Impact of digital health Apps onmedication adherence & self management

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Abstract

Although several medication adherence strategies have been proposed in the literature, their practical applicability has been shown to be limited. Even when they are aware of the repercussions of noncompliance, few patients persistently engage over an extended period of time to improve health outcomes. The impact of these novel approaches remains poorly documented, despite the potential of mobile phone apps as a medication adherence management tool. This evidence gap can be narrowed with the help of empirical evidence.

Prescription drugs are frequently a part of the best therapy of chronic conditions including type 2 diabetes and hypertension. Medication compliance, or MA, is a facet of self- management. Digital mHealth optimisation has the potential to improve patient awareness and/or communication between the patient and the physician. Prescription drugs are

frequently a part of the best therapy of chronic conditions including type 2 diabetes and hypertension. Medication compliance, or MA, is a facet of self-management. Digital healthoptimisation, including eHealth and mHealth, may improve patient awareness and/or provider-patient communication.

KEY WORDS

Adherence, Compliance, Smartphone, Nonconcurrent, m-health, Physiological, Validated, Digital health, e-health, self management.

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INTRODUCTION

Adherence is the degree to which a patient's behavior conforms to medical or prescribed health advice. It is regarded as non-judgmental and is preferred to the term "compliance," which implies that the patient is to blame. One of the main challenges facing psychiatry is figuring out why patients may or may not follow recommendations for medication and other treatments.

Self-management and medication adherence in chronic conditions are increasingly being supported by digital interventions, such as smartphone applications (apps). Examining how patients interact with and feel about these devices is crucial.

Examining patients' opinions of smartphone apps to enhance medication adherence was the goal of this study.

The use of information and communication technologies (ICT) for health, including patient treatment, research, healthcare professional education, and public health monitoring, is referred to as eHealth by the World Health Organization (WHO) (2015). This "eHealth" category includes many technological domains, such as: 1) telehealth, which often involves using electronic or phone technology to facilitate health care or distance education; 2) mHealth, which is represented by clinical interventions supported by mobile devices; 3) social media, which often includes interactive web-based platforms; and 4) the use of electronic health records (EHRs) to direct patient care[54].

The epidemic of the twenty-first century is chronic diseases. They are frequent, expensive, and in some cases avoidable. Primary care physicians are constantly searching for fresh and creative methods to avert chronic illnesses. Since self-management takes place outside of the primary healthcare provider's office, it requires a variety of strategies as an essential component of the prevention and management of chronic illnesses. Improving patient outcomes will result from the development of tools to assist the individual in acquiring life skills to promote self-management. Patients with type 2 diabetes mellitus (T2DM) risk health complications if they do not take their medications on time or according to the prescribed regimen. Because of inadequate management, a rise in medical visits, greater costs, and an increase in mortality, it also drives up healthcare costs. In the end, it results in increased hospital, ER, and outpatient expenses for T2D problems[55].

Advantages

1) Improve patients adherence
2) Diversity suitable for chronic disease management.
3) Minimise risk.
4) Continue monitoring .
5) Easy to use.
6) Increases health care access for historically underserved population.
7) Boost the coordination of patients

Disadvantages

1) Privacy and Security Issues

2) Reliance on an untrustworthy source, the possibility of hacking, the deterioration of social skills and a feeling of community, and information misuse

3) Exorbitant prices.

Digital health technologies are widely used for disease management, with their computing platform, software, and sensors being used for health care.

This study aims to comprehensively review the literature on the use of digital health apps. Following are some diseases that are discussed in this review article.

1) Hypertension

The purpose of this systematic review was to assess how well health care can help adults better control their hypertension on their own. Blood pressure (BP), BP control, medication adherence, self-management behaviour, and expenses were the end measures.

