Chapter 14
Mobile Technology Solutions for COVID-19

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Abstract The World Health Organization (WHO) has declared the outbreak of COVID-19 as a pandemic which has led to lockdowns of all sectors like primary education, higher education, industrial sector, logistics, etc. and a complete clampdown on sporting, cultural events, any form of social gathering, etc. The entire world is now striving to combat this pandemic with the aid of different technologies. Emerging technologies are being widely employed across the entire world to curb the outbreak of coronavirus. China has deployed robots for disinfecting hospitals and delivering medical supplies. In Singapore, the government database has enabled study of the outbreak, and in South Korea, the authorities are tracking the potential carriers by using mobile phone satellite technology. In India, drones are being used to monitor the lockdown and also to deliver essential commodities to the citizens. In addition, technology powered by artificial intelligence is enabling us to keep track of the outbreak, deliver supplies to hospitals, develop vaccines, etc. The development of mobile applications that suggest better solutions for personalized healthcare, disease management, flexible ways of communicating with physicians, and services to patients and caregivers has accelerated due to the advantages of wireless technology. In this chapter, the current Mobile Technology explores viable mobile big data solutions to combat this pandemic while adhering to principles of privacy and ethics. In addition to this study, a novel telehealth solution is proposed for combating the coronavirus.

Keywords Healthcare applications · Disease management · Telehealth solution · Surveillance · Diagnosis · Prevention · Treatment

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14.1 Introduction

COVID-19 pandemic affects almost all countries, and the number of COVID-19 patients is increasing day by day. It has made a significant effect into the healthcare sector on their available healthcare facilities and treatment system. Worldwide countries are responding differently to the virus outbreak. As the novel corona virus continues to spread and the number of infected patients increases continuously, all the government and the healthcare service providers have a challenging task. Social distancing, lockdown, case detection, isolation, contact tracing, and quarantine of individuals had revealed the most efficient actions to control the disease spreading [1].

Now the government and healthcare sector are giving interest on using Mobile Technology to fight against the COVID-19 pandemic. Many mobile applications are already launched for the purpose of tracking and tracing the COVID-19 patients in order to control the spreading of coronavirus [2].

Almost all cities got lockdowns; schools and colleges were closed to control the gathering of people and maintain social distancing. People who are suspected to be infected by coronavirus are kept in isolated places (quarantine center) or home quarantined. After doing all these exercises, coronavirus continues to spread. To control the spreading of coronavirus, the WHO advised some preventive measures like washing the hands frequently with soap and water or with sanitizers, maintaining social distancing, and practicing respiratory hygiene. Masks are also used for safeguarding people from COVID-19 patients. The most important preventive measure to control COVID-19 pandemic from spreading is by staying at home and avoiding social gathering (Fig. 14.1) [4].

Fig. 14.1 Coronavirus (COVID-19) charts and stats [3]
Many countries preferred Mobile Technology in giving proper surveillance. GPS-based mobile applications are widely used around the world to track and trace the people for controlling the spread of coronavirus [5].

According to the present scenario, children and elderly are very risky to visit the hospital to do health check-up. Telemedicine service reduces the risk of infected people by giving healthcare services through online, [6, 7]. Using Telemedicine, people can consult doctors from home or their present location through video conferencing. It helps the healthcare service providers to give services to remote places where the health worker could not reach. It ensures to keep coronavirus-infected individuals out of the emergency care facilities or physician’s offices.

Many tools are available for self-screening whether the coronavirus symptom is found in the user or not [8–11]. Using smartphones, everyone can do self-screening by staying at home or places where they feel comfortable. It helps to reduce the gathering of people at the hospital and the risk of people getting infected from other infected patients.

Healthcare workers who directly interact with COVID-19 patients need different types of training like how to care COVID-19 patients, what are the preventive measures they must follow, etc [12]. Many health organizations around the world conduct online training programs so that people from different geographical areas can participate in the training program by maintaining social distancing [13–17]. Some health organizations published webinar series to provide training to healthcare workers. Different video conferencing tools like Zoom, WebEx Meet, and Google Meet are used to give online training [18]. Hence, to fight against the novel coronavirus, it requires a combined effort from all the healthcare providers, government, and more importantly the public with the utilization of Mobile Technology.

The rest of the chapter is organized as follows: Sect. 14.2 defines the applications of Mobile Technology in healthcare, Sect. 14.3 explores Mobile Technology-based solutions for COVID-19 pandemic, Sect. 14.4 defines proposed Novel Telemedicine solution, and Sect. 14.5 concludes the chapter.

