

An Approach for Collaboration Between Different Stakeholders to Strengthen the Public Health System

Tanvir Ahammad^{1,*}, Tamanna Yesmin², Md. Mahmudul Hasan³, Sudipta Kumar Mondal¹, and Selina Sharmin¹

¹Department of Computer Science and Engineering, Jagannath University, Dhaka-1100, Bangladesh

²Department of Computer Science and Engineering, Uttara University, Dhaka-1230, Bangladesh

³School of Science and Technology, Bangladesh Open University, Gazipur-1705, Bangladesh

*Corresponding author: Tanvir Ahammad; e-mail: tanvir@cse.jnu.ac.bd

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Nowadays, the healthcare problem is one of the major crises in many parts of the world, especially the COVID-19 pandemic has exacerbated this to a greater extent. Many developing countries with inadequate healthcare systems are suffering greatly from this crisis to provide proper medical services. The reasons are the insufficient number of healthcare providers, costs of medical tests and equipment, lack of accessible points of care and data analysis, and lack of sufficient online healthcare facilities. However, research on the benefits of establishing e-health platforms to strengthen the conventional public-health system is limited—most of the research targets patients in specific disease groups. This paper focuses on an approach for designing a healthcare social media platform for services provisioning, consuming, enabling patients to find an alternate source of healthcare advice, and then building a collaborative health community for all kinds of people. Its usability and applicability have been experimented with as a prototype on Android-based smartphone devices. The results show six features and benefits that are distinct from existing approaches in the literature. In addition, the approach will be considered an affordable alternative to conventional healthcare in case of emergency treatment.

Povzetek: Razvita je kolaborativna zdravstvena platforma na Androidu za posredovanje informacij in sodelovanje pri reševanju zdravstvenih težav.

1 Introduction

The expansion of information technology and online communities in the twenty-first century significantly draws attention to online communication mediums among patients and health services providers. This scenario leads towards an online health services system that has become an emerging sector due to ubiquitous internet access [1]. The health societies are engaging people to provide high-quality and affordable healthcare by making online health communities [2]. These communities have great insight and intelligence on the necessities of health services and improving the health condition of the people. Any patient can obtain services publicly or privately through the online health services system from anywhere in the world from experienced healthcare providers. Moreover, the use of social media platforms has changed human lifestyle [3] by connecting with others and getting 10 necessary information, especially for seeking healthcare services about the potential benefits and concerns of accessing appropriate health information [4]. In the last two decades, patients are no longer dependent on doctors' advice as a source of medical information; instead, they use the internet to find required information by searching or connecting with online health support groups [5].

Online healthcare systems are not only provided services to the people but also help researchers to collect accurate data from intended patients. By using more advanced technology, the health data is archived and harnessed to find the exact causes of a disease or early prediction of a disease and then give early treatment to patients [6]. For the last fifty years, health care research has benefited from the increased availability of electronically accessible administrative data [7]. Besides, online diagnostics have gained popularity among patients with the emergence of the Internet and technological use. These facilities enable users to conduct preliminary and frequent health consultations, seek suitable medical professionals, explain their symptoms, and submit the corresponding medical test results [8]. However, the growing area of online health platforms has arisen in the last five years. In the third quarter of 2020, there have been more than 100,000 health applications listed in the Google Play Store and Apple App Store¹.

Online healthcare services system provides an opportunity to build effective and sustainable online tools to help people investigate and discuss their medical issues. As a result, patients can take greater accountability for their treat-

¹<https://www.grandviewresearch.com/industry-analysis/mhealth-app-market>

ment and reduce their healthcare expenditure [9]. However, conventional health care systems are not enough to provide proper medical support and cost-effective treatment in most cases, especially in low and middle-income countries. Moreover, traditional medical services require regular visits to health care centers to treat a sick or injured person's mild, chronic or acute condition. So, regular or frequent visits to medical centers are sometimes expensive and time-consuming, especially in distant areas. The main reasons for these improper health care issues are the insufficient number of doctors or healthcare providers, costs related to medical tests and equipment, health care facilities and treatments, and unified service-delivery paradigms [10]. Therefore, it is necessary to transform the conventional health care services strategies into online services platforms and then make these accessible and convenient to all sorts of people to effectively strengthen the public-health management system.

As the healthcare sector is moving towards the digital health care system, it is essential to make aware of the healthcare stakeholders and educate them to cope with the digital innovation in public health, especially to get familiarized with online platforms. There have been many types of research on the importance and benefits of the E-health caring system or online health caring support groups in literature. However, most research has focused on the importance and effectiveness of online health services targeting patients with a specific disease. For instance, a significant number of studies were showed on exploring how people learn in their everyday contexts and settings through online sources for diabetics, where participants were involved in sharing past stories about the medical treatment and gaining experiences against diabetes [11, 12, 13]. While some other researches emphasized changing the trends in getting healthcare information of Cancer [14], Kidney disease [15], and mental health services [16] on different online sources or web portals [17]. In addition, there are many applications providing e-health services, including tracking individual meals, work sessions, sleep patterns, and heart rate monitoring. However, making a collaborative health social platform for different kinds of people/users is indispensable in the modern public-health system, especially in this COVID-19 pandemic.

