Digital health services in managing people living with diabetes
Jour of Diab and Endo Assoc of Nepal 2021; 5 (2): (1-4)
ISSN Print 2594-3367 ISSN Online 2631-2107

Journal of Diabetes and Endocrinology Association of Nepal

EDITORIAL

DIGITAL HEALTH SERVICES IN MANAGING PEOPLE LIVING WITH DIABETES

Gupta PP[1], Maskey R[2]

[1]Associate Professor, Department of General Practice and Emergency Medicine
[2]Head of Department and Endocrinologist, Department of Internal Medicine
B.P. Koirala Institute of Health Sciences, Dharan, Nepal.

In the recent world, more than 450 million people have diabetes. There are several types of diabetes and among them common are Type 1 DM in which the body cannot produce Insulin, Type 2 DM in which body cannot properly use insulin and Gestational Pregnancy related Diabetes. For diabetic patients, failure to treat or manage it can lead a serious complications like blindness, renal failure, heart attack and lower limb amputation. The burden of diabetes in patients are more acute in low middle income countries where nearly 80 % people lived with diabetes.

Digital health is a methodology that uses ICT to more efficiently personalize, and precisely address, the various problems people face with health[1]. In addition to healthcare, experts and stakeholders from various fields such as engineering, public health, and the economy are also involved in the digital health arena. In general, the provision of digital health services facilitates the collection of data related to an individual's condition, analyzes data to evaluate clinical or pre-clinical conditions, and provides the personalized intervention or monitoring for an area of interest[2]. These services not only include traditional interfaces such as e-mail, text messages, and web, but also new technology-based services such as smartphones, applications, and wearable devices[3]. Furthermore, the digital health field incorporates advanced and specialized services directly utilized by doctors and healthcare professionals.

Development of digital health implies that in dealing with diabetes there is a demand to establish a standard as guidance. Standard of digital health technology should fulfill aspects of functionality, contextually, effectiveness, and economic efficiency[4]. Level of evidence in functional aspects divided into three levels[4].

a. Level 1 is noticed when there is no direct user benefit such as electronic health records that can be connected to the wards and emergency room.
b. Level 2 is noticed when the information related to healthy living and illness prevention behaviors is provided. At this level, digital health service may provide information; do monitoring, and conduct two ways communication.
c. Level 3
   - 3A refers to the use of digital health service in preventing and managing diseases by self-management behavior with measurable patient's outcome.
   - 3B, which the most advanced medical device takes role in treating, activating, monitoring, calculating and diagnosing the patient.

The contextual and functional aspects have to be contemplated among the vulnerable populations who have limited digital literation. Adding to that, digital health service should provide factual information and clinical judgment to prevent misdiagnosis. This approach could support health

Correspondence Author
Dr. Pramendra Prasad Gupta
Associate Professor
Department of General Practice and Emergency Medicine
B.P. Koirala Institute of Health Sciences, Dharan
Email : dr.pramen@gmail.com

Jour of Diab and Endo Assoc of Nepal 2021; 5 (2): (1-4)
ISSN Print 2594-3367 ISSN Online 2631-2107
Journal of Diabetes and Endocrinology Association of Nepal

EDITORIAL

care professional deliver their practical treatment5. In spite of the patient having low digital skill, the national government of the concerned countries should declared the legal and ethical consideration of digital health service which will be used. It also relates to economic consideration when the higher level functional digital health service the higher cost should be spent to cover the budget impact, cost utility, and cost consequences[6].

