

Report of Dhadkan-2 Mobile application on Heart failure outcomes



Dr.L.Gopichandran



Dr. Deepak
Sharma



Prof.
Sandeep
Seth



Ms. Dainy
Thomas



Mr. Subeen



Ms. Ankita
Sharma



Ms. Divya

College of Nursing, AIIMS, New Delhi (1), Department of Biotechnology, IIT, Roorkee (2), Heart failure clinic, AIIMS, New Delhi (3), Nursing officer, Cardiology Department, AIIMS, New Delhi (4)

Introduction

Heart failure (HF) is a common cardiovascular condition with increasing incidence and prevalence. The estimated prevalence of heart failure (HF) in India is about 1% of the population or about 8–10 million individuals and the estimated mortality because of HF is about 0.1–0.16 million individuals per year. The elderly are predominantly affected by HF in western countries, but younger age groups are more affected in developing countries like India.(1) It is a chronic and debilitating condition, hence requires long term self-care behaviors, illness knowledge and regular monitoring of HF symptoms. Almost one third of patients after admission for heart failure are likely to get readmitted or die in the next 3–6 months.(2) Telemonitoring these patients after discharge allows picking up adverse events before they happen and improving the quality of life in these patients. This is an effective way to deliver long term health services and monitor these patients from home or remote areas.

Development and implementation of Dhadkan software application using smart phone was done in lieu of this long term and regular health needs of heart failure patients. Dhadkan application was first introduced in 2016, another version of it has been developed and now is in a trial for validation.

History (Dhadkan -1)

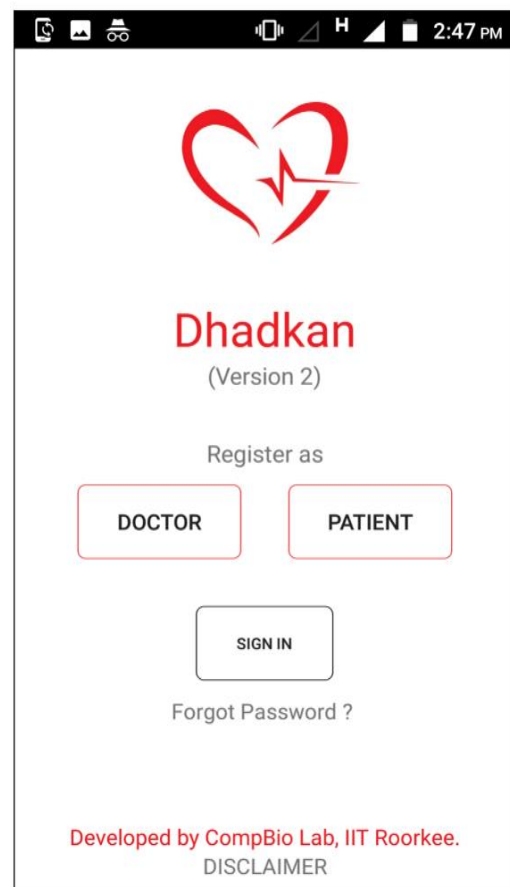
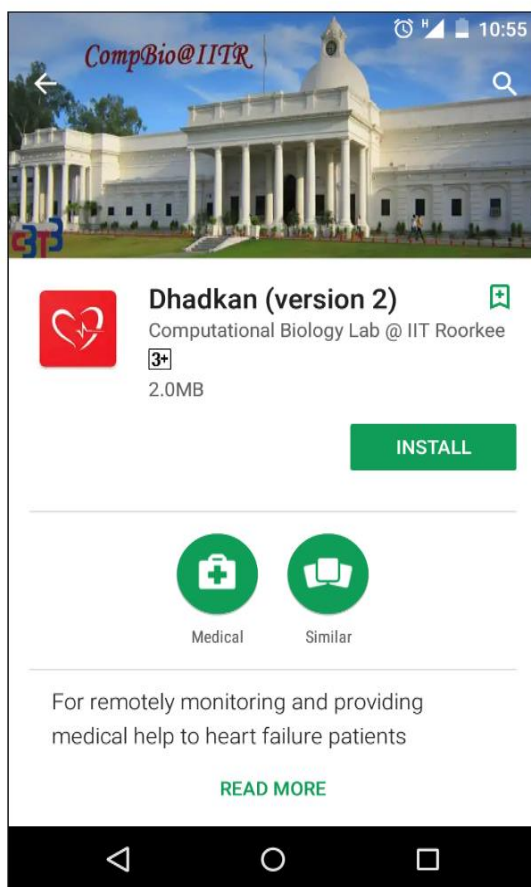
Dhadkan-1 an indigenous smartphone application. This application collects information regarding Blood Pressure, Heart rate, weight and transmits it once a week to the authorized caregiver (a nurse or a doctor or paramedic) who is linked to the patient during the initial registration. It is available on Google Play Store. After downloading, the patient registers on this application. The caregiver also has to register. After this, the patient will enter the blood pressure, heart rate, and weight, once a week on the app screen. Once he/she saves the information, the information is transmitted to the caregiver as a simple SMS. If the patient does not carry a smartphone, their children are encouraged to help them as children usually carry a smartphone. After the launch of this app, a validation study was conducted in which patients were randomly assigned to a nurse-led heart failure program, which included this smartphone app as the monitoring tool.(3) Half of the patients were registered on the