In this paper, we focus on an approach for making a collaborative online health-related social network platform that allows patients and their acquaintances to learn about the disease, find and provide social support, obtain treatment from specialists privately or privately, and communicate with others in similar situations. This platform also includes people with the disease, researcher groups, the health care community of common interest, the general patient and patient-to-patient, or a combination of both. As a source of health information, this platform appears to contain nearly all answers to patients' questions. Moreover, the proposed approach includes many benefits. These are the interaction between patient and healthcare provider, reducing unnecessary frequent medical visits through videoconferencing

or voice calls, minimizing medical costs, and the patients with colds, minor sprains, or other non-urgent medical conditions the platform seems to be an affordable and effective alternative to emergency treatment. First, however, we have implemented the proposed approach as a prototype on Android-based smartphone devices for experimenting. The prototype resembles an elementary version for demonstrating the usefulness and relevance of creating a healthcare social media platform. Then we have shown the results from different perspectives: membership accomplishment, service provisioning, service consuming, data archival, and data analyst/research.

Although online healthcare practices are significantly gaining popularity among the patients, they can also lead to several complications, such as misleading information, trust and safety of the platform, slowness of technological adoption by the healthcare providers and lack of participation of patients, and lack of accessibility of services to the people. However, to the best of our knowledge, this article is the first work that represents an approach for making a healthcare social media platform for healthcare service provisioning, consuming, and building a collaborative health community for all types of people, including healthcare providers, patients who need health advice or medical treatment, and research groups. In other words, the main contributions of this article are as follows:

- proposing an approach for making an online healthcare social media platform for the interaction of different stakeholders.
- encouraging the patients to make sure that healthcare services are provided only by the authentic professional healthcare providers
- allows users to share health issues in different ways (i.e., text typing, voice to text, and IoT devices records).
- enabling the reduction of unnecessary frequent medical visits through videoconferencing or other communicating scopes.
- making an affordable and effective alternative to emergency treatment or health consultancy.
- making accessibility of the healthcare services to all conveniently.

The rest of this article is structured as follows: section 2 presents the study of literature related to this article, whereas section 3 exemplifies and explains each module of the proposed approach. Then, section 4 discusses the experimental procedures and results. Finally, the article concludes with some future directions in section 5.

2 Related work

Research on benefits, importance, and designing online health caring communities are slightly limited. Besides, patients' experience is another crucial factor in deciding which platform is suitable for which type of people [18]. So, the evaluation of the patients' impact on the online

healthcare community needs to explore further. Despite the lack of extensive research, many studies have shown how online communities appear to aid patients and healthcare professionals. One such work was investigated by S. Loane et al. [19] about how online health communities enable patients to find alternative sources of their health suggestions that are impossible with conventional healthcare. However, they examined only two specific groups of communities with Parkinson's Disease and ALS in their studies without patients with other diseases.

P. Wicks et al. [20] introduced a patient-centric online research platform where patients share their life-threatening diseases information with other patients, learn from clinical discussion, get treatments, and give feedback about illness. A similar type of research proposed by Frost et al. [21] in their paper that introduces the concept of an online patient community called PatientsLikeMe. Their paper mainly focused on how patients share their health problems within the community and assisting others to get benefited from disease self-reliance. Although their study demonstrated a research-oriented platform, it should have many essential attributes on making social health platform. The attributes include allowing healthcare providers to get membership using strong credentials not to mislead patients with fake or dis-proven treatments, making a convenient way to share information using voice to text posting or text typing process, and collecting patient health status from IoT device records. Moreover, it should make a helpful community for people without requiring too many unnecessary tests and medical visits.

One of the essential aspects of designing an online platform is how one patient's data access can be helpful to others. J. H. Frost et al. [22] addressed this issue in a study about how the online community enables patients to share their experiences and reference personal health information to other patients. Although their study emphasized health information within patient-to-patient communication, the importance of privacy for sensitive health data sharing schemes should prioritize. In addition, matching patients with almost identical disease conditions and treatments and integrating data in the archive are essential in designing an online healthcare platform.

Predicting diseases epidemics with data sources from online platform play a vital role in public health informatics. There are many works found in the literature on disease outcome prediction. One of such works was published in 2008 by Davis et al. [23]. They proposed a framework to predict future diseases risks using collaborative filtering, which used patients' medical history based on ICD-9-CM codes. Later in 2010, they further proposed an iterative version that used ensembles of individual-diseases clusters [24]. Then they showed some case studies using the proposed framework, but they did not use any medical test results or any other diagnostic information which can be added later for further improvement.

Harnessing health information to make data-driven decisions for improving healthcare is one of the most crit-

ical researches seen in the past few decades. For example, N. V. Chawla and D. A. Davis [25] demonstrated a Big Data-driven approach targeting personalized patient-centered effects, reducing re-admissions. Although their approach improves the personalized health care of patients and minimizes unnecessary re-admissions rates, few points need to consider. The points include the automatic suggestion for specialized healthcare providers based on the disease symptoms, automatic matching of people with similar disease conditions and using similar treatments, and integrating data into online platforms for health conversations.