As the primary modifiable risk factor for cardiovascular disease, hypertension is known to produce severe cardiovascular and cerebrovascular events, which in turn cause a significant amount of premature morbidity and mortality [1]. Antihypertensive medication treatment has been shown to be clinically beneficial in controlling blood pressure (BP) and managing hypertension [1,2]. Recent data, however, indicates that the control of blood pressure with antihypertensive medication is not ideal, with at least 20% of prescription treatment failing to achieve control (control rates across 12 nations) [3]. Results from community-based research studies that are nationally representative, like The Irish

Longitudinal Study on Ageing, show that control rates can be as low as 50% [4].

BP JOURNAL : BLOOD PRESSURE LOG

The app

The "BP Journal" app is the one being utilized on smartphones. The research team selected BP Journal, a commercially available app from the Google Play Store that functions as a companion app to a clinically validated home blood pressure monitor. Its two primary features, medication reminders and self-monitoring of

blood pressure, are typical of

medication management apps for hypertension. The software lets users make their own profiles and schedule daily reminders to take their blood pressure measurements and medicine. The application facilitates the self-reporting and archiving of blood pressure values, generating statistical and interactive charts as feedback on blood pressure measures. Users have the option to print or transmit BP data in PDF or comma-separatedvalues format thanks to the export function.

Procedure…..

1) After attending the first session, participants downloaded the app and made their ownprofiles.

2) After that, they received a home blood pressure monitor (A&D Medical model UA-767S- W) and were instructed on how to use it.

3) For four weeks, the participants were asked to use these resources to assist their own self-management of hypertension. It was advised that participants take blood pressure readings at least twice a week in order to familiarize themselves with the app's functions(unless they had a pre-established self-monitoring habit).

4) Based on earlier mobile health feasibility studies that used 2- to 4-week durations, the 1-month feasibility duration was determined [5,6].

5) To gather information about patients' experiences using the app, the lead researcher, CM,a female MSc graduate in health psychology with training and experience in qualitative research methodologies for data collection and analysis, facilitated semi structured face- to-face interviews that were audio recorded.

6) The interview topic guide was created by studying qualitative research in the field and was updated during the data collection process to address unforeseen problems. It was centred around questions about feasibility and usability. In order to make sure the researcher did not limit the analysis to just issues that were expected to be significant, aniterative strategy was used [7].

7) The degree to which participants successfully (or unsuccessfully) used the BP Journal app over the 4-week period and the viability of utilizing the app to self-manage hypertension were the two factors that determined feasibility (Multimedia Appendix 2). Before the study started, the interviewer had no prior relationship with the participants. Theinterviews lasted anywhere from nine to twenty-nine minutes.

8) At the charity's dedicated facility, all data were gathered. The lead researcher was theonly nonparticipant present during the data collection process.

9) Prior to the start of the interviews, participants were given the System Usability Scale (SUS) [8] in order to gather descriptive data regarding how user-friendly they thought theapp was. Higher scores on the SUS indicate greater perceived ease of use.

10) Scores on the SUS range from 0 to 100. Above average is defined as a score of 68 orabove [9].

2) Tuberculosis treatment

We looked through a number of bibliographical databases to find research on the benefitsof digital treatments for treating active tuberculosis, such as medication monitors (MMs), video-observed therapy (VOT), and short messaging services (SMS). Included were only studies that reported effect estimates and had a control group.

MM

MEDICATION MONITORS[50]

A pilot study conducted in South Africa found that the risk ratio for an improvement in curerates was 2.3 (95% CI 1.6–3.4) [16]. However, the study used a historical, non-concurrent control group as its comparison group. With a risk ratio of 1.62 (95% CI 1.09–2.42), this trialsimilarly indicated a significant improvement in smear conversion at twomonths; however,the control group was once more historical (non-concurrent). A bigger RCT conducted in China found that using an MM had a statistically significant impact on adherence compared to standard therapy; the percentage of patient-months when at least 20% of

doses were missed had an adjusted means ratio of 0.58 (95% CI 0.42–0.79) [18].