Validating digital health products requires a complex domain which is time-consuming during its development process. There are 4 domains to construct the rigor of digital health known as digital health scorecard[7].

a. 1st domain is technical to ensure the precision of the device of the digital product as valid as the gold standard of clinical examination. Technical validation was also constructed by security and interoperability aspects. The examples of technical validation of CGM in diabetes management that the device could check the blood glucose accurately, easily transfer to the health care provider, safely encrypted and provide data privacy for the patient[8].
b. 2nd domain is clinical aspect to make sure the digital health product feasible in real-world settings. In this stage, there will be critical appraisal of the simulation to determine a true clinical judgment9. An example of clinical validation in diabetes mobile apps using Mobile App Rating Scale (MARS) scoring to determine whether the application is good acceptable or poor acceptable[10].
c. 3rd domain is usability, to define when the feature of digital health met the needs of consumers (diabetes patients or health care providers). The best example of usability validation in CGM is calculation of high and low glucose scores, user's experiences, and patch attachment adherence[11].
d. 4th domain is about the cost or amount of price that consumers should pay to get access to a digital health service or product. In some diabetes apps, it is low cost and somehow it is free of charge. In the beginning, advanced technology such as CGM devices will be quite expensive. In future, this cost will be paid congruence with a better quality of care[12].

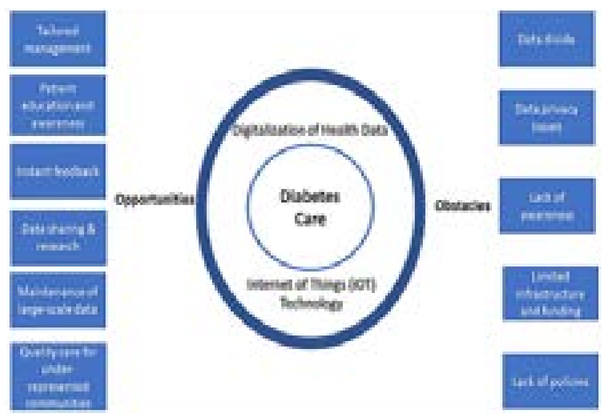

Fig 1. The main opportunities and obstacles implicated in the wider implementation of digitalization of diabetes health 13

Table 1: Representative digital health-related factors that can be used in diabetes and metabolic diseases

Classification	Example
Pre-clinical condition	
Assessment of daily activity	Activity tracker, heart rate, electrocardiogram, sleep quality
Evaluation of eating habits	Evaluation of meal time, frequency, total food intake, and calorie pursuing automation with the "food lens" function

Jour of Diab and Endo Assoc of Nepal 2021; 5 (2): (1-4)
ISSN Print 2594-3367 ISSN Online 2631-2107

Journal of Diabetes and Endocrinology Association of Nepal

EDITORIAL

Weight reduction/diabetes prevention	Obesity management applications, online diabetes prevention program interventions
Digital health for people with diabetes mellitus	
Patient education	Evidence-based reference materials, Chatbot service
Advanced blood glucose measurement	Continuous glucose monitoring systems
Improvement of medication adherence	Oral medication with biosensor, insulin dose calculator, digital insulin pen
Evaluation and management of complications	Screening of retinopathy, and foot ulcer, detection and/or prediction of fall, hypertension management, home urinalysis
Direct involvement from healthcare professionals	Remote blood glucose monitoring, human coaching
Remote clinical trial	'ResearchKit', mSToPs study

Resource: Rhee SY, Kim C, Shin DW, Steinhubl SR. Present and Future of Digital Health in Diabetes and Metabolic Disease. Diabetes Metab J. 2020;44(6):819-827. doi:10.4093/dmj.2020.0088

Various successful activities already been running in many countries. The recent study shows a comprehensive diabetes healthcare center in south India has been efficiently exploiting the Diabetes Tele-Management System (DTMS®), a telemedicine-based intervention and follow-up program for diabetes management since 1998. The DTMS® team uses telephone/email/secure website to educate patients/caregivers on insulin injection technique, diet, exercise, use of a glucometer, hypoglycemia, and compliance to medications as well as to titrate insulin and oral drug dosages according to personalized glycemic targets. Telemedicine follow-up through DTMS® produced a significant reduction in HbA1c and hypoglycemia frequency in a cohort of 1000 patients with T2D. This approach ensures appropriate glycemic control, reduction in micro- and macrovascular complications, and multidrug compliance among the patients[14].