Social media platforms play a significant role in the public health sector. In 2015, C. Smith et al. [26] examined how social media platforms use as a tool for monitoring and surveillance of disease outbreaks to improve the public health system. An identical type of research study was found in 2016 by Al-Surimi et al. [27]. They highlighted and discussed the potential roles of social media in epidemic prevention and control and summarized its pros and cons. Social media platforms sometimes encourage a person to confess his/her deepest secrets and thoughts to others, especially transgender people. Cipolletta et al. [28] addressed this issue on how transgender people talk about themselves, ask questions, and build relationships through online communities in their study. In other words, they mainly demonstrated how social media and other online platforms minimize the barrier of transgender in political and other social aspects. However, many issues need to consider in the case of using social media platforms in healthcare. As social media platforms are not specialized healthcare platforms, heterogeneity in user-level data sources can cause the spreading of misinformation about infectious diseases in the public health system. Moreover, many users are not interested in sharing their disease conditions to social platforms for many reasons, including less probability of finding out professional healthcare providers, the possibility of false information, and limited scope of profound insights and analytics regarding the community's activity.

The related studies discussed above show critical observations about a collaborative healthcare community, as shown in Table 1, which includes the main points of overviewed research. The importance of online healthcare platforms plays a vital role in improving the public health system, especially in this COVID-19 pandemic situation; its necessities are indispensable. So, we need to focus on designing a collaborative healthcare social platform that targets different groups of people, including patients with different diseases, researcher groups, the healthcare community/provider of similar interest, and the general patient and patient-to-patient, or a combination of both. Moreover, the platform should enable users to access it conveniently and at the same time makes it an affordable alternative to emergency treatment/health consultancy by mitigating all the raised issues from the existing literature.

Table 1: Summary of the related work.

Reference	Purpose	Outcomes	Observations
S. Loane et al. [19]	Shown how online communities appear to support patients and healthcare professionals.	<ul style="list-style-type: none"> Facilitate patients to find alternative sources of their health suggestions. 	<ul style="list-style-type: none"> Examined only two types of diseases without patients with other diseases. The interactions of different groups of people.
P. Wicks et al. [20]	Focused on a patient-centered online research platform.	<ul style="list-style-type: none"> Information about life-threatening diseases with other patients. Patients learn from clinical discussions, receive therapies, and provide feedback on their ailment. 	<ul style="list-style-type: none"> The process of hiding or locking patient profiles and information Getting membership using identifiable credentials. Convenient way to share information using voice-to-text posting or text typing. Collecting patient health status from IoT device records
Frost et al. [21]	Focused on how patients share their health problem within the PatientLikeMe platform, assisting others to get benefits about disease self-reliance.	<ul style="list-style-type: none"> Patients post disease information, treatments, and give feedback to reflect satisfaction about diseases. Discussion within the forum by open posting and commenting on other health issues. 	<ul style="list-style-type: none"> Automatic matching of people with similar disease conditions and using similar treatments. Making the platform a helpful community to the patients to avoid unnecessary tests or medicines.
J. H. Frost et al. [22]	How social media enables patients to harness and share their experiences and feedback with others.	<ul style="list-style-type: none"> Making way for next-generation healthcare services consumed by patients. 	<ul style="list-style-type: none"> No guarantee about how patients hide their secret heal status.
Davis et al. [23, 24]	Proposed a framework to predict future diseases risks using collaborative filtering.	<ul style="list-style-type: none"> Predicting future diseases risks using collaborative filtering with patients' medical history. 	<ul style="list-style-type: none"> Inclusion of any medical test results or diagnostic information later for further improvement
Chawla and Dervis [25]	Introduced a framework based on the collaborative filtering approach to predict, manage, and make health decision.	<ul style="list-style-type: none"> Improving personalized health care of patients and minimizing unnecessary re-admissions rates. 	<ul style="list-style-type: none"> Integrating similar types of disease conditions and treatments into online platforms for other patients.
C. Smith et al. [26]	Examined significance of social media platform as tool to improve public health system.	<ul style="list-style-type: none"> Identify and monitor disease outbreak and management in order to enhance public health using social media. 	<ul style="list-style-type: none"> Addressing reliability of the social media for patients' health data sources.

Table 1: continued from previous page

Al-Surimi et al. [27]	Highlighted the potential role of social media in epidemic prevention and control.	<ul style="list-style-type: none"> – Social media as important platform to reporting and alerting regarding infectious diseases. 	<ul style="list-style-type: none"> – Heterogeneity in user level data sources may cause misinformation of infectious disease in the public health system.
Cipolletta et al. [28]	How transgender people talk about themselves, ask questions, and build relationships in online communities.	<ul style="list-style-type: none"> – Social media platform and Internet minimize the barrier of transgender in political and other social aspects. 	<ul style="list-style-type: none"> – Less probability of finding out professional healthcare providers. – The possibility of false information. – Limited scope of profound insights and analytics regarding the community's activity

3 Methodology

This section introduces our proposed approach that connects patients, healthcare practitioners, and researcher community groups. The proposed platform consists of five different modules, namely, membership accomplishment, service provisioning, service consuming, data archival, and analyst, as shown in Figure 1. The first module defines how a new member, either healthcare provider, data analyst, or healthcare service seeker, enrolls in the system. The second module characterizes the healthcare service seekers' activities, including sharing health stories, conditions, symptoms, and referencing health specialists. Moreover, this module defines how patients post their health issues to obtain healthcare aid from specialists.

On the other hand, the third module enables healthcare provider interactions in providing treatments, suggesting medicines, and notifying disease outbreaks or health hazards to the intended users on the platform. Finally, the data flow on the platform is stored in a data archive, as indicated in the fourth module. This archive aims to convert data into healthcare decision-making, as illustrated in the last module. It is, however, the diagram (see in Figure 2) shows the detailed functional and operational characteristics of the proposed platform.

