

Health Games - Modern Tools for Enhancing Patient Adherence

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Abstract

Low patient adherence remains a major public health challenge globally and imposes a considerable economic burden on healthcare systems. It is critical to develop an effective intervention to improve patient adherence. Factors such as physician-patient relation, patient's health literacy, attitude, cultural variations, and patient's involvement in decision making are responsible for improving adherence. Information technology has revolutionized almost all industries including healthcare but its use has not shown its full promise to boost adherence. Recent developments in smart phone market penetration, gamification, and easy to navigate user experience have made it possible for healthcare providers to effectively connect with patients using innovative ways enabled by technology. Leveraging on this fact, healthcare industry should be focusing on development and use of interactive health games. Indication-wise games can be developed in collaboration with physicians, academics, thought leaders and experienced media companies. In summary, gamification may effectively be used to improve patient adherence.

Keywords: Patient adherence; Smart phone; Physician-patient relation; Gamification; Health information technology

Introduction

Low Patient Adherence Remains a Major Public Health Challenge Globally

Patients' adherence to prescribers' drug therapy is essential for safety, efficacy and healthcare costs. Patients' non-adherence to the prescribed therapy will considerably impact their health outcomes[1]. Patient adherence in patients suffering from chronic diseases like diabetes and cancer in developed countries averages about 50%[1-3]. Magnitude and impact of poor patient adherence in developing countries is assumed to be even higher than in developed countries[1].

Poor patient adherence increases with increasing chronicity of the disease[4]. Studies estimate non-adherence costs the US healthcare system close to US\$ 310 billion annually in direct and indirect costs[5]. The UK's National Institute for Clinical Excellence (NICE) estimated around £ 4 billion of medicines supplied on prescription were not used correctly[6]. It is also estimated that non-adherence results in an average per-drug loss of 36% in potential sales for a pharmaceutical company[7].

Various Factors are Responsible for Low Patient Adherence

The search for scientific literature for identifying relevant articles for this manuscript was conducted in PubMed scientific database in August 2014. Search string used was: games for health AND patient AND "last 10 years"[Pdat] AND Humans[Mesh]. Other relevant reports and pertinent articles from the web were also found using Google search.

Low patient adherence is responsible for various factors such as socio-economic, therapy related, patient related, disease related, and health system related factors[1,8] as shown in Figure 1.

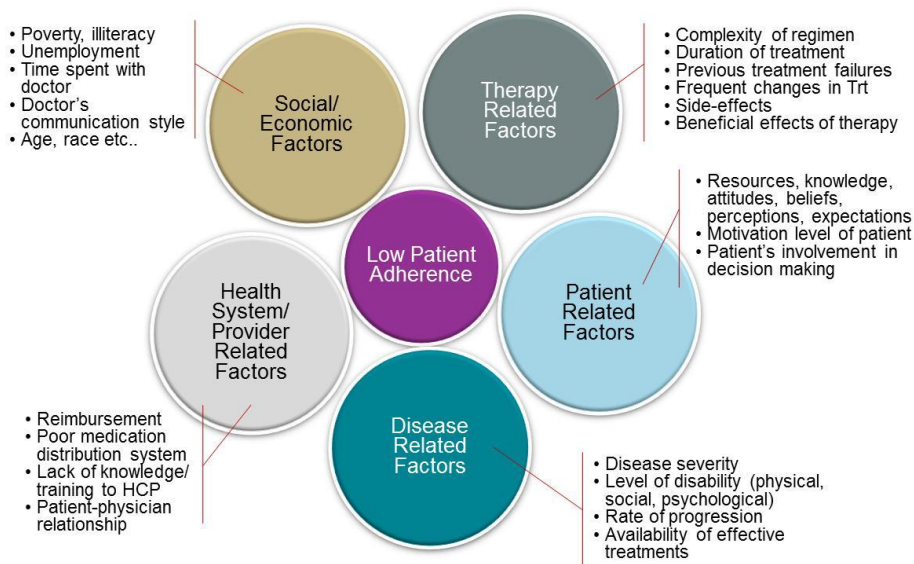


Figure 1. Factors responsible for low patient adherence

Problem Statement

It is Critical to Develop an Intervention which Will Target Multiple Factors to Improve Adherence

No single intervention strategy will improve patient adherence. Success depends on tailoring multiple interventions to the unique characteristics of patients. For example, a 65 years old patient might benefit from parameters like motivation, social support, and value for money. On the other hand, a middle aged executive may appreciate if he/she was involved in decision making by his/her physician while prescribing the regimen. Other factors like gamification, networking, and awareness might make a difference in improving his/her health outcomes. Factors like networking, gamification, and reminders will help child patients to improve health outcomes.