### 14.2 Mobile Technology in Healthcare

Mobile Technology becomes advanced, and the developer has been launching different applications that can be used in various areas where the healthcare sectors are giving importance to the application of Mobile Technology [19]. Today’s healthcare environment using Mobile Technology and mobile devices has proven to be effective. Mobile application is widely recommended for asthma peak flow monitoring [20]. Mobile Technology can be used for recording and gathering asthma data. During asthma data, gathering an electronic peak flow meter can be use, and it is linked to a mobile phone that will record current asthma symptoms.

The facilities provided by the healthcare sector are leveraging Mobile Technology in new ways to decrease the costs and make their service affordable for any category of people. For the last 15 years, the healthcare sector has been trying for
technological improvement. According to a 2015 report, 52% of smartphone users gather healthcare-related information on their phones [21]. People are demanding better connectivity between patients and their service providers. As of now, Mobile Technology is already changing the healthcare sectors. Healthcare sectors are interested more and more in mobile computing that enables doctors and nurses to access electronic health record (EHR) directly from the bedside as the patients demand better connectivity between healthcare service providers and the patients. With the help of EHR, patient and physician interaction increases as the EHR is updated regularly. Again using Mobile Technology, doctors can access a patient’s imaging result, open files at the patient’s bedside, and review the results together with the patient [21]. By doing so, it enhances the quality of care and improves outcomes by engaging the patient activity in their own care management. Today’s Telemedicine service is widely used throughout the world and reduces the expenditure of the patients [22]. With the help of Telemedicine, service patients can get the care they need from home or where they are. It reduces many of the external costs that are associated with healthcare delivery, including the cost of transportation from nursing home to the providers, arranging elders care, and hours spent in the waiting room. Therefore, Telemedicine significantly reduces the cost of healthcare delivery for both the patient and the service provider (Fig. 14.2).

Many industries have launched Internet of Thing (IoT)-based wearable devices for healthcare and make it possible for remote monitoring of patients by the physicians [24]. These IoT-based healthcare devices enable the physician to send their patients home earlier, track their condition, and lower the overall cost of hospital visits. Therefore, it is just as if the healthcare service providers fully depend on Mobile Technology. Hospitals got an opportunity to introduce the application of Mobile Technology for reducing the costs with providing the same or better standards of patient care.

Fig. 14.2 Viz.ai—diagnosing anyone showing symptoms of stroke [23]
Now Mobile Technology plays one of the major roles in fighting against COVID-19 pandemic. Mobile Technology is used to track and trace the COVID-19 patients. It enhances COVID-19 surveillance to control the spreading of coronavirus. Many mobile applications are available to do self-screening for coronavirus symptoms from home [8–11]. It reduces the risk of the user getting infected by coronavirus from the infected patients at hospital. As the number of COVID-19 patients increases, healthcare service providers could not reach remote places. Telemedicine service helps the user to get healthcare services from home or from places where they are. Mobile Technology is also used for giving training to healthcare workers those who are directly interacting with COVID-19 patients by the health organization.

Mobile Technology is not a new technology to healthcare, and it can improve the healthcare in four different ways [25]:

1. Increase the conformity of the medication.
2. Enhance posttreatment perception.
3. Health information can be shared with the patient.
4. Aggregation of data enhances population healthcare.

### 14.3 Mobile Technology to Fight Coronavirus

Coronavirus is continuously increasing, and it has forced countries to use different technologies with new methods to control the spreading of coronavirus. Asian countries have used a range of technologies to fight against COVID-19 pandemic. All the healthcare system and the government are trying to use the better technology that helps in fighting against COVID-19 pandemic. Mobile Technology is used worldwide as a tool to fight against COVID-19 pandemic; AI technology is used for diagnosis of the patients, medical imaging process, disease tracking, and its prediction [3]. Many tools are available for tracking the COVID-19 patient, self-screening for coronavirus, and treating the COVID-19 patient. Some countries use electronic bracelets for tracking and tracing the patient, and the system alerts the monitoring station when the patient leaves the quarantined or isolated places [26]. It helps to control the spreading of coronavirus. Using a screening tool, everyone can do self-screening for coronavirus, and if it is found to have some symptoms, the system will give necessary steps to be taken [8, 9, 27]. Many healthcare sectors provide telehealth services. With this telehealth service, a patient can consult a physician through video conference. It reduces the risk of infection of coronavirus from other patients at the hospital. Many countries use drones for proper monitoring during curfew and total shutdown enforcing social distancing in public area. Mobile technology is also performing the major role in the spreading of information related to the preventive measures of the virus to the people.
14.3.1 Mobile Tracking and Study of Behavior Trends Using Google and Facebook