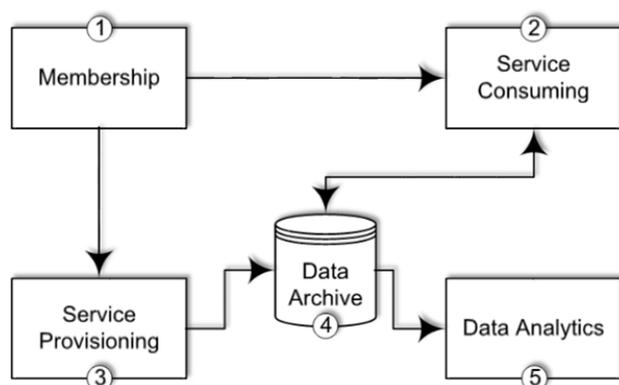


Figure 1: Architectural model of the platform.

The flow diagram (shown in Figure 2) starts with membership enrollment. The members are the healthcare provider, healthcare seeker or patient, and data analyst. When a member finds the platform to visit, it has to ensure whether the member is new or existing. For a new member, it (platform) has the feature to enroll or not. If the member does not want to enroll, then he/she is only allowed to view publicly available health data contents. On the other hand, the member, who wishes to enroll, must request a membership token. This token is the unique identity of a user in the platform. Moreover, the token is used in the modification of any activity by the registered members. So, using the obtained token, the member is enrolled either as a healthcare seeker, provider, or data analyst/researcher. For a health service seeker, few credentials such as name, date of birth (DoB), social security number or national identity

number, e-mail, and nationality require to assure that the intended member needs healthcare services. In addition, any fraudulent activity of the member can also be capture with the given credentials. However, for the rest of the members (except healthcare service seekers and researchers), one more credential such as healthcare providers' (can be registered doctors') professional identity or any valid identity as a healthcare provider is essential.

The service consumers are the health service seekers/patients stated in the platform. The service seeker can share diseases conditions, symptoms, and health status in different ways, such as through IoT device records, voice to text, and text typing. Voice-to-text typing is essential for users who are not capable of writing text properly digitally. It is also helpful for users who are physically disabled for typing something by hand. Moreover, text typing is generally for all users who can describe their health issues through typing. On the other hand, IoT devices records are instrumental in providing health status nowadays. For instance, blood pressure, diabetes, and recognizing body activities are the most common in real-time with different wearable IoT devices such as body sensors, wearable blood pressure, and diabetics monitors. These devices are automatically captured and submitted to the health status in the proposed platform. However, healthcare seekers can share their past health stories with others who benefit from the shared information. The stories are shared willingly or based on the requested message (solicited message). The healthcare seekers can also refer to experienced healthcare providers to other service seekers.

The service providers are the healthcare providers who have professional capabilities in provisioning various suggestions regarding health issues to the healthcare service seekers. The roles of the healthcare providers are to provide treatments, prescribe medicines and tests to the patients either publicly or privately. Publicly suggesting means making comments in reply to someone's health post visible to all users; the privately suggesting refers to the secret messaging based on the healthcare seekers' requests through the chatbox. Furthermore, one of the most valuable and essential roles of the healthcare provider is to alarm the people regarding emerging diseases and health hazards like Ebola or Covid-19 pandemic. The healthcare provider shares information regarding new diseases, symptoms, and treatments and makes health consciousness to all or motivates people to be health conscious through various healthcare tips.

Finally, the information generated in all modules characterizes an organized collection of structured data, typically stored electronically in a data archive. This archival aims to harness health-related data and turn it into various healthcare decision-making that the researchers or data analysts accomplish. The insights from health data are beneficial to improve one's health condition.

