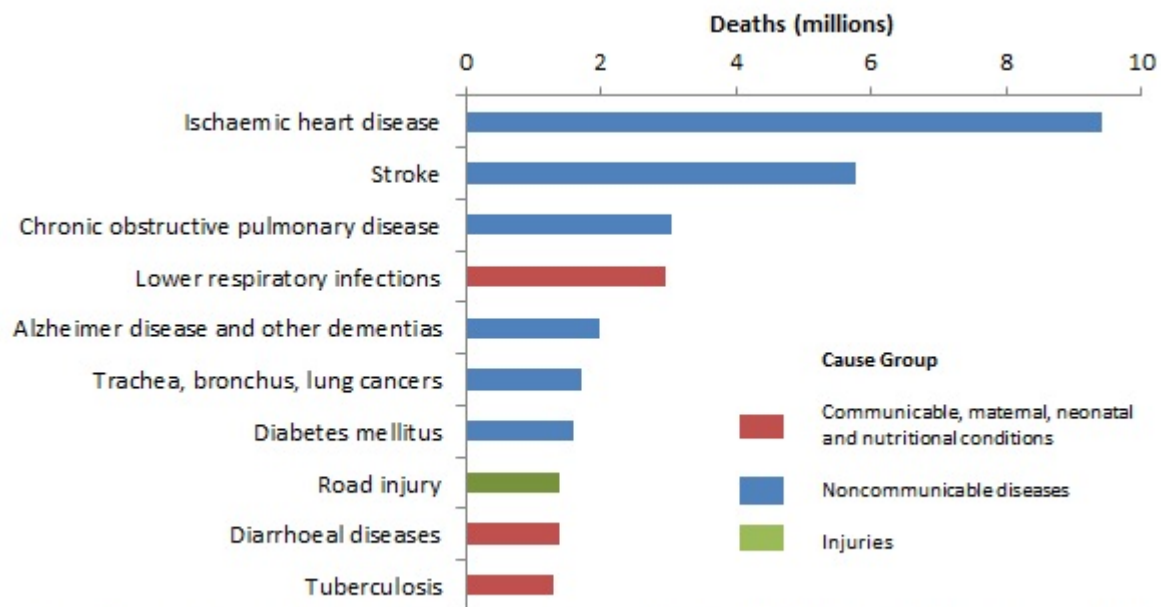

Source: Global Health Estimates 2016: Deaths by Cause, Age, Sex, by Country and by Region, 2000-2016. Geneva, World Health Organization; 2018.

Table 3: The Top 10 Causes of Death Over the World

According to Table 3, chronic lung diseases are one of the top 10 causes of death in the world. ("top 10 causes of death," 2018)

- Deaths can occur due to incorrect drug use. ("Errors in health care: A leading cause of death and injury - To err is human - NCBI bookshelf," n.d.) And drug follow-up of chronic patients is of utmost important:

- It demonstrated that up to 67% of patients had at least one medication error on admission to hospital general medical services (Lau et al., 2000)

- A systematic review of 22 separate studies showed that 10-61% of patients made the mistake of neglecting to take their medication at least once. ("Medication errors: The importance of an accurate drug history," n.d.)

- It was observed that 41% of errors due to all other reasons were clinically significant. ("Medication errors: The importance of an accurate drug history," n.d.)

- It was determined that 22% of the errors that occurred due to all other reasons had the potential to harm the patient. (Tam, 2005)

- Chronic patients were observed to be unstable in regular use of their medication (Table 1) ("CDC grand rounds: Improving medication adherence for chronic., "2019)
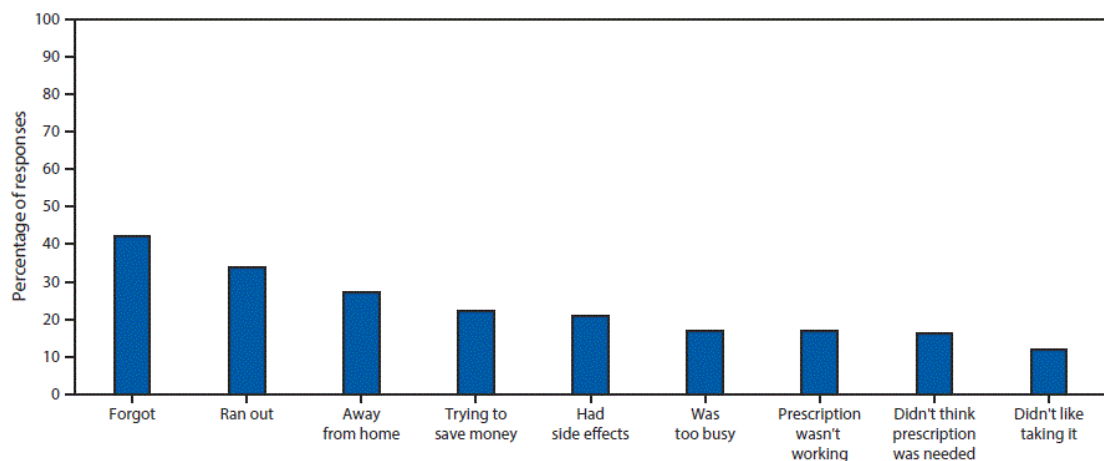
- Medication errors are common as a result of the studies and can cause significant harm to patients; this is a common and worldwide problem. ("Medication errors: The importance of an accurate drug history," n.d.)

Finally, if the project is implemented, it will effectively ensure the follow-up for the three chronic diseases and the Covid-19 patients in isolation. *Self-Health* , which has the potential to ensure that the use of medicines is disciplined after the pandemic process has passed, aims to follow up all chronic patients in a systematic, easy and automatic way in the future. Our team takes the motivation from increasing the follow-up problems of chronic patients around the world and our aim is to reduce deaths due to these diseases, and we are zealous to put this project at the service of chronic patients all over the world.

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