The role of public health experts for proper monitoring of the coronavirus patients is a mammoth task. Apart from providing treatment, the patient’s history of traveling and further keeping track of the patients after recovery are essential. Location tracking is one of the best means to monitor the coronavirus patients, and it helps to control the spreading of the pandemic [28]. Google has launched COVID-19 Community Mobility Reports web tool to support health experts for monitoring the spread [29]. It also helps to identify large-scale behavior trends at public places. With the help of Google maps, it is easy to determine whether certain business or public places are busy at a particular time of day using location tracking data from mobile devices. Google provides downloadable Community Mobility Reports that highlight movement-trend differences at country, state, or regional levels [29]. These reports are intended to support public health officials and other major decision-makers as they work to control coronavirus spread. These reports maintain privacy protection by adding artificial noise to the dataset enabling high-quality results without identifying any individual person. In these reports, initially it covers 131 countries and regions as the urgent need of this information [30]. Still they are working to add additional countries and regions to ensure these reports remain helpful to public health officials across the globe looking to protect people from the spread of coronavirus. This information can be used to understand changes in daily essential trips that can define recommendations on business hours or inform delivery service offering. It also helps to indicate the requirement of additional buses or trains in order to allow people who need to travel with 1-m distance of maintaining social distancing.

Facebook offers mapping tools that show population movement and help the researchers and nonprofit organization to understand the crisis [31]. These mapping tools include disease prevention maps to help disease forecasting and protective measures (Fig. 14.3).

A voluntary survey has been designed to help health researchers to identify COVID-19 hotspots. The health researchers have used disease prevention maps to better understand how population dynamics influence the spread of coronavirus and its response to the pandemic. Facebook has launched three mapping tools which aimed at tracking the potential spread of the pandemic [31] as described as follows:

1. The first map is a co-location map which can define the probability that different Facebook users will come into contact with each other in person. This map can estimate the probability of different people coming in contact with each other [31]. Therefore, it can figure out the relationship among people in different places and can send an alert message if any people in those places got infected with Coronavirus. The blue lines in the Fig. 14.4 indicate people movements, based on location tracking on mobile devices. The more blue lines indicate more
people are traveling between each region and showing the risk of spreading of
the virus.
2. The second map is called a “movement range map.” It shows the details of peo-
ple staying at home or moving out a lot. This map helps us to understand about
the people moving out for essential work and who has to travel long distances for
pharmacy or grocery store (Fig. 14.5).
3. The third map is called “social connectedness map” which focused on insight
around Facebook friends across geographic lines (Fig. 14.6).
It has been since 3 years that “The Data for Good” is used by Facebook. Slowly, it is looking at natural disaster [31]. Facebook provides population mobility information, and it always needs to be contextualized with an arrangement of additional data sources on local demographics, infrastructure, and socioeconomic indicators in order to understand the underlying reasons for observed variations in mobility and can also aid us to understand the risk associated with the pandemic.

14.3.2 Mobile-Based Health Technology Solution for Coronavirus

With alarming cases arising daily, many countries started working on developing tools of Mobile Technology to control the virus. The digital health community monitoring the spread of the coronavirus is still trying to create more advance tools. The medical community tries for a better solution to curb the spread of coronavirus. Technology has also helped the medical industry track and treat viruses since the last decades. In 2018, Kinsa’s smart-connected thermometers helped to a great extent during the severe flu season in the United States [33]. The uses of digital epidemiology tools, chatbot helper, EHR guidance tools, and rapid-response test kits are increasing. Mobile Technology is becoming one of the most helpful technologies to control coronavirus. Apple and Google announced that they have plans
to launch an API that will enable interoperability between IOS and Android products to support the uses of Mobile Technology for the pandemic. Telehealth services started providing mental therapy by leading licensed mental health practitioners to deal with the stress and anxiety of the patients at free of cost. Walgreens has expanded their telehealth program to include a COVID-19 risk assessment, information of clinical trials, and a greater number of providers where they can connect with physicians [34].

Numerous people are also working to develop tools for tracking and tracing the COVID-19 patient. Few companies have already introduced the tracking and tracing device with the help of Mobile Technology and GPS service. In order to control the spread of coronavirus, many quarantine centers are available in every state or country for keeping the patients or persons who are suspected to be COVID-19 positive. Government needs to continuously monitor the suspected patients staying in the quarantined centers. However, the monitoring has not been successful, and as a result, patients got an opportunity to stay out of the quarantine center. Therefore, tracking and tracing device is one of the necessary devices to keep a track of the positive cases and thus control the spreading of coronavirus.

The Kingdom of Bahrain is using an app “Beware” for monitoring infected/suspected patient’s unwanted activity. Any unwanted activity of these patients triggers an alert message. Based on this, the government can take necessary actions [26].

The wristbands must be always connected to the app via Bluetooth, with GPS enabled to track the patient movement. This technology ensures that the patient will
not leave the quarantined center. Similarly, the device can track the self-isolated people by setting their location. Facebook started a program called “Data for Good” with the aim to trace the potential spreading of coronavirus [31]. It has used co-location maps to determine whether people are staying at home on a county-by-county level (Fig. 14.7).