SM

SHORT MESSAGING SERVICES[49]

When compared to the local standard of TB care, four RCTs [17,18] assessing SMS as medicine reminders did not find any statistically significant benefit on treatment completion. The risk ratios for completion, success, or cure in three of these [12, 13, 15] ranged from 1.0 to 1.45, and in each trial, the 95% confidence interval fell between these values. In the fourth trial's SMS arm [14], the adjusted risk ratio for failure, mortality, and loss to follow-up when compared to standard treatment was 0.44 (95% CI 0.17–1.13). SMSreminders were found to have very little to no effect on the dosages of TB treatment taken in the same four investigations, with risk or means ratios close to 1.

VOT

VIDEO-OBSERVED THERAPY (VOT)[48]

A study conducted in New York City, NY, USA, found that treatment completion with virtualoutpatient therapy (VOT) had a lower risk ratio of 0.99 (95% CI 0.93–1.05) when compared to in-person DOT. However, the study also found that appointment attendance was positively impacted, with 95% of scheduled VOT sessions adhered to, compared to 91% of scheduled DOT visits [11]. A larger percentage of observed treatment doses with VOT compared to in-person DOT was found in another Australian study [12], yet the impact on treatment completion rates was not statistically significant[19]. VOT significantly

decreased the amount of staff time required for treatment supervision in both trials.Compared to asynchronous (recorded) VOT, synchronous (videoconferencing) technologies may have a distinct impact on adherence in these studies [10].

TYPE 2 Diabetes Mellitus

One of the most prevalent chronic noncommunicable illnesses in the world, type 2 diabetes mellitus (T2DM) has a substantial negative impact on a person's physical, mental,and overall quality of life. According to projections from the International Diabetes

Federation, the prevalence of diabetes worldwide was 9.3% (463 million) in 2019 and isexpected to increase to 10.2% (578 million) by 2030 [20][21].

Diabetes Self-management Education and Support (DSMES) App

DSMES...[51]

To find out how diabetes self-management education and support (DSMES) apps affect patients with type 2 diabetes mellitus (T2D) in terms of adherence, a systematic review andmeta-analysis of interventional studies will be conducted.[22].

Treatment adherence has been increased by using a variety of strategies, including simplepackaging, reminders, and single-dose regimens[23]. Diabetes self-management education and support (DSMES), one of these strategies, has been utilized to address medication, lifestyle, blood glucose monitoring, and other psychosocial components of therapy; all of these have been linked to better health outcomes and lower medical expenses[24] One of the best methods for enhancing treatment adherence in T2D patientsis DSMES because of its patient-centred, all-encompassing approach.

The distribution of DSMES using mobile health (m-health) technologies may increasepatient convenience and coverage. By facilitating the tracking of prescriptions and medications and by setting up automated reminders and messages, m-health helps to increase adherence[23] [25]. The majority of WHO member states have implemented this technology[26]. The American Diabetes Association also classifies mobile health as part ofthe "standard of medical care" for diabetes mellitus[27]. Regrettably, even with this support, m-health is frequently

underutilized in DM management[28]. Even fewer people are using the apps that could increase drug adherence[29]. Even less research has been done on the impact of mobile app-delivered therapies meant to increase T2D patients' adherence. The majority of earlier reviews have focused on evaluating SMS interventions' impact on medication adherence[23] [30]. A review did document the impact of therapies delivered through apps, however the study sample was diverse and included few T2D patients[31]. The objective of other reviews has been to evaluate the impact of m-health interventions on glycaemic management[32][33].

To our knowledge, no review has been conducted to assess the effect of DSMES administered through mobile apps on adherence, particularly in the T2D population.

Research has focused more on drug adherence than on adherence to lifestyle modifications. Moreover, earlier reviews have documented contradictory results, ambiguity surrounding the definition and assessment of medication adherence, and insufficient application of theoretical frameworks in the study interventions[23] [20].

The current review's findings will clarify previously published research and provide quantifiable proof of the effects of self-management support and diabetes education provided by apps on T2D patients' treatment adherence. The review's conclusions would also provide vital application information to IT and medical professionals working to lessen the burden of diabetes worldwide[22].