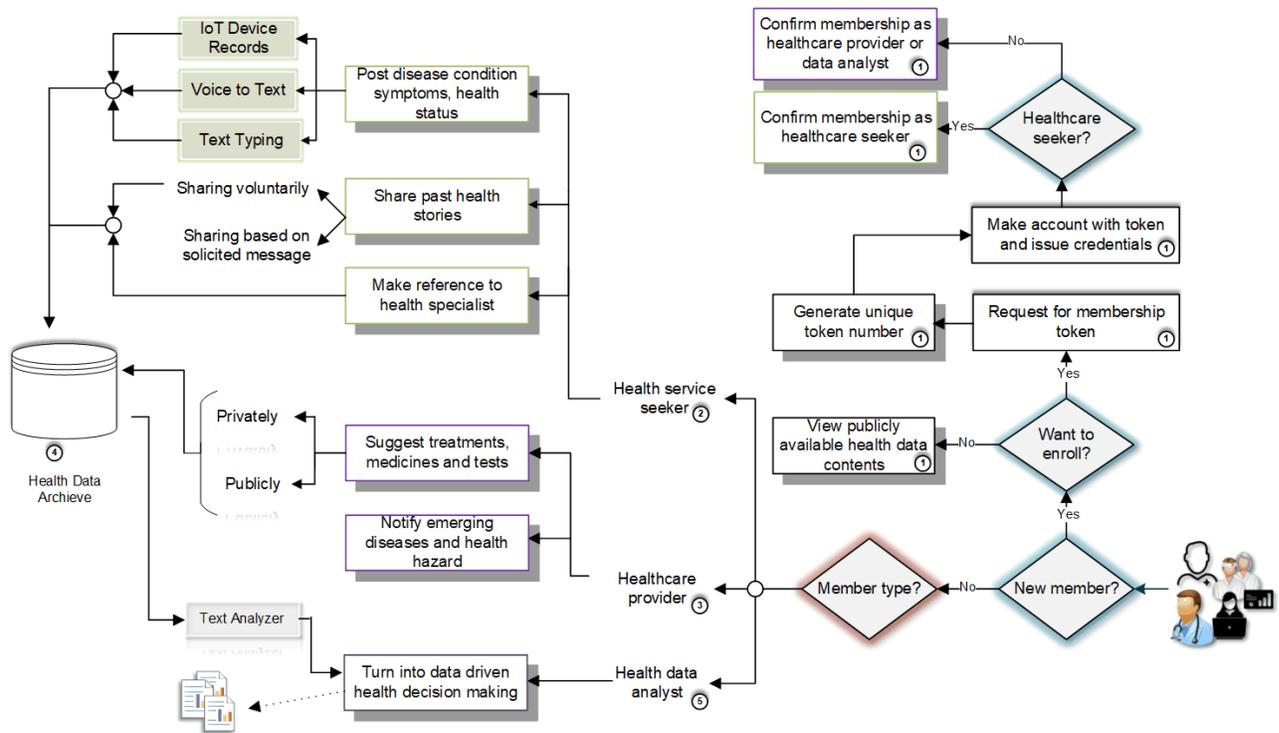


Figure 2: Overall workflow showing the interaction and task accomplishment of various healthcare service oriented components.

4 Experiment and result analysis

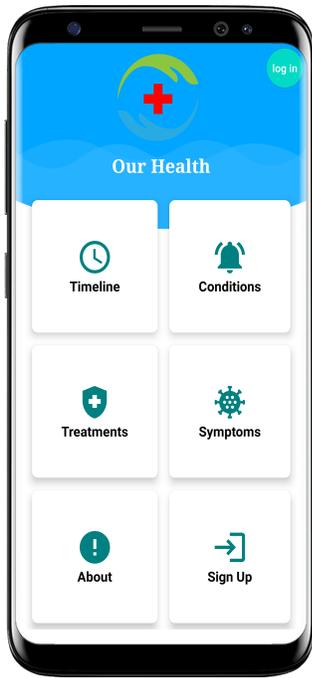
This section represents the experiments, results, and discussion of this work. As we focus on establishing a health community platform with various modules incorporating patients, healthcare practitioners, and researchers so for convenient access, we implemented it as an experimental prototype on Android-based smartphone devices. The prototype symbolizes an elementary visual replica that looks like an actual application and demonstrates the basic design and functionality of all the modules of the proposed approach. The prototype intended to demonstrate the applicability and usability of our proposed approach to make an online healthcare social platform. However, the rest of this section demonstrates the various functionalities of the proposed model through the designed prototype.

Figure 3 shows the visual interface that characterizes the users to the nature of the app. It is the initial view of the proposed platform. When a user looks for a health community medium, the interface appears as an app landing page (see Figure 3a) to the users in order to describe different functionalities of the app. All the functions and related information on the app landing interface are publicly accessible to any user. The information presented in this interface is about the public timeline, disease conditions, disease symptoms, treatments, and membership enrolment. The public timeline, as shown in Figure 3b, shows recent activities of registered users who share information regarding symptoms, diseases, treatments, and related health issues. Moreover, information in this public timeline also

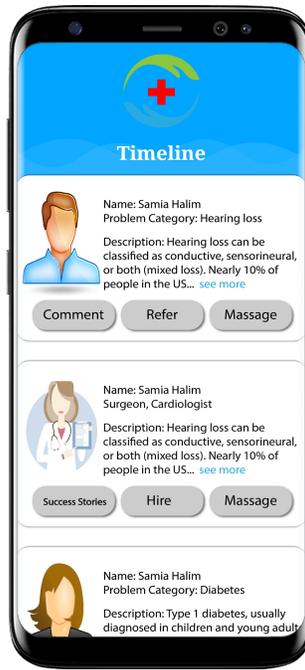
shows an alarming notification to the intended users in the platform in the case of health hazards or disease outbreaks (e.g., COVID-19 pandemic).

Disease condition represents the categorization of different symptoms and conditions in a specific disease. For example, breast cancer, lung cancer, and liver cancer conditions classify as cancer, as shown in Figure 3c. The treatments interface, as shown in Figure 3d, depicts a historical description regarding the treatment of the patients, for example, how many patients are satisfied with the obtained treatments, how many recover from a disease, and how a healthcare provider prescribes a patient. Finally, the symptoms interface, indicated in Figure 3e, characterizes the patients who are suffering from various symptomatic diseases and conditions and need health services.

As the proposed platform allows users to view only publicly available health data contents (see in Figure 3), so users must enroll in membership to get full advantage of it. The membership enrolment follows few processing phases. Figure 4a shows the first step that enables users to register and gain access to the platform independently. As we focus on three types of users, including healthcare provider (or doctor), data analyst, and patient, so we have provided the option to select the type of user that indicates in Figure 4b. After choosing the proper user type, it is necessary to obtain a membership token by providing a few basic information about a user. For example, Figure 4c shows how the healthcare providers do this in the registration process. Finally, the membership enrolment is complete with a few



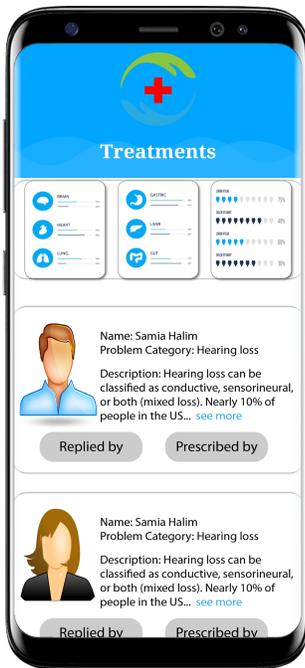
(a) Landing page.