Telemedicine technology and services also contribute to control the spread of coronavirus. Chatbots are also performing a major role to prevent COVID-19 pandemic by giving COVID-19 information to millions of people every day. Some chatbots use artificial intelligence (AI) and machine learning that can perform prescreening for coronavirus symptoms [35, 36]. Apple launched a COVID-19 app which gives services for both screening and information platforms. This COVID-19 app user needs to answer a couple of questions including symptoms, risk factors, and exposure. At the end, the user will get the possible next steps to be taken.

Telemedicine has been used by Japan to quarantined passengers of a cruise ship for a week. Drones having loud speaker are used by Chinese government to provide instructions to the people like “make social distance.”

### 14.3.2.1 Solution for COVID-19 Surveillance

The spread of coronavirus is still a major issue even after there was complete lockdown. One of the important reasons is the lack of surveillance. During curfew and total shutdown, people are still roaming and doing social gathering. Government advised us to stay at home during lockdown, and curfew is not followed strictly. There is a need for better surveillance and monitoring systems. Today, Mobile Technology has become one of the important technologies in controlling the spreading of coronavirus. Many countries have already started using Mobile Technology as a solution of COVID-19 surveillance.
China has currently in use of tracking system to deal with the COVID-19 outbreak. They are using Health Code Color system and tracking bracelets for proper COVID-19 surveillance [37]. These systems are deployed all over the main metropolitan areas of China. They are using the Health Code Color system: red color code is assigned for infected people, yellow color code is assigned for quarantined people, and green color code for healthy people for proper COVID-19 surveillance [37]. These systems are deployed all over the metropolitan areas of China, and it is also upgraded with facial recognition capabilities to track people moving without face masks. The system is capable of extracting the user’s travel history thereby understanding whether he has come in contact with infected patients or quarantined people. For example, Mr. Chang is color green, but has come in contact with an infected person, then Mr. Chang becomes a potential threat for coronavirus.

In Hong Kong, they are using electronic wristbands to track the infected locals. Every infected person or self-quarantined at home is assigned a wristband, and they are compulsory to wear at all times [37]. This wristband is paired with a smartphone through Bluetooth. If the user left the isolated place, removed the bracelet, switched off the phone, or moved away far from the phone that is paired with the bracelet, the app on the device would send an alert signal to the Department of Health. New version of bracelet with built-in GPS tracker is also launched to quarantine people or infected locals. They are also using drones for surveillance, and the people are following COVID-19 safety guidance. All these drones have the loudspeaker to give instructions like “make social distance,” “go home,” or “use face mask regularly.”

In Israel, the government passed emergency by granting access to the entire country’s cell phone location data to police and the Shin Bet security service [37]. It is used to track down all those people who are in contact with an infected patient and then notifies them via SMS about the next steps they must take. The government also planned to use the cell phone surveillance system with Tel-Aviv to ensure the infected patient could not leave their isolated place.

Government of India also already launched the mobile app called “AarogyaSetu” for tracking coronavirus patients [38]. This will be one of the most important tools of India in fighting against coronavirus. When the users come near a COVID-19-infected patient, the user will get notification through this app. The AarogyaSetu may become the mother of all apps related to COVID-19 pandemic in India [39]. The government has also plan to make it a single point of access for food shelters, night shelters, and all the Suraksha retail stores that are being launched throughout the country. Many other apps like telemedicine platform may also be attached with AarogyaSetu app. The tracking of this app is done through Bluetooth and location-generated social graph which can notify the user interaction with anyone who has tested positive. The geo-fencing technology is used in Tamil Nadu to ensure that the persons who are in quarantine will stay inside the quarantined center [40]. In Delhi, the city police and civic agencies are using drones for proper monitoring during curfew and total shutdown enforcing social distancing in public areas and spraying disinfectants (Fig. 14.8).
14.3.2.2 Solution for COVID-19 Prevention

The Mobile Technology performs a major role in the spread of information related to the preventive measures of coronavirus to the people. It helps to control the spread of coronavirus.

In South Africa, HealthAlert is implemented to give right information to the citizens through smart phones [42]. HealthAlert is a WhatsApp-based helpline to support users on health queries or concerns and helps them to direct the accurate information sources when they require [43]. The users will get all the necessary information related to the spread of coronavirus. They do not need to call the helpline and thus reduce the traffic at the call center helpline. An automated information response system is used in HealthAlert helpline that gives answers to the most frequently asked questions. HealthAlert ensures that the citizens will get the best possible health information during COVID-19 outbreak. This tool helps users self-assess their COVID-19 risk category based on their symptoms and their exposure history. Health Alert is straightforward, and questions of the users answered immediately.

