IoT in Health Care

**Case Study:** Remote Patient Monitoring System for Chronic Disease Management

Chronic diseases, such as diabetes, hypertension, and heart disease, require ongoing monitoring and management to prevent complications and improve outcomes. Remote patient monitoring (RPM) systems that leverage IoT technology can help healthcare providers stay connected with patients and monitor their health status in real-time, without the need for frequent in-person visits.

In the current setup, a patient must book an appointment to meet a doctor and specify the reason for visit (see Exhibit A). For chronic conditions, there is a periodic visit scheduled. During the appointment, routine vitals are checked by the nurse. Doctors use this information along with patient past data stored in a heath record system such as Epic systems and any new symptoms to guide patient care for future. In a chronic condition, patients are asked to voluntarily monitor conditions such as blood pressure or blood sugar remotely and keep a log. They may share that log with the doctor during their visit. Patient compliance for self-monitoring is low.

Companies such as Medtronic aim to provide integrated monitoring systems to healthcare providers to remotely monitor patients with chronic conditions such as diabetes and heart disease. The system includes a range of IoT devices, such as blood glucose meters, blood pressure cuffs, weight scales, and pulse oximeters, that patients can use at home to collect and transmit data to their healthcare provider. The data must be transmitted securely over the internet to a secure database, where it can be accessed by the patient's healthcare provider. The provider can then monitor the patient's health status in real-time and intervene if necessary to prevent complications or adjust treatment plans.

Devices for IoT monitoring can qualify for health insurance. Otherwise, patients will have to bear the cost. Any new data captured through IoT devices should be reliably sent to the healthcare setup. Doctors must view this information and come up with proactive recommendations for patient care to realize the true value of such monitoring. Following interventions are possible:

1. **Immediate**: IoT data carries some information which needs urgent attention and patient would be notified to see the doctor or go to the hospital. For example, if the heart rate is very erratic, it may be a sign of heart stress and may need immediate attention.
2. **Near Future**: IoT data shows some concerning pattern which can be detected and be used for corrective action such as follow up visit. For example, if the blood sugar levels are varying a lot, doctor can be notified and may consult with the patient to understand the reason for the pattern and whether there is a need for any corrective action.
3. **Long term**: IoT data reveals patterns about patients with different conditions and can be aggregated and used to come up with interventions to improve their conditions.

You are hired to come up with a process design and a solution design for successful implementation of such an IoT monitoring system using cloud technologies (refer to the IoT reference architecture). Your design should explain how your can enable different components of an IoT solution such as events, insights and action for remote patient monitoring. Process design should consider steps involved to use the IoT information along with other activities performed by doctors, interaction with different systems and related information flows. You also need to think about about potential technical and business challenges and mitigation strategies.

**Exhibit A**

Current Process & Information Flow

Doctor viewing and updating patient information

Patient making next appointment

Patient Check in

Patient Appointment

Patient Scheduling System

Patient Scheduling System

Patient Record system

**Exhibit B**

Graphical user interface, diagram

Description automatically generated