Digitally facilitated interactions between people living with Diabetes and healthcare professionals can allow enhanced access to care and prevent avoidable complications. This was demonstrated by the Be He@lthy Be Mobile (BHBM) initiative, run jointly by the WHO and the international Telecommunication Union (ITU), which works with governments and other partners to improve the prevention and control of NCD including diabetes with mobile technology. One BHBM program helped people living with diabetes in low- and middle-income countries to reduce diabetes-related complications through simple SMS interventions.

References

1. Sharma A, Harrington RA, McClellan MB, Turakhia MP, Eapen ZJ, Steinhubl S, Mault JR, Majmudar MD, Roessig L, Chandross KJ, Green EM, Patel B, Hamer A, Olgin J, Rumsfeld JS, Roe MT, Peterson ED. Using digital health technology to better generate evidence and deliver evidence-based care. J Am Coll Cardiol. 2018;71:2680–90. [PubMed] [Google Scholar]
2. Ricciardi W, Pita Barros P, Bourek A, Brouwer W, Kelsey T, Lehtonen L Expert Panel on Effective Ways of Investing in Health (EXPH) How to govern the digital transformation of health services. Eur J Public Health. 2019;29:7–12. [PMC free article] [PubMed] [Google Scholar]
3. IQVIA. Digital health tools. Available from: https://www.iqvia.com/insights/the-iqvia-

Jour of Diab and Endo Assoc of Nepal 2021; 5 (2): (1-4)
ISSN Print 2594-3367 ISSN Online 2631-2107

Journal of Diabetes and Endocrinology Association of Nepal

EDITORIAL

institute/reports/the-growing-value-of-digital-health(cited 2020 Oct 20)

4. National Institute for Health and Care Excellence. Evidence standards framework for digital health Technologies. Available from: https://www.nice.org.uk/about/what-we-do/our-programmes/evidence-standardsframework-for-digital-health-technologiesPublished 2019
5. Darrel MG Strategies for digital care of vulnerable patients in a COVID-19 world—keeping in touch. Available from: https://jamanetwork.com/channels/health-forum/fullarticle/2767347.Published2020Last accessed on 2020 Nov 18
6. Alami H, Gagnon M-P, Fortin J-P. Digital health and the challenge of health systems transformation Mhealth. 2017;3:31.
7. Mathews SC, McShea MJ, Hanley CL, Ravitz A, Labrique AB, Cohen AB. Digital health:A path to validation NPJ Digit Med. 2019;2:1–9
8. Petrie JR, Peters AL, Bergenstal RM, Holl RW, Fleming GA, Heinemann L. Improving the clinical value and utility of CGM systems:issues and recommendations:A joint statement of the European Association for the Study of Diabetes and the American Diabetes Association Diabetes Technology Working Group Diabetologia. 2017;60:2319–28
9. Fleming GA, Petrie JR, Bergenstal RM, Holl RW, Peters AL, Heinemann L. Diabetes digital app technology:Benefits, challenges, and recommendations A consensus report by the European Association for the Study of Diabetes (EASD) and the American Diabetes Association (ADA) Diabetes Technology Working Group. Diabetologia. 2020;63:229–41
10. Chavez S, Fedele D, Guo Y, Bernier A, Smith M, Warnick J, et al Mobile apps for the management of diabetes Diabetes Care. 2017;40:e145–6 doi: 10.2337/dc17-0853
11. Freckmann G, Link M, Kamecke U, Haug C, Baumgartner B, Weitgasser R. Performance and usability of three systems for continuous glucose monitoring in direct comparison J Diabetes Sci Technol. 2019;13:890–8
12. Wan W, Skandari MR, Minc A, Nathan AG, Winn A, Zarei P, et al Cost-effectiveness of continuous glucose monitoring for adults with type 1 diabetes compared with self-monitoring of blood glucose: The DIAMOND randomized trial Diabetes Care. 2018;41:1227–34
13. Kesavadev J, Krishnan G, Mohan V. Digital health and diabetes: experience from India. Therapeutic Advances in Endocrinology and Metabolism. January 2021. doi:10.1177/20420188211054676
14. Dash, SP. The impact of IoT in healthcare: global technological change & the roadmap to a networked architecture in India. J Indian Inst Sci 2020; 100: 773–785.