Interactive radio is widely used in many countries to deliver coronavirus preventive measures to all the citizens of the countries [3]. It pairs AM and FM radio broadcasts with mobile phone responses. This is the best way for reaching rural and remote communities. The listener can give a response using a mobile phone for any clarification about COVID-19 outbreak. Interactive radio broadcasts in different languages so that all the citizens will understand the preventive measures of COVID-19 pandemic. This helps to increase knowledge and change attitudes and
Inclusive E-learning program is widely used to support prevention efforts of COVID-19 pandemic by educating everyone on good hygiene practices and COVID-19 prevention strategies [3]. Many online programs are conducted for those people who directly interact with COVID-19-positive patients by giving procedures in order to prevent coronavirus. Many mobile apps are available at free of cost to conduct E-learning programs. Using these apps, people can easily attain an E-learning program from home or any places they are comfortable. The Government of India delivers COVID-19 prevention strategies to everyone with the help of Telecommunication and social media. Caller tunes of cell phones are widely used to deliver prevention strategies by the government. The Punjab government developed an app called “COVA” to spread awareness of COVID-19 prevention [44]. The users need to login with their mobile number, and then the user can get information like preventive care information and other government advisories. The Kerala government also launched a mobile app called “GoK Direct” aimed to give citizens’ awareness over the COVID-19 pandemic and to check fake information on coronavirus being spread [45].

The World Health Organization (WHO) is leaving no stone unturned in publishing coronavirus-related prevention and control technical guidance to people. They have also exclaimed the importance of technology. Noora Health organization has a huge storage of COVID-19 health education resources. These are also available in different languages [46]. With the collaboration of the government of Bangladesh, they are attempting to deliver WHO-verified and accurate information using the WhatsApp platform. They also launched a training app called “Namaste Nurses” that gives training to nurses about COVID-19 prevention. In some places, COVID-19 doctors and other health professionals restrict the suspected patient from directly entering their room by giving a video call facility on mobile devices or tablets to interact with them. It helps to prevent the spread of coronavirus.

14.3.2.3 Solution for COVID-19 Diagnosis

People need to be diagnosed when they catch the flu or normal fever. In order to help these people, a self-testing app of coronavirus is available at free of cost. As of now, many tools for COVID-19 diagnosis are available in every country. Any time a user can do self-screening and testing by giving answers to the questions given on the app. Users will get advice about necessary steps to be taken if the testing system got some positive signs and symptoms from the user.

In India, Goa Ministry of Health introduces automated self-evaluation assessment mobile app to identify the risk patients for coronavirus. This app was India’s first self-testing app for coronavirus. Goa Ministry of Health developed this app in collaboration with Innovaccer to self-diagnose COVID-19 symptoms [8]. The user needs to give their basic information, and then it performs a survey with basic questions that can be answered in either “Yes” or “No.” These questions are related to
present symptoms and the user’s travel history. After giving all the answers, the user
will get information whether the user has COVID-19 symptoms or not. The
Puducherry government developed a similar app called “Test Yourself Puducherry”
in collaboration with Innovaccer [9]. Reliance Jio, largest telecom operator, also
upgraded MyJio app with self-testing facility for COVID-19 symptoms [10]. Apollo
Hospitals Group has tied up with telecom operator Airtel and introduced a new
feature in Airtel’s existing app called “Airtel Thanks App,” for self-testing of the
user [11]. This new feature was developed through AI-based technologies that allow
users to assess their COVID-19 risk profile by answering a few simple questions on
any of the devices.

In Sri Lanka, the CommonWealth for Digital Health launched a mobile app
called “COVID Shield” for combating COVID-19 [27]. It can help people keep
track of health status and seek medical care early. It provides coronavirus-specific
advice to the user following a self-health check, which includes an automated and
AI-driven breathing assessment.

In the United Kingdom, self-test mobile app called “COVID-19 Tracker” is used
to control the spread of coronavirus. This app allows user to self-report symptoms
to help reduce the rate of spreading coronavirus. If the user has found COVID-19
symptoms, the app will alert with contacts so that the user can seek medical care to
prevent the measure of the virus.

In United States, Pinterest CEO and a team of leading scientists launched a self-
reporting coronavirus tracking app called “How We Feel.” This app is available for
both IOS and Android that everyone can download at free of cost. It was designed
to make it easy to self-report about the symptoms the user has [47].

The Aga Khan University of Karachi has launched a self-testing app called
“CoronaCheck” that enables users to easily check their symptoms at home and
understand the next steps to follow [48]. This app uses an interactive chatbot, driven
by AI, which allows users to understand their symptoms, recognize whether they
may be COVID-19 positive, and seek help in a timely manner. It reduces the need
for patients to visit for testing and also reduces the burden on the healthcare system.