3) Rheumatoid Arthritis

Sympathetic polyarthritis resulting from immune-mediated inflammation of synovial tissue is a hallmark of rheumatoid arthritis (RA), a systemic inflammatory illness]. The symptoms include weariness, stiffness in the morning, and painful, swollen joints. Bone and cartilage can be harmed by uncontrolled polyarthritis. In order to reduce inflammation, long-term medication with disease-modifying antirheumatic medications is necessary, preferably under a rheumatologist's care [34].
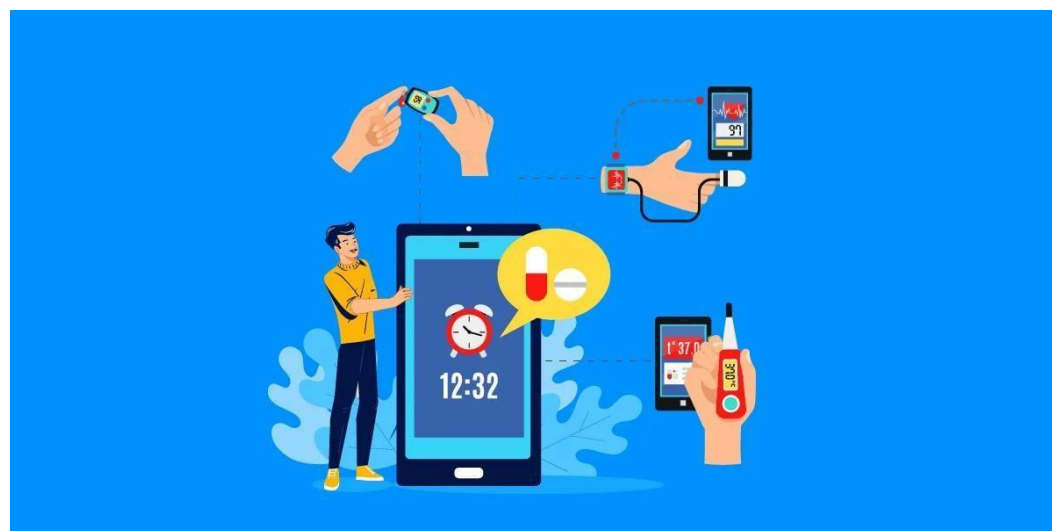
MOBILE HEALTH..[52]

The field of mobile health (mHealth) is a rapidly expanding area of health care delivery in which medical and

public health practices are supported by mobile devices, especially through smartphone apps [35]. mHealth apps have the potential to be helpful resources for patient self-management and for fostering better patient-provider communication [36].

More over two thirds of adults in the US own a smartphone [37]. As a result, mHealth is becoming more widely available, and a large number of smartphone apps for health are currently on the market [38 39]. mHealth may offer a means for patients to take a more active role in managing their chronic illnesses, including RA. In a Portuguese study, 86 out of 100 RA patients thought that a smartphone app would be helpful for managing their condition [40]. The usage of email, the Internet, and short messaging services, as well as younger age and smartphone ownership, were all linked to the propensity to use applications for RA self- management. According to a small Japanese investigation, there was a strong correlation between rheumatologist-assessed RA disease activity and patient-reported disease activity data using approved instruments [41]. Additionally, there is evidence that mHealth therapies, including smartphone apps, could help patients with various chronic illnesses [36,42,43]

A method for categorising and grading the calibre of mHealth apps is the Mobile App Rating Scale (MARS) [44]. The examination of current standards for app quality assessment led to the identification of the 23 items in the MARS. With descriptors given for each anchor rating, each item was graded on a 5-point scale (1 being inadequate, 2 being poor, 3 being acceptable, 4 being good, and 5 being exceptional). The items were categorised by the MARS into four groups: five for engagement, four for utility, three for aesthetics, and seven for information quality. Additionally, there was one subjective quality scale with four items. Each category's mean and the overall mean score of the MARS were calculated. The MARS offered a trustworthy way to rate and compare, and it showed strong internal consistency and inter-rater reliability [44,45].