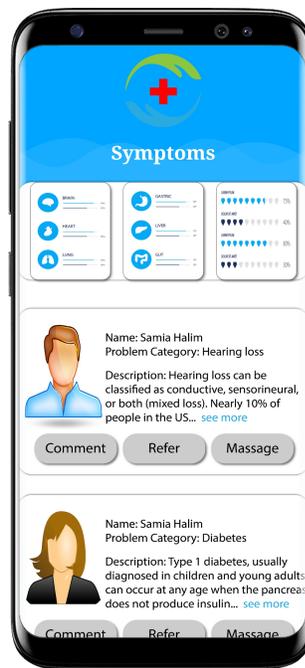
(b) Timeline.



(c) Diseases conditions.



(d) Treatments.



(e) Symptoms.

Figure 3: A snippet of the app describing the users to what the app is all about.

more information as shown in Figure 4d.

Healthcare service seekers or patients are one of the main stakeholders in the proposed platform. They perform different activities in the platform, including issuing diseases, symptoms, and conditions, looking for treatments or health suggestions, sharing past health stories, etc. Some of these major activities show in Figure 5. After a registered user entering into the app as a patient, the first thing that comes up is a dashboard (see Figure 5a) that provides an at-a-glance view of the major activities of user. Like other users of this app, the patient's timeline, as shown in Figure 5b, presents a place that allows any user to view the patient's various activities, including who has given a reply or given treatment to solve the patient's problem. A patient's past and current health status helps improve his/her health and makes other patients aware of their health. Moreover, anyone can request further information regarding the health status of a patient. These are represented in Figure 5c, and Figure 5d respectively.

Healthcare service provisioning is another essential component of the proposed platform. Any authentic healthcare provider generally accomplishes the service provisioning process. Figure 6a shows the role assignment of a healthcare provider on the proposed platform. Unlike other users, the healthcare provider's timeline, as demonstrated in Figure 6b, contains different activities of patients and doctors. In addition, any notification on health hazard issues, such as the COVID-19 pandemic, is presented on a timeline. Any user, who need healthcare advice, can view a healthcare provider's detailed profile (Figure 6c), and will be able to know about the patients served by the healthcare provider and will also be able to connect with those patients if the user wants (Figure 6d). Moreover, any user finds a healthcare provider's success stories (Figure 6e) and then suggests others to follow the healthcare provider.

4.1 Discussion

The proposed platform focuses on certain features that distinguish it from any other existing systems. Although there is a limited number of platform in state-of-the-art regarding interaction between patients and healthcare providers, in spite of that, we have found various communities, including PatientsLikeMe², HealthBoards³, MedHelp⁴, DailyStrength⁵, WebMD⁶, GiveForward⁷, HealthUnlocked⁸, and Inspire⁹ that are providing services targeting to a specific group. These are the patient-centric research-oriented platforms and the world's popular health engagement and community platform. Although the concepts of these platforms are somewhat similar to the proposed approach, it has

many dissimilarities with the proposed platform in terms of operational and functional characteristics. However, in Table 2, the comparative summary between existing platforms and the proposed platform is presented with some of the key features.

Taking a closer look at Table 2, we can see that there is a tendency for public health fraud to provide false medical reports or advice by unauthorized caregivers in the existing systems. In contrast, professional healthcare providers can offer health services to people by proper identification in the proposed platform. Moreover, it makes an affordable and effective alternative to emergency health consultancy to avoid unreasonable regular medical visits. We can also observe that patients' data hiding scheme is not available in the traditional approaches, whereas the proposed system contains both public and secret health data sharing strategies. Besides, the target patients share their health status using a single channel in the previous platforms; inversely, the current approach includes different channels (IoT, voice-to-text, or text typing) for building a collaborative health community. In other words, the proposed platform allows accessibility and involvement of different stakeholders for health service consumption and provision.

5 Conclusion

This article focuses on building an online health community platform for the interaction of diverse users, including doctors/healthcare providers, patients/healthcare seekers, and research groups of common interest. It is the first approach towards a healthcare social media platform for provisioning, consuming, and building a health community. The platform consists of various functional modules, including membership accomplishment, service provisioning, service consuming, data archival, and data analyst/researcher. The users' involvement on the platform has been ensured by gaining access to get the full benefits of the platform with membership and then allowing unregistered members to view publicly available health data contents. However, most of the functionalities of the proposed approach have been illustrated employing a prototype on Android-based smartphone devices. The prototype resembles the elementary version for showing the usability and relevance of making a healthcare social media platform. Furthermore, the proposed approach shows some unique features different from the state-of-the-art approach related to the online health community, including different types of user role assignment, public and personal data sharing schemes, focusing on various ways of providing health issues by any patient, and so on. In addition, the platform will consider an affordable and effective alternative to emergency treatment or consultancy in case of mild, chronic, or acute disease.

