

Leveraging Healthcare Technology to Improve Quality of Care

Harish Rijhwani*

Department of Information Technology, K. J. Somaiya College of Engineering, Mumbai, India

The advent of COVID-19 has brought Healthcare Information technology to the forefront. Organizations across the globe have been forced to look at different options to keep their revenues (especially outpatient) going. Telemedicine was conceptualized in 1920s, till few months ago it was considered as a target market for only rural areas. In many countries it was still in the nascent stage. The current world situation has forced organizations to consider telehealth/telemedicine very seriously. BCBS Massachusetts announced in April 2020 that it processed 250K telemedicine claims, overall a 3600% increase over Feb 2020 and 5100% increase over 2019. The growth seen is explosive, but to truly monitor a patient the vitals (viz, SpO₂, BP, Sugar) are needed to be captured, hence we could also see a growth in home medical devices. This is where, we will also see a growth in Health IoT. Organizations like Healthkon have their own medical devices capable of monitoring multiple parameters (ECG, SpO₂, Sugar and others) in one device. Using IoT devices, physicians would easily be able to monitor a patient remotely, provided the solution considers real time Data Integration. In the current scenario, a digital thermometer with a Bluetooth device (capable of integrating with the EMR system) can be a life saver. The integration/interoperability can come by using some of the latest standards like FHIR. In a recently conducted HL7 India Connectathon, (COVID Teleconsultation Track) the team showcased a demo of using FHIR to seamlessly connect the patient to a doctor for teleconsultation. By the way, if you look back, the Spanish flu of 1918 could be the reason for conceptualizing Telemedicine [1-5].

Healthcare Innovation has also seen some rapid growth in the past few months. Kaggle for example had more than 100k downloads for its COVID-19 hackathon. Many world governments (USA, UK, India) have run healthcare specific hackathons/digital innovations to solve some of the current problems. In Canada, SAP ran a "We vs. Virus hackathon" which brought together eight leading organizations together. India very recently launched a drug discovery hackathon which would be run in 3 parts of three months each, prior to this the focus was on innovative solutions to manage bio-medical waste. In UK, the focus was towards digital innovations which led to solutions for the elderly, cancer patients.

Let us talk a little bit about the Pharma world. It takes anywhere between 10 to 20 years for a new drug to be launched in the market. The current situation has forced organizations to see how this time can be reduced using technology. Organizations like aicures.mit.edu have been working towards using AI in the space of Biotechnology. They have developed a machine learning algorithm (SAMPN: Self-Attention-Based Message-Passing Neural Network) which can help in predicting molecular lipophilicity and aqueous solubility of a molecule. The advantage of SAMPN is that it leverages chemical graphs to predict the property and is not dependent on a black box machine learning algorithm.

Another aspect in the Pharma industry is Clinical Trials. It is important to identify the right candidates for Trials; approximately 10% of the drug development budget constitutes towards Patient Recruitment. Traditionally, organizations use websites, advertisements to recruit patients. In recent times organizations like Clinithink harnesses the power of NLP to identify patients for clinical trials using some of its CLiX tools. Mount Sinai using CLiX ENRICH was able to reduce the recruitment time from approximately 9 months to two weeks. Google's Deep Mind predicts the 3D structure of a protein just based on the genetic sequence. There are many other examples to cite in the pharma space, but overall technology can be leveraged to reduce the drug discovery time for any disease and not just COVID-19 [6-9].

In a Healthcare environment, there are many business processes (backend) which are still not digitized, consider the call center services for a Payor. Organizations like Humana have been focused on RPA (Robotic Process Automation) for some time now. RPA can help organizations reduce time spent on repetitive and mundane tasks. The advent of COVID-19 has forced organization to look at things differently. As per Centers for Disease Control (CDC), COVID-19 testing protocol requires a patient is registered and test kits are correctly labeled, for collection and reporting. Additional requirement is that the patient is registered in the EMR system, and labels are also printed. The manual process can have an average of six hours waiting time, this process was automated by Cleveland Clinic using UiPath which reduced the processing time by more than

Correspondence to: Harish Rijhwani, Department of Information Technology, K. J. Somaiya College of Engineering, Mumbai, India, E-mail: harish.rijhwani1580@gmail.com

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90%. RPA helps save time but also has a direct impact on the cost saving. The current focus for Healthcare providers is to save cost and RPA provides that unique advantage. Imagine, a patient has a surgery scheduled (knee replacement for example), but due to COVID-19 it was cancelled. The surgery can be delayed but cannot be avoided after a certain point in time. Another similar example is that of Cataract Surgery. As the pandemic ends, there is an expected surge in these surgeries and in this case as well, RPA can help in hugely reducing the administrative time [10,11].

In a Hospital, there is lot of data generated at the point of care, i.e. the Physician - Patient interaction. The world is now filled with Electronic tablets, but there are many physicians who still prefer a pen, and that is where solutions like Next Pen from Nextgen and Digital Pen from Doxper come into play. These solutions focus on digitization without impacting the Physician workflow. Capturing clinical notes electronically is key to one of the most important solutions for Healthcare, Clinical Text Mining. We talked about using Text mining in Patient Registration for clinical trials, but beyond this there are many use cases. One area is around Medical Coding, which requires organizations to report the ICD-10 diagnosis code for billing purposes. NLP tied with the power of SNOMED-CT can ease the pressure on Medical Coders and help reduce the AR of hospitals/clinics. In case of COVID-19 in the past 6 months, a number of organizations have published their research on sites like medrxiv, and biorxiv. On Kaggle there are approximately 167K or these research papers uploaded for analysis. It is manually impossible for someone to analyze this data. This is where the power of Natural Language Processing (NLP) can be leveraged. Using NLP, teams have been trying to answer various questions around diagnostics, surveillance, non-pharmaceutical intervention, and risk-factors to name a few [12,13].

In Sept 2019, GE won its first FDA approval to use AI algorithms to detect pneumothorax, thereby reducing the time from 8 hours to as little as 15 mins. Organizations like Geisinger and Cleveland have been Machine Learning and AI to find out the risk of a patient getting sepsis. A similar logic can be leveraged to identify the risk of a patient getting any chronic

disease which can help prevent the same. As per World Health Organization more than 1.1 billion people worldwide suffer from Hypertension and is a major cause of premature death in people. As per Centers for Disease Control and Prevention (CDC) 22% of the COVID-19 deaths in US was associated a comorbid condition of hypertension while 15% with diabetes. Overall, technology in the healthcare space is being used in pockets, but if we can tie all these together, believe it can have a positive impact on our lives [14-16].

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