Apple Company also released COVID-19 website and app with a self-screening
tool and other information about the coronavirus pandemic [49]. The screening tool
of this app will ask users to answer a series of questions around risk factors, recent
exposure, and symptoms. Based on their responses, users will get CDC recommen-
dations on the next steps, including guidance on social distancing and self-isolating,
how to closely monitor symptoms, whether or not a test is recommended at this
time, and when to contact a medical provider.

14.3.2.4 Solution for COVID Treatment

Providing proper treatment to home quarantine patients is one of the challenging
tasks of the health organization. Digital health community to monitor the spread of
the disease and facilitate better treatment of those patients who are home-quarantined
has released new tools to reach out in rural areas. Many people use chatbot to figure
out the right steps of their treatment. Healthcare sector has been using Mobile
Technology since many years. Many doctors and nurses use smartphones and ipads to aid hospital rounds communicate and guide the patients in treatment recommendations. It helps to improve posttreatment understanding and patient’s access to health information using mobile health apps (Fig. 14.9).

A growing number of hospitals are turning to automated tools to help them manage the coronavirus pandemic. These automated tools are based on AI. The University of British Columbia (UBC) researcher applied a virtual care platform called “WelTel” to COVID-19 pandemic [51]. The WelTel was developed to improve the treatment of HIV in Kenya, and it was successfully implemented. The aim of WelTel is to improve patient engagement and personal care by connecting physicians and their patients through text messages. It allows physicians to send SMS text check-in to their patients. After the successful implementation and the effective outcomes in Kenya, expanded its scope and scale by automating check-ins and giving more features, it is used in several other African countries for HIV and tuberculosis. Now, the platform is modified so that it can be used for coronavirus, to provide daily check-ins for people in self-isolation. This platform can give response to people’s questions very quickly and concerns while in home quarantined, as well as being able to more easily triage patients who need additional assistance.

Oracle has launched a Therapeutic Learning System app on 30th March 2020 to fight COVID-19 pandemic [52]. The goal of this app is to provide real-world data on which medication and dosages work against the coronavirus. This app has many functions like registration page of doctors to enter their credentials, records of their patients, and for practitioners and patients to update daily progress data, and the app provides real-time dashboards on patient status. There are also administrative screens that check authentication and credentials to guard activities against the database. This app is used to get the aggregated picture of what medicine is working, how, and under what scenarios and what medicine is not (Fig. 14.10).

Fig. 14.9 Patient interaction with doctor using Telehealth service [50]
14.3.3 Telehealth Solutions for Coronavirus

The overwhelming coronavirus pandemic makes some of the hospitals in many countries unable to give proper services due to the shortage of physicians. Telehealth service becomes the only solution of the present scenario to provide healthcare services when there is a shortage of physicians. Telehealth service is the utilization of electronic information and telecommunication technologies to support and promote long distance clinical healthcare, patients, and professional health administration.
Telehealth services can give health services to remote places where the physicians could not visit. Telehealth can connect those needy patients to the healthcare services through remote monitoring, video conferencing, electronic consultation, and wireless communication. It will reduce the spread of coronavirus. The patients do not need to visit the hospital for doctor consultation. It will also reduce the risk of other family members.

Since the last decades in the United States, almost all hospitals are providing telehealth service. According to a 2019 report from the American Hospital Association, 76% of US hospitals connect with patients at a distance through the use of video and other technology [7]. During coronavirus pandemic, they depend on telehealth service. The benefits of telehealth service are that patients and providers can overcome common barriers to healthcare like physical distance, limited access to reliable transportation, and lack of available healthcare providers [53]. The telehealth can provide service to those who are in medically not deserved or rural communities. It increases the relationship between doctor and patient by providing services through flexibility and convenience with the help of telehealth services to increase quality and affordable care. It reduces the gathering of patients in the hospitals and helps to reduce the spreading of coronavirus. It reduces hospital admission and readmission by allowing remote monitoring and consulting.

Telehealth services keep potentially infected individuals out of emergency care facilities or physician’s offices. It reduces the risk of coronavirus transmission to other patients or healthcare staff. In the United States, it offers a free COVID-19 evaluation, screening, and escalation tool to all the hospitals. If the screening tool identifies the patient as being at high risk for the virus, they are directed to the appropriate facility and given instructions on how to manage the virus. This tool is also updated frequently with new recommendations and guidelines from the CDC.