Although the proposed approach makes a pathway towards an online social health caring services system, there are several different scopes to work on it, such as restrict-

²<https://www.patientslikeme.com/>

³<https://www.healthboards.com/>

⁴<https://www.medhelp.org/>

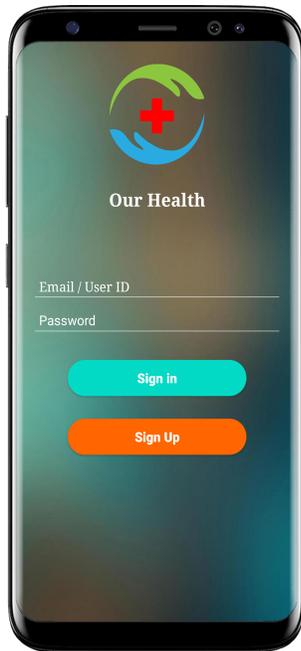
⁵<https://www.dailystrength.com>

⁶<https://www.webmd.com/>

⁷<https://www.giveforward.com>

⁸<https://www.healthunlocked.com>

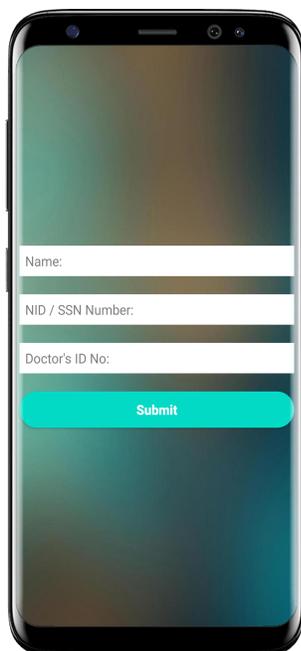
⁹<https://www.inspire.com>



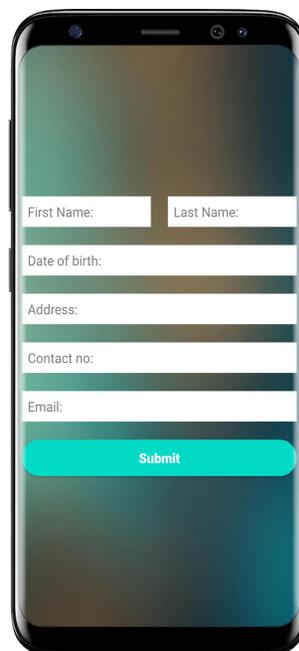
(a) First phase.



(b) Second phase.

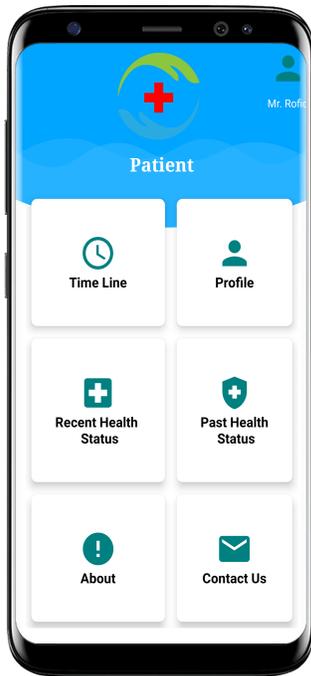


(c) Third phase.

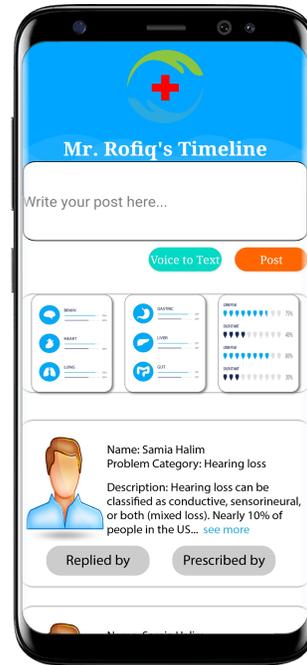


(d) Final phase.

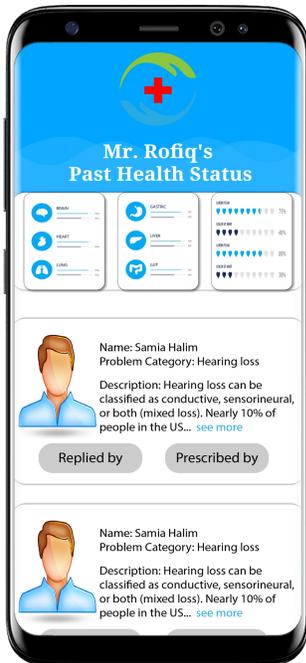
Figure 4: A snippet of the step-by-step membership enrolment process.



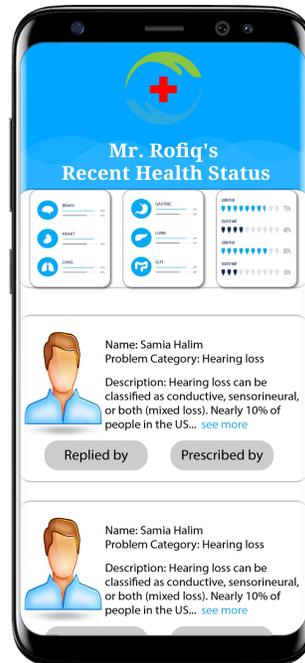
(a) Patient dashboard.