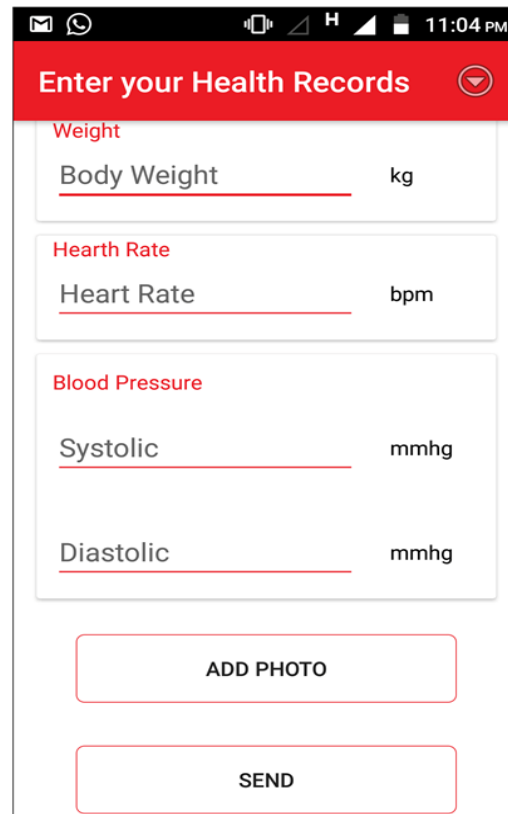
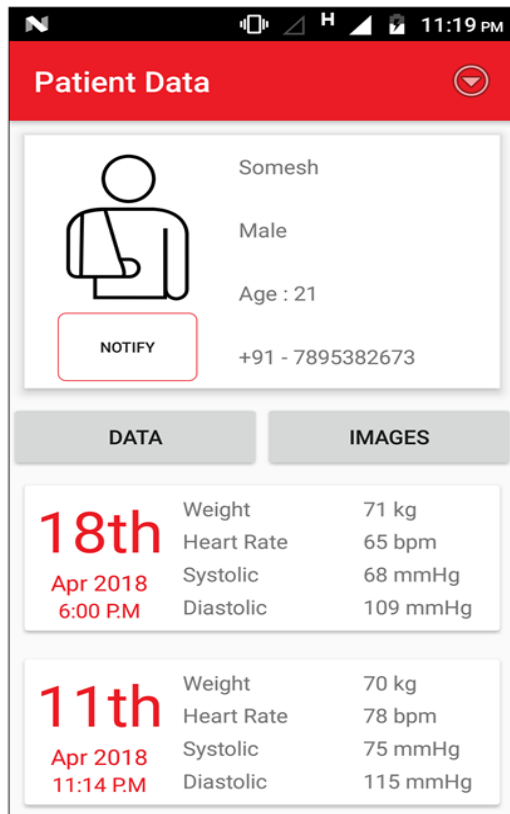
Dhadkan application while the other half was kept as control arm. Registered patients were instructed to send their vital parameters through this application once a week. The nurse and doctors in the program intervene whenever there are inappropriate blood pressure fluctuations or heart rate fluctuations in the patient or an increase in weight over the past week. This study revealed a significant improvement in registered group in terms of Quality of Life, NYHA Class after three months.(4)

Dhadkan -2

Dhadkan-2 Mobile App is also developed for remotely monitoring and providing medical assistance to the HF patients. It collects patient data (at any desired interval) on blood pressure, heart rate, and weight, and transmits it to the authorized caregiver (a doctor, nurse or paramedic) who is linked to the patient during the initial registration. It also provides a two-way communication between doctors and patients. In addition, patients have the freedom to send images of any reports (for example, ECG or Echo) to the doctor and get doctor's advice immediately/remotely.