One of the major problems in fighting against COVID-19 pandemic is the shortage of test kits to go around. With the help of telehealth, the healthcare service providers can safely evaluate and identify potentially infected patients whether through video conferencing or text-based communication [54]. If the patient has been diagnosed with it based on symptoms, they will most likely be advised to stay at home and self-quarantine. Using telehealth, the service provider can keep a watchful eye on disease progression, enabling them to treat and monitor patients with milder cases and know who is sick enough to refer to a hospital. When dealing with those patients who are living in urban areas, the service provider can provide proper healthcare services to the patients. However, rural towns are more isolated, so the service provider could not reach many places to give healthcare services. Many people in rural areas are not following COVID-19 pandemic prevention guidelines. This could lead to the increase of COVID-19-infected patients. Implementation of telehealth service is very necessary in rural areas to get them proper health service and to slow down the spreading of coronavirus. Some rural areas have limited Internet speed or no Internet; they can also use text messages service to consult with physicians.

Telehealth service is the ideal solution of dealing communicable diseases like COVID-19 pandemic. It helps those people who are at higher risk of being affected
by coronavirus like older adults with preexisting medical conditions and by providing convenient access to routine care without the risk of exposure in a congested hospital or in a medical waiting room. Telehealth service has been used in many countries since the last decades.

The North Atlantic Treaty Alliance (NATO) developed a multinational teledicine system in 2000 that has been deployed with their military forces during various crises. During the Acute Respiratory Syndrome (SARC) pandemic in 2003, China began working on telehealth service for use in the future when they are facing a similar situation [55]. The aim of telehealth service is to provide services in remote places and rural areas where the physicians could not reach. However, to fight against COVID-19 pandemic, telehealth service is also useful for people living in metropolitan areas since the population density is high in these places.

In Australia since 13th March 2020, many temporary Medicare Benefits Schedule (MBS) telehealth items are available for helping to reduce the risk of coronavirus transmission in hospitals and provide protection to patients and healthcare service providers [56]. These telehealth items are available to GPs, nurse practitioners, medical practitioners, participating midwives, and allied healthcare service providers. These items are for those people who are living in remote places and rural areas or who do not like to take risk of coronavirus transmission. These temporary MBS telehealth items help people to stay at home with essential Medicare-funded health service without the risk of coronavirus transmission within the community.

There are three major roles of telehealth to fight against coronavirus [57]:

1. Screening of patients remotely. People can get medical advices without going to the hospital for illness like cold and fever. This reduces the risk of spreading COVID-19 through social contacts, thus saving other patients and healthcare staff.
2. It provides unchanging care for those high-risk COVID-19 patients.
3. It aids in keeping the COVID-19 patients isolated in the quarantine center.

14.3.4 Mobile-Based Educational Technology Solutions for Coronavirus

The existing and new healthcare staff, those who directly interact with patients’ needs, are upskilling to practice safely with the necessary skills and sufficient knowledge. It is required to teach them with reliable information. According to the present scenario, online teaching and training is the better solution to improve their skills. Many tools have been developed for both trainers and trainees. Using these tools, the healthcare staff can learn from experts without face-to-face delivery. Many video-conferencing tools are available at free of cost so that any expert can give training to other health workers and the other people also. Most commonly used video-conferencing tools are as follows [18]:
Currently, all the countries are making all arrangements to conduct training programs on COVID-19 for healthcare professionals. Experts can also share how to handle the COVID-19 patients in live video. An authorized health expert can also provide training throughout the world using video conferencing. Many SAARC countries conduct training programs on COVID-19 pandemic for healthcare professionals in different countries [15].

In India, many health organizations provide training programs for healthcare workers to handle coronavirus patients. On March 22, 2020, a training program was conducted nationwide for critical care management of COVID-19, at 1000 places through video conferencing [13]. Indian Nursing Council (INC) also plays a major role in India to fight against COVID-19 pandemic by giving training to healthcare workers who are dealing with COVID-19 patients through Webinar series [14]. On the first day of the INC, conduct a Webinar series on the topics “COVID-19 Facts and Myth and Preparedness, readiness and response for COVID-19.” On the second day, conduct a Webinar series on “IPC-standard precautions and transmission based precautions and IPC-Hand Hygiene.” Total number of participants was 12,000 healthcare workers in this Webinar series. It is not possible to provide training on 12,000 participants at a time without Mobile Technology. Till today, many Webinar series have been conducted, and thousands of healthcare workers have been trained by the INC to fight against COVID-19 pandemic. INC uses Zoom apps to provide online training through video conferencing. Zoom apps are available at free of cost, and every participant can easily download them from the Internet. Some Webinar series are helpful to those family members who provide care to COVID-19 patients. Like this normal people can also go through the Webinar series of INC, and it is freely available on YouTube. A Webinar on the topic “Response to COVID-19 in South Asia” was hosted by the Public Health Foundation of India in collaboration with the South Asia Institute Harvard University on April 15, 2020 [16]. They have used Zoom apps for video conferencing and giving knowledge to a huge amount of people without any registration. They have offered an overview of varied in-region responses to the coronavirus and their impact on the health system and social sector. Many employers in India are faced with a business continuity crisis due to lockdown and being challenged with the need to put in place new and possible models. Therefore, to help them, a Webinar was hosted by AZB and partners, in collaboration with Conventus law on March 26, 2020 to address common questions and concerns faced by Indian employers [17]. The World Health Organization (WHO) gives coronavirus disease training, and it is online for those people who are directly interacting with the patients [58].

