Open Challenges of Big Data and Internet of Things (IoT) in Telehealth

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ABSTRACT

Internet of Things change the life of people in various aspects including how we live and also it helps to reduce various problems. It depicts a network of objects to connect and exchange data with other systems through internet. IoT is a fast growing technology that enables us to lead a better life in various perspectives. Getting sick is a fact of life and arranging an appointment, traveling to the doctor and sitting in a waiting room is not easy or May be we live in a rural area and it is really hard to get an appointment with a doctor close by. At that case the IoT come into role in Telehealth. Telehealth can be used for medical issues such as allergies, cold and flu, fever, ear aches, sore throat to name a few. Telehealth is available 24 hours a day, 7 days a week including nights, weekends and even holidays. There are lots of reasons we might use Telehealth instead of visiting a doctor's office, may be doctor or paediatrician is unavailable. We are traveling and need medical care or May be it's just easier. Also big data can improve the communication and allow to ensure the relationship between patients and the doctors or healthcare providers. In the upcoming years, we will definitely face security and interoperability challenges for these providers. Major security challenge is the terms of authentication and authorization of IoT devices.

Keywords: Big data, Internet of Things, Tele-health, Hadoop, COVID 19

INTRODUCTION

Getting sick is a fact of life and arranging an appointment, traveling to the doctor and sitting in a waiting room is not easy or May be we live in a rural appointment with a doctor close by. Talk to a doctor from the comfort using our computer. All partners for health plan members have access to the state-sponsored medical telehealth program through the health insurance carrier. Telehealth can be used for medical issues such as allergies, cold and flu, fever, ear aches, sore throat to name a few. Telehealth is available 24 hours a day, 7 days a week including nights, weekends and even holidays. There are lots of reasons we might use telehealth instead of visiting a doctor's office, may be doctor or paediatrician is unavailable. We are traveling and need medical care or May be it's just easier. State sponsored telehealth program is also less expensive than a regular doctor's office visit. Telehealth uses many technologies and various data to assist the healthcare services. IoT devices can automatically collect health metrics like heart rate, blood pressure, temperature and more patients who are not physically present in a health care facility that eliminates the need for patients to collect it themselves.

We all use smartphones. we have wondered that how much data it generates in the form of texts, phone calls, emails, photos, videos searches and music approximately 40x bytes of data gets generated in every month by a single smart phone user. Now imagine this number 40 Exabyte (x) multiplied by 5,000,000,000 (five billion) smart phone users. In fact, this amount of data is quite a lot for traditional computing systems to handle and this massive amount of data is termed as Big Data. The data generated per minute on the internet is given below.

2.1 million Snaps are shared on the snap chat.
3.8 million Search queries are made on Google.
1.0 million People log on to Facebook.
4.5 million Videos are watched on YouTube.
188 million emails are sent.

How do we classify any data as Big Data?

This is possible with the concepts of 5V's.Volume, Velocity, Variety, Veracity, Value. In the case of healthcare industry aspirins and clinics across the world generate massive volumes of data. 2,314 Exabyte of data are collected annually in the form of patient records and test records. All these data is generated at a very high speed which tributes to the velocity of Big Data. Variety refers to the various datatypes such as structured data, semi-structured data and unstructured data. Veracity means the accuracy and trustworthiness of the data. Analysing all these data would benefit the medical sector by enabling faster disease detection, better treatment and reduced costs. This is known as the value of Big Data.

How do we store and process these data?

To do this job, we have various frameworks. Let's take Hadoop as example and see how Hadoop stores and processes Big Data. Hadoop uses a distributed file system known as Hadoop distributed file system. If we have huge file of 300MB that will be broken into smaller chunks and stored in various machines. Not only that when we break the file we also make copies of it which goes into different nodes by this way we can store big data in a distributed way and make sure that even if one machine fails the data is safe on another machine. A technique called Map reduce is used to process big data. A lengthy task A broken into smaller tasks B, C and D. Now Instead of one machine, three machine taken up each task and completed in a parallel fashion and resembles the results at end. Things to the processing becomes easy and fast. It's referred as parallel processing. Now, the data is stored and processed. Then we can analyse these data in numerous applications. Designers analyse user data to understand at which stage most of the user's pause, restart and quit. This helps them to rework and improve the user experience.