(b) Patient's timeline.

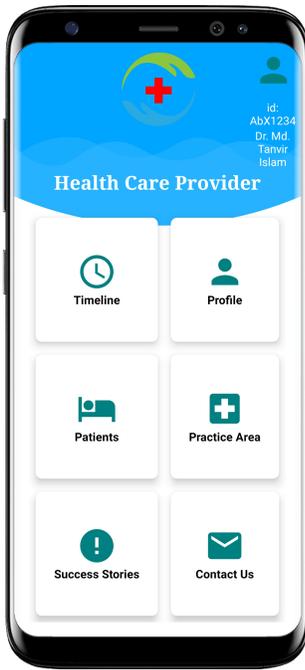


(c) Past health stories.

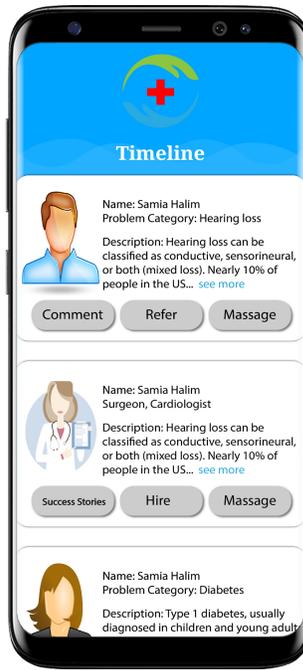


(d) Recent health status.

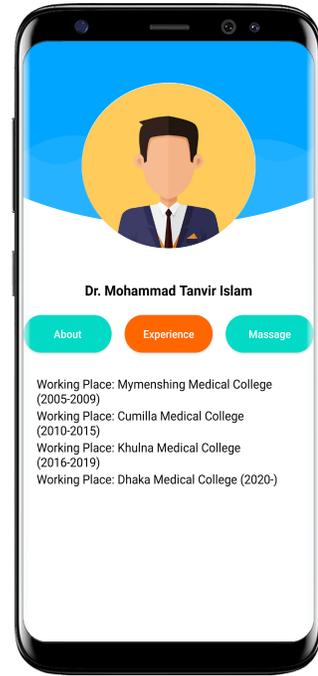
Figure 5: Healthcare service seeker.



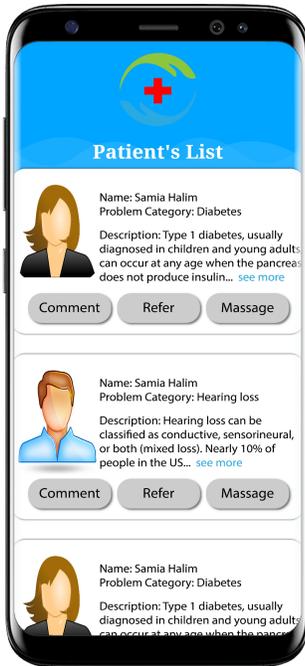
(a) Dashboard.



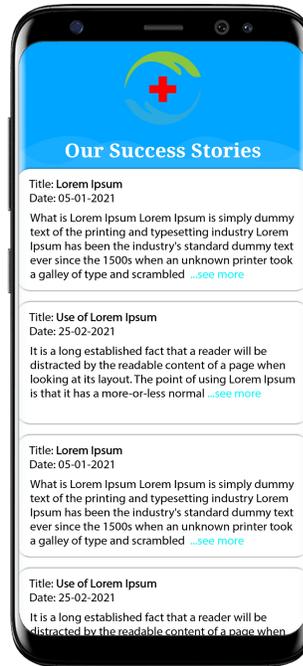
(b) Timeline.



(c) Profile.



(d) Patients' list.



(e) Success stories.

Figure 6: Healthcare services provider.

Table 2: Comparison of operational and functional features between the existing Web-based platform and the proposed platform

Existing health communities	Proposed platform
There are more likely to get health care services from people who are not registered healthcare professionals. The reason is that anyone can join as a caregiver for someone else without verifying identity as a healthcare provider.	The proposed platform has different types of user rule assignments to be easily identified if a user shares any fallacious information related to health. So, there are more likely to get health services from professional caregivers.
It is a mainly patient-centric research-oriented platform.	It makes the interactions between patients and healthcare providers as well as offers research-oriented services. It also makes an affordable and effective alternative to emergency treatment or health consultancy in order to void unnecessary frequent medical visits.
It provides health data open for the benefit of others.	It has both public and private data sharing facilities for the benefit of others.
The target patients of this platform are those who can post/share health issues through text typing.	It offers three different ways (i.e., text typing, voice to text, and IoT devices records) to post/share health issues for all types of patients.
It only focuses on building healthcare communities among the people.	It focuses on healthcare service provisioning and consuming as well as building a healthcare community.
Accessibility and participation to people are still constraints in these platforms because the targeted audiences are advanced users.	It targets different categories of audiences alongside accessibility of services in terms of different communicating schemes (e.g., voice or texts).

ing misleading or falsification information regarding health issues, ensuring trust and safety of health data, securing sensitive health information using advance technology (i.e., blockchain), and then testing the platform in front of large users. However, in the future, we have a plan to include these issues. In addition, we will include a video conference scheme for the consultancy of doctors with patients.

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Conflict of interest

The authors have no conflicts of interest.

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