All the countries are providing training to their healthcare workers through Webinars. All of these online trainings are conducted with the help of Mobile Technology Solutions for COVID-19.
Technology. Currently, all the schools, colleges, institutions, and universities are also affected because of COVID-19 pandemic. However, Mobile Technology helps to overcome these problems [59]. On 3rd March, UNESCO announced the impacts of COVID-19 on the shutting down of the schools and its effect on the students. By 10th March 2020, one of the five students are staying at home, and by 29th March 2020, 90% of the students are staying at home [60]. In India, the COVID-19 impact has been on the examination of the 10 + 2. Furthermore, the entrance examination for engineering, medical, law, fashion, etc. has been postponed, and the government is working for a model for conducting the same. The need for engaging the students had become a challenge, and all the educational institutions and teachers started opting for the online class mode. Technology has been playing a vital role during this pandemic. Many apps are available for video conferencing, and almost all are at free of cost. One of the most used apps is Zoom. Zoom was having ten million users till Dec 2019. By February, it reached 12.9 million, and by the end of April, it was 300 million users. The Zoom stock price has increased from $68.72 to $146.12 by 30 March [61]. In India, the adaption to online classes by students has increased. However, there are still many to be a part of the online class due to lack of awareness, knowledge, interest, and network connectivity issues. However, few of the higher education institutes/universities have successfully rolled out online classes and also conducted examinations through Zoom and Moodle (Open source Learning Platform). During this COVID-19, many of the MOOC’s major players like Coursera, edX, Udemy, and Udacityetc are providing free online courses. Major companies like TCS and Tata Steel also have come up with free courses and internship for the students.

14.4 Proposed Novel Telemedicine Solution

Telemedicine solutions have become very popular during the pandemic. The utilization to the most effective way is the thought of the day. In this paper, we are proposing a cloud-based 24 × 7 Telemedicine solution using the Mobile Technology. As there are millions of users in Facebook, Twitter, Instagram, and YouTube accessing them, we proposed a 24 × 7 streaming of COVID-19 precaution, measures, and quantized methodology need to be followed. It also includes the answering of questions. Through an App, a user can put the relevant questions and see the time slot in which it will be answered. If the question is similar to one previously asked, it will tell the user about the already scheduled time in which the question will be answered. It will also provide the statistics of the number of users who has asked making the user satisfied that he is putting forward the right question. The doctor’s schedule for the interaction was provided to the doctor before 24 h. Each doctor will be having a half an hour slot and will receive alert message before the commencement of the slot. The doctor can also find the statistics of people logging in the sessions, number of questions put, the diversity of the people, etc. The app will have an SOS module, which will be used for two purposes: first, you need to know the answer
immediately and, second, get the help of a physical interaction with the doctor immediately. The doctors/staff for the immediate SoS will be scheduled daily, and each of the concerned will receive his duty information prior to 24 h. Furthermore, there will be slots for psychology doctors as there are many cases of depression observed during this pandemic. Depression is the second deadly disease after cancer. The app will also schedule interaction of famous personalities for different walks of life to provide an insight on their experience in COVID-19 followed by few activities like poem recitation, singing a song, etc. The app will also schedule the interaction of the recovery patients and their experience, will power, and faith. Through this Telemedicine solution, we will try to establish a connection and continuity with people to motivate them and ascertain the hope to live tomorrow, and each of us has an individual role to achieve it.

14.5 Conclusion

Mobile Technology is used by the government, health organization, healthcare workers, and the people for different purposes related to the pandemic. Without Mobile Technology, it will be very difficult to fight against the spread of coronavirus and deal with pandemic situations. Through Mobile Technology, the surveillance of coronavirus has been successful. It is the mobile which can be used to track the movement of the people thereby can be used to maintain social distance as much as possible, alert the alarming zone, provide up-to-date statistics of the active cases which are around the mobile user [62]. Self-quarantined people are getting full online support for their improvement. In online MOOCs, the teacher of the institution/university is using the Mobile Technology to get themselves connected with the students during the COVID-19 pandemic. This has helped the student community not to sit ideal during the pandemic and thus have a sound mental health. Our proposed Telemedicine solution is also focused to provide an ecosystem where each one of us get benefited by connecting to each other and knowing what is happening in and around us. Today, in this pandemic, Mobile Technology is a savior and courage to fight against this pandemic.

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