Remote Health Monitoring Patients with Chronic Disease(s)

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Abstract—Connected health devices and remote patient tracking can improve health outcomes and lower healthcare costs for people with chronic disease. Patients suffering from chronic illness may want to stay at home instead of visiting the doctor's office or being admitted into a hospital, thus increasing the necessity for remote monitoring. Remote patient tracking will allow providers to monitor their patient's health when necessary rather than waiting for their next appointment or emergency hospital visit. As we navigate the COVID-19 pandemic, people need to stay at home, especially if they have the virus or have a greater risk of serious illness.

1 BACKGROUND AND SIGNIFICANCE

Chronic disease is defined as a disease that persists for a year or more ("About Chronic Diseases," 2019). Examples of chronic diseases include cardiovascular disease, cancer, chronic obstructive pulmonary disease, asthma, diabetes, arthritis, and HIV/AIDS. Roughly half of Americans suffer from at least one chronic condition (Tinker, 2017), and the numbers are on the rise. People with chronic illness have an impaired quality of life - affecting and limiting their physical, social, and psychological function. Chronic disease is the leading cause of death in the United States (Heron, 2017), resulting in the death of seven out of ten Americans each year ("FastStats," 2020). Given that chronic disease care is intricate, it costs the United States 90% of the $3.5 trillion annual healthcare expenses (Health and Economic Costs, 2020). Monitoring and managing symptoms caused by chronic illness can help reduce these costs.

1.1 Problem

There is currently a burden on the healthcare system due to the rise of patients with chronic disease(s). Frequently, patients with more than one chronic condition make managing their health difficult and costly. Currently, patients need to wait until their doctor's visit to have their symptoms assessed, and by then, it could be too late. Some patients may have trouble visiting the doctor's office regularly due to their condition or travel restrictions. Patients with chronic illness are often readmitted to the hospital several times a year, resulting in high healthcare costs (Friedman, B., Jiang, J., & Exilhauser, A, 2009).

1.2 Proposed Solution/Idea

Remote patient monitoring can help ease most of the issues that come along with chronic disease. The solution - providers or health insurance companies can send patients a package including a tablet (with a preloaded application) and IoT health monitoring devices specifically for their needs. The application will store the data from the health monitoring device and send the data to the provider. The application can also be set to remind the patient to measure themselves, so they do not forget. The provider will have a dashboard of all their patient data. The dashboard can be set to give the provider notifications about patients if their measurements reach an alarming point. The provider can then assess the next steps and contact the patient. The following steps can include video chat, messaging, phone calls, office visits, new prescription(s), prevention methods, etc. With the patient's permission, providers can share data about a patient with one another (given that patient has more than one chronic illness). This solution allows providers to monitor their patients daily and increases the quality of the patient's health through a personalized connection.

1.3 Complexity and Effort

Providing patients with the necessary technologies for remote monitoring is significantly cheaper in the long run since doctors can monitor more than one patient virtually. Remote health monitoring will also reduce the risk (and cost) of hospital readmission. A major roadblock for this solution is setting up these devices in a patient's home. Especially with older patients with a lack of technological expertise, this can be very challenging. Along with the technologies provided will be a user manual that details how to set up these devices. Patients have the option of requesting someone to come to their home and help or chat/talk with IT support. Given the recent bio-health technology advancements, this solution is very feasible. There exist some devices that can monitor pulse/EKG, motion, orientation, glucose, blood pressure, oxygen saturation, weight, respiration, temperature, hydration, brain activity, skin conductance, and other devices still in development. The devices will connect to the application via a Bluetooth module; however, the patient needs to have internet connectivity to send the parsed data to the provider for data collection and analytics. Nowadays, most people have some form of Wi-Fi, so this should not pose a significant issue. However, utilizing wireless communication protocols should be considered in the future in case some patients do not have internet connectivity (even if just temporarily).

1.4 Discussion

Given the current Coronavirus pandemic, people need to stay home to stop the spread. People with chronic conditions are at risk of severe illness or death if they contract COVID-19. However, visiting a doctor is necessary for these patients to keep track of their health. Implementing a remote health monitoring solution will allow these patients to connect with their doctor(s) without needing to put their health into more significant risk. Unfortunately, IoT technologies pose the risk of cybersecurity attacks. There needs to be an effort from the device manufacturer and the provider organization to limit cyber attacks. There needs to be regulation set in place to ensure the basic blocks of security are present. It is also vital that the patients have the most up-to-date operating system and application, which can be enforced by having automatic updates. The tablet provided to the patients will be locked, so they can only access the health monitoring application. Future development to this solution would be adding "reward points" when a patient does something beneficial to their health, such as measuring every day, walking a mile, etc. The patient can redeem these points as gifts, gift cards, vouchers, etc. Implementing a points system will motivate the patient to improve their health. UnitedHealth Group implemented a similar program for its employees, and they saw many benefits like identifying 7,200 people at high risk for disease (Worth, 2013). Another future development idea is integrating a Bluetooth pill bottle. A Bluetooth enabled pill bottle will help providers verify that the patient is staying up-to-date on their prescribed medication. Unfortunately, some patients have trouble traveling to the pharmacy to obtain their prescriptions. Perhaps it would be beneficial for the provider to partner with a home delivery company for delivering medications such as Amazon PillPack or Uber Health. Although the health monitoring application is specifically targeted to patients with chronic disease(s), it can be expanded to other patients which could potentially save them from developing chronic illness(es).

1.5 Conclusion

Chronic disease presents a significant setback to the United States healthcare system as the number of chronic illness patients is climbing. Often, these patients do not receive the proper care for their condition(s) because it is difficult for providers to monitor these patients outside of office visits. The patients end up with more severe infections or woefully, death. Recent technological developments in healthcare can benefit these patients and remove burdens from their provider(s). Presenting patients with at-home health monitoring devices will allow the provider to monitor their patients and notice the early stages of problems. The health monitoring devices will be paired with a tablet with a preloaded application so the data is sent to the provider for analysis. Monitoring the patient's health will result in a decrease in hospital

readmissions, thus reducing healthcare costs. Providers will have the ability to conduct data analysis to provide better care and lower organizational costs.

2 REFERENCES

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