Proposed Solution

It is Proven that Gamification Can Significantly Improve Health Outcomes

In early 2000, health games were successfully used by clinical trainers to simulate and train physicians to develop their surgical skills [9-11]. As shown in Figure 2, this application of health games for medical fraternity has already been proven. In the current decade, patients and their relatives are slowly getting exposed to these games. Researchers are testing their hypotheses whether health games can provide audio visual and sensory feedback to patients and caregivers. Researchers are also keen to test whether gamification can enhance positive attitudes in patients or not.

Recent research has already proven that gamification can significantly improve learning, behavior change, and patient outcomes[12,13]. Researchers and clinicians can collaborate effectively

with patients to improve adherence/compliance by using health games and significantly improve health outcomes in patients.

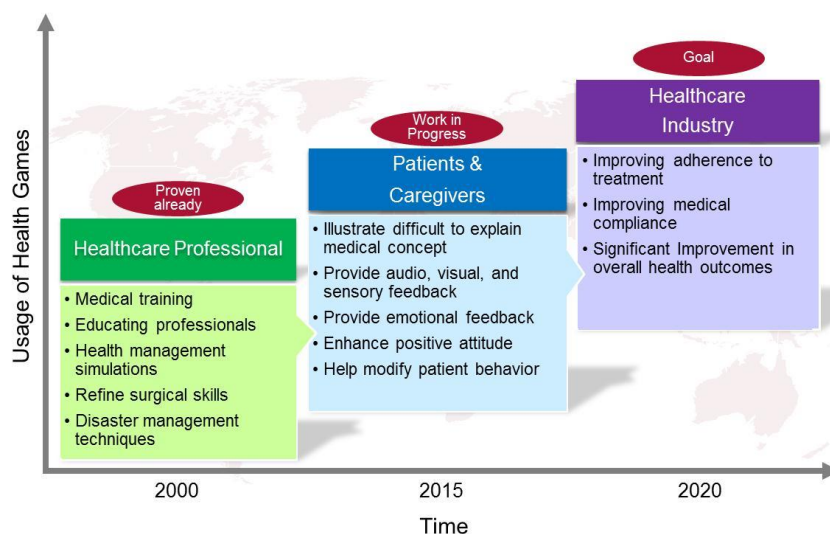


Figure 2. Usage of health games from years 2000 to 2020

Indication-Wise Health Games Can be Developed in Collaboration with Multiple Stakeholders

Recent developments in market penetration of smart phones, gamification, and easy to navigate user experience have made it possible for healthcare providers to effectively connect with patients using innovative ways enabled by digital technology. Leveraging on this fact, the healthcare industry should now be focusing on development and use of interactive health games for treating and preventing diseases like diabetes, hypertension, Alzheimer’s etc. As shown in Figure 3, indication-wise interactive health games can be developed in collaboration with physicians, academic institutions, thought leaders like Accenture, experienced media companies, gamers and programmers.



Figure 3. Stakeholders involved in developing a health game

Physician's Office Can Share Indication Specific Interactive Games with Identified Patients

Physician’s office can share indication specific interactive games with identified patients with a particular disease at regular intervals(Figure 4). Patients can play games from either their smart

phones or computer.



Figure 4. Physicians can share indication specific health games with patients

Reports and Statistics Regarding the Completion of Gaming Activity Can Be Generated

Detailed reports and statistics regarding the completion of gaming activity by individual patients can be generated and delivered to the physician's office, to keep the physician informed. Patient's improvement over multiple parameters such as knowledge, awareness, and attitude (as shown below) can be compared pre- and post-gaming intervention.