Telehealth has become a key method for people who are on lockdown during pandemic to continue to receive their healthcare services. Especially now that Telehealth and Telemedicine is expanded to Medicare, Medicaid/medical and many other facets of healthcare industry. With the lockdown and pandemic affecting all of us and shutting down a huge portion of health services. There is still a few health resources that have had an astronomic gained because of everybody being stuck at home one of the success stories is the rise of usage in telehealth/telemedicine. In the wake of shutdown telehealth services have seen a huge growth in the last 4 months. Prior to the pandemic telehealth services were available to most people through their health insurance, but almost nobody ever considered using the service when they could see a doctor in person.

Telehealth setup and best practices

Though audio and video over the internet, doctors can meet with their clients/patients on the go from the desktop, laptop, tablet or mobile devices: iOS or android. Telehealth by Simple Practice allows to connect with clients anywhere with the secure and convenient appointments that save the time and hassle. There is no need to deal with traffic when we can schedule and attend to the appointments directly from a laptop or mobile devices. It is available on the professional plan and professional plan for groups. For $10 per clinical per month for unlimited hours of video appointments with the clients.

How does telehealth work in simple practice?

In Simple Practice, telehealth sessions all take place within your telehealth office. The telehealth office is its own location within your Simple Practice account. When you make your first telehealth appointment with your client select your telehealth office from the locations menu. Once an appointment is added, you will see a video camera icon in the appointment block on your calendar indicating that the appointment will be held via telehealth. Some telehealth feature is fully HIPAA complaint. clients can access the office via a unique link sent to them before their appointment. Doctors can make sure that the telehealth, clients receive email appointment reminder and again ten minute before the start of the appointment. You can resend it anytime by opening the appointment and clicking share link. Neither doctors nor clients need to download any additional software on your computer to use telehealth. If the doctor uses a phone and the clients can download our free telehealth by Simple Practice app from the iTunes or Android app stores. Before the first telehealth appointment, we must check a few things to make sure that you will have the best experience with the clients.

Getting setup for Telehealth

Since telehealth is a video conferencing platform make sure the internet connection in the office meets the requirements for high quality video and audio streaming. At the bare minimum, both the upload and download speeds need to at least 10 megabits per second. However, for best experience you will want

upload and download speeds of 35 megabits per second or higher. If you are not getting that speed right now you will want to reach out to the internet service provider and speak to them about upgrading the internet plan. In addition to a reliable connection, you will need a computer or mobile device with both a camera and microphone. Make sure whichever device you are using has the most up-to-date version of the operating system and browser.

Choosing a spot for the telehealth appointment is important. It should be quiet well-lit location where you want won't be disturbed. If you can move your router closer to you while holding your sessions to optimize your connection.

Holding a telehealth appointment

When it's time for your appointment, open that appointment from the calendar and click "start video session". This opens up your video office within your browser. Select your camera and microphone and click "Join Video Call" to start the session. On the client's end, they will open up their unique video link from their email and it will also open in their browser. They will choose their camera and microphone and then join you in the session. If they arrive before you, they will wait in your digital waiting room until you join. Once the appointment is over, click "leave" to turn off your video and microphone and exit the window.

Trouble shooting common issues.

Our telehealth feature exceeds industry standards for reliability and stability. If you notice your appointments are not meeting these standards, there are several things you can do to improve your experience.

The audio/video cutting out is due to a poor internet connection on either at the doctor or at the client's end. Both of them should run internet speed tests to ensure that getting enough speed to hold a telehealth appointment. When running these tests, besides making sure the upload and download speed are both 10 megabits per second or higher. you will want to ensure your latency is under 300 milliseconds. Latency measures how long it takes data to make a round-trip from one computer to another. High latency leads to choppy sessions and talking over each other.

Hearing an echo is the frequently occurring problem it can overcome through the placement of the microphone and speaker on the participants' end. The best solution is to use headphones.

One participant can't see/hear the other is another problem, because telehealth operates within the browser. If the browser's access to the camera and/or microphone is blocked, your client won't be able to see or hear the doctor. Locate the browser settings menu and ensure camera and microphone access is allowed.

Camera/Microphone stopped working is another problem, camera or microphone has permission and is plugged in, but it stopped working. Camera's microphones, like computers have software that requires updates from time to time. Look up the camera and microphone and see if a software update is available. If it isn't install it.