Most importantly, it automatically sends a notification to both the doctor and the patient, in case(s) of any drastic changes in patient's data indicating a possibility of imminent heart failure. Thus, it not only eliminates the need for manual monitoring of each patient by the doctor but also helps them in proactively recommending precautionary action during the treatment period. Dhadkan 2 App is freely available on Google Play Store for the use of doctors and patients (<https://play.google.com/store/apps/details?id=com.compbio.iitr.dhadkan>). Patient has the freedom to change his/her doctor. On doing so, the entire medical history of the patient is transferred to the new doctor. If needed, doctor/patient can reset the password.





Technology Used

The App primarily uses Python for back-end services, Java for Android development and XML for developing User Interface. Furthermore, it uses Android Studio (an official integrated development environment for Google's Android operating system) as its framework for front-end development. Django, a high-level Python Web framework that encourages rapid development and clean/pragmatic design, has been used for the development of back-end that is hosted on Nginx Server in Computational biology Lab, IIT Roorkee (India). It uses SQLite3 as its database system and Firebase as a notification service for notifications regarding anomaly detection, messages and OTPs during password-reset. Authentication framework is used to validate every user operating on the platform. JWT (JSON Web Token), a compact and self-contained way for securely transmitting information between parties as a JSON object, has been used as the authentication protocol. This information can be verified and trusted because it is digitally signed.

Benefits/Advantages

The main benefit of Dhadkan 2 Mobile App is that it will help in saving the precious lives of heart failure patients. It is available free and no charges are involved to avail the benefits of this App. In addition, it will be of tremendous benefit to those who don't have any tertiary care hospitals near their homes. The App has been developed and designed in such a way that it can be easily used by rural people as well.

Randomized controlled trial

A validation study is being conducted to assess the effectiveness of this application, in which heart failure patients are grouped into two, where one is registered with Dhadkan 2 application and other one is receiving usual care. Registered patients are being monitored with this application along with this; patients are instructed about management of heart failure. Quality of life, medication adherence and heart failure biomarker pro BNP are the

outcomes that will be compared between app registered and non-registered groups after 3 months.

3rd Commonwealth Digital Health Awards 2018

Dhadkan 2 application is appreciated as well as selected as a finalist at 3rd Commonwealth Digital Health Awards 2018, on 11th and 12th October under the category of health education and health promotion.

Conclusion

Dhadkan 2 smart phone application is an indigenous invention that is much required as in western countries, the patients are connected to their physician through various monitoring systems. Here in India, it is important to have such methods so that the patients with chronic disease as Heart failure can be monitored regularly for long term and early intervention can be sought in case of emergency.

References

1. Chaturvedi V, Parakh N, Seth S, Bhargava B, Ramakrishnan S, Roy A, et al. Heart failure in India: The INDUS (INDia Ukieri Study) study. *J Pract Cardiovasc Sci* [Internet]. 2016 [cited 2017 Dec 31];2(1):28. Available from: <http://www.j-pcs.org/text.asp?2016/2/1/28/182988>
2. Liu M-H, Wang C-H, Huang Y-Y, Cherng W-J, Wang K-WK. A Correlational Study of Illness Knowledge, Self-Care Behaviors, and Quality of Life in Elderly Patients With Heart Failure: *J Nurs Res* [Internet]. 2014 Jun [cited 2017 Dec 31];22(2):136–45. Available from: <http://content.wkhealth.com/linkback/openurl?sid=WKPTLP:landingpage&an=00134372-201406000-00010>
3. Seth S. "Dhadkan," an indigenous smartphone app for heart failure patients. *J Pract Cardiovasc Sci* [Internet]. 2016 [cited 2018 Nov 1];2(3):141. Available from: <http://www.j-pcs.org/text.asp?2016/2/3/141/201383>
4. Rai M, Sharma K, Seth S, Pathak P. A randomized controlled trial to assess effectiveness of a nurse-led home-based heart failure management program. *J Pract Cardiovasc Sci* [Internet]. 2017 [cited 2018 Feb 22];3(1):28. Available from: <http://www.j-pcs.org/text.asp?2017/3/1/28/210869>