Operating Model

Roles and Distinct Phases for a Game Developed for Leukemia Patients

Specific roles and distinct phases of game development are showcased in Figure 5 and are explained below in detail.

- Patient/subject: Leukemia health game designed to improve patient adherence to chemotherapy will benefit patients as well as physicians in the due course of the treatment regimen. Apart from an improvement in patient adherence for chemotherapy, the patient-physician relationship will also benefit significantly which will improve overall health outcomes for leukemia patients.
- Physician/primary investigator: They will be responsible for conceptualization and finalizing the game in close collaboration with multiple stakeholders (as described above in Figure 3). Interpretation of patient evaluation and communication with them is another important role which has to be conducted by the physician/primary investigator in the case of a clinical trial setting.
- Game concept: The blueprint for the game is a technical area that will be completed by an experienced programmer/gamer in close collaboration with all stakeholders. This will involve personalization, continuous improvement, and dealing with software and hardware that are required for the smooth running of the health game.
- Nurse: Successful implementation of the health game depends on nurses as they are the primary contact point for all patients. They can motivate their patients to start adopting health games and try to convince patients to use technology to improve their health outcomes. Nurses will also help in continuous follow-up with patients and they can play a role of conduit between patient and physician.
- Administrator/physician's office: Finally tracking patients and providing valuable inputs to the physician is an important role of the administrator/physician's office. They may use an innovative and insightful dashboard to keep physicians well informed.

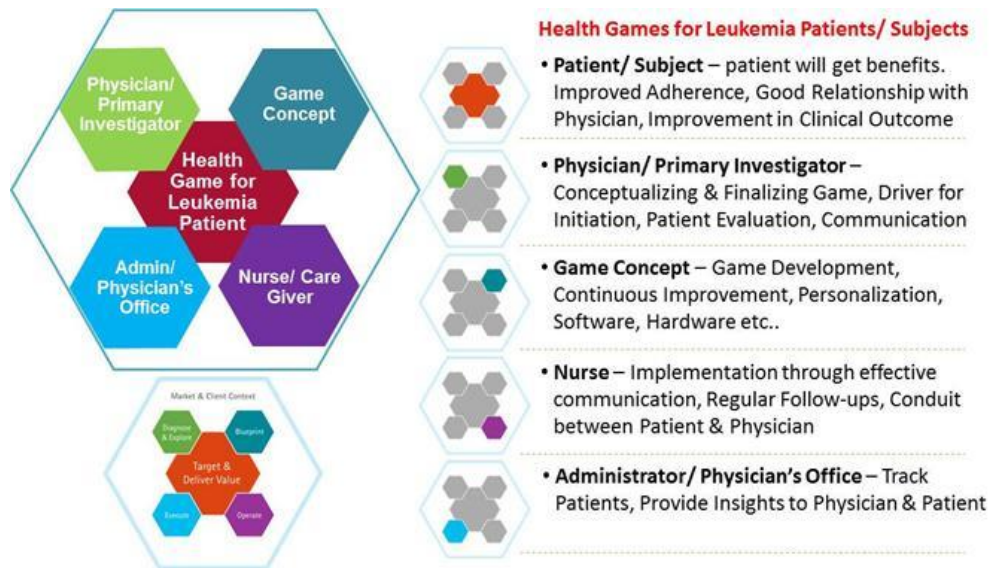


Figure 5. Roles and phases of health game development

Conclusions

Low patient adherence remains a major public health challenge globally. Innovative health games have been already successful in improving patients' health outcomes and can potentially improve adherence. These health games will not only engage patients to adhere better to their therapy but also offer an element of fun and motivation to fight their disease. The most challenging task for the game developers is to demonstrate the efficacy of intervention so that games can be well accepted by physicians, providers, payers and patients. Another challenge is to bring diverse stakeholders like academics, researchers, industry sponsors, and gamers/programmers together to develop effective interventions. Finally, no single intervention but a tailored collaborative intervention will help improve outcomes in the near future. If this concept proves to be successful, physicians may prescribe an interactive health game along with the regular list of medications for their patients.

List of abbreviations

HCP = Health