The novel corona virus pandemic has stretched healthcare systems to the brink.Covid-19, might be getting all the headlines, but patients are still getting sick from other diseases and injuries. And that's left doctors looking for other ways to treat them while minimizing contact. Over the past decade, telehealth a broader term used to define all medical services and health education delivered digitally has grown steadily as an industry.

Telehealth proponents have sold it as a solution for patients in rural areas. Now they advocate it as a low cost and convenient option for tech savvy millennials and busy parents as well. Some medical issues just cannot be resolved over the phone or over video and require an in-person visit. Doctors are not always paid the same amount for a virtual visit as they are for an inpatient visit. Telehealth has a risk of exacerbating pre-existing inequalities in healthcare in either access to care or in health outcomes. Large parts of the country are rural and may not have access to high speed internet. So if we leave those folks out of our approach to telehealth, we will just make health inequities worse. While most health systems have been able to quickly adapt, there are hospitals start to strike these deals with telemedicine companies. Most hospitals not every service was equipped for telemedicine companies. Most hospitals, not every service was equipped for telemedicine. The high demand for care has left hospitals and practices to retrain physicians on how to care for patients virtually. Another thing that has become very important in this tragic crisis are serious illness conversations with patients. Talking with patients and their families about their choices and if they have chronic medical conditions, talking about whether or not they would want to be on a ventilator

if their illness progressed rapidly due to COVID 19 and they could not breathe. So many of the things that used to take for granted would happen in person.

Some people still don't have internet access in their homes. Most restaurants and public places offer free Wi-Fi. But going to a public place is not possible when we are sick or need treatment. Even beyond that, needing to travel somewhere to get internet service even contradicts some of the benefits of telehealth in the first place-saving travel time, removing the need for transportation and having easy access. Along with the internet, patients also need access to devices that can support telehealth services. While some assessments happen over the phone, oftentimes telehealth visits use visual assessments which require a smart device. Without these technologies, patients can't access the internet at all.

Those who can't afford these devices won't be able to access this service unless they're able to borrow a device from someone or use free services at their local library. Telehealth often benefits the underserved communities who can't afford traditional care options. This could be because they don't have access to transportation, live in poor rural areas where there aren't necessary professionals, or they can't afford the costly service. They also might not be able to afford missing work for an appointment. But if they can't afford devices or the internet in the first place, they won't benefit from telehealth options at all.

Another disadvantage with telehealth is the generational gap. A reason why this service is becoming more popular because of what younger generations value in healthcare. With their fast-paced schedules, they appreciate the convenience that comes along with the digital options. But older generations are not as open to these digital tools. They struggle more with technology since they don't understand use it as much. Because of this, they don't understand telehealth services as easily. This becomes a challenge for elderly patients, even though they had benefits from telehealth since they may struggle with getting to the doctor.

Another potential shortcoming with telehealth is that doctors can only do so much for their patients when they aren't physically with them. Assessment is limited to what they aren't physically with them. Assessment is limited to what they see or what patient tells them. Physicians might need equipment to check the patient's condition, which is why they might suggest the patient seeks further treatment. But that doesn't benefit those who are unable to get to the doctor. Telehealth also currently has legislative barriers. The federal government hasn't come to a solid conclusion on telehealth guidelines, so states have different rules for use of services and their reimbursement. This makes it difficult to access care in different areas, even though that's what telehealth aims to solve in the first place.

Having medical appointments online adds a security risk to patient information because online data is hackable. Cybercriminals could potentially access a user's medical record if they get into the patient's telehealth account. Clinicians need to consider how to keep health information safe and secure, just as they would for a visit in their office. It might require more security measures for telehealth, but it's essential for protection. Even though telehealth services are expanding to solve many national healthcare issues, there are still negative aspects to consider. Most healthcare experts agree that the pros for these services far outweigh the cons, but that doesn't mean these disadvantages should be ignored.

CONCLUSIONS

Telehealth services are expanding to solve many national issues in healthcare. It benefits both patients and providers to ease access to care options. But even though there are many advantages to the emerging trend, there are still negative aspects to consider. But most healthcare experts agree that the pros for these services far outweigh the cons. Most of the negatives involved with these emerging technologies are coming up with solutions to them. As more issues get resolved, government update their policies and patients grow familiar with telehealth it will change the landscape of modern-day health care.

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