With the potential for mHealth apps to help RA patients track their disease activity, it's critical to evaluate the functionality and calibre of the smartphone apps that are now on the market. By monitoring medically reliable RA activity between visits and maybe allowing for some care to be delivered via telehealth, apps that gather disease activity data using validated disease activity instruments may be helpful in streamlining management with a rheumatologist [46,47].

Overall percentage of respondents in the chosen countries who use paid or freehealth apps is displayed in this chart (2020).
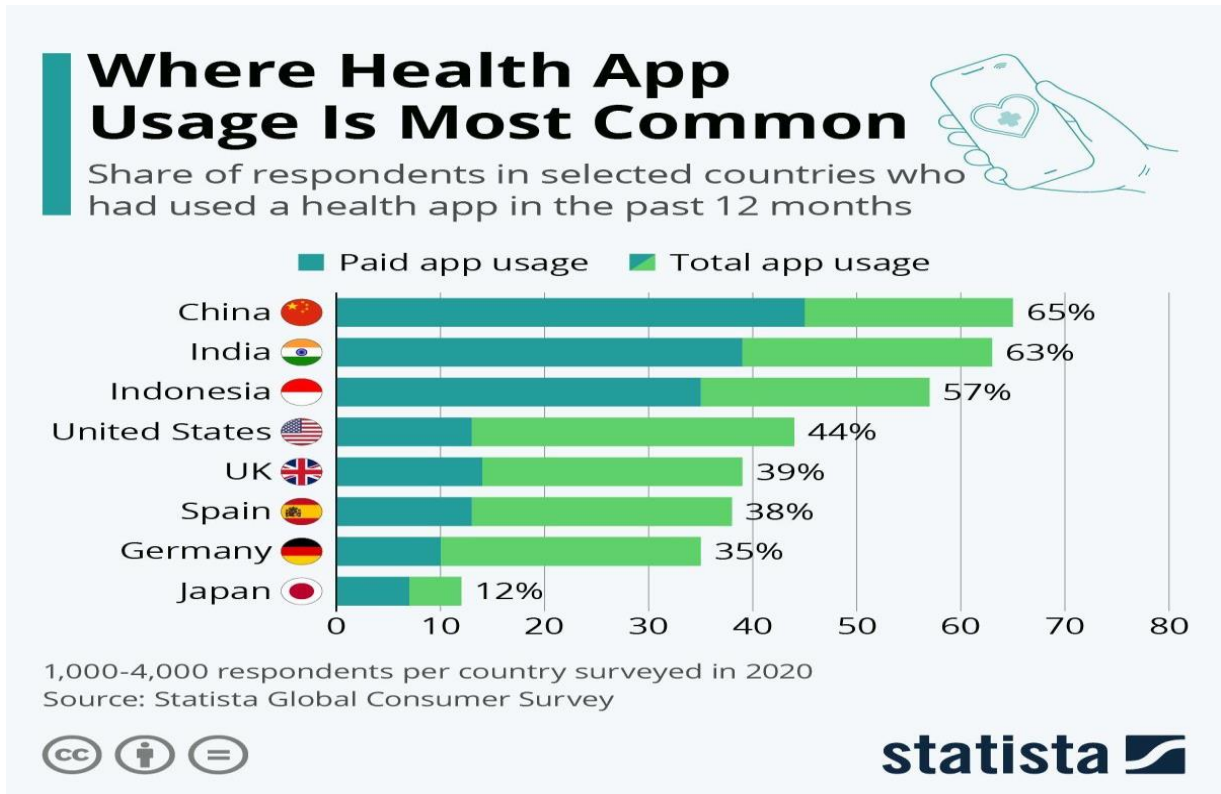
WHERE HEALTH APP USAGE IS MOST COMMON [55].

CONCLUSION

Adherence rate improvement of up to 20% is possible with digital health care apps. Adherence to medication has an effect on total health care expenditures, quality, andresults. Utilizing smartphone apps to enhance patient behavior combines patient

education and patient warehouse. The digital health app can help us avoid a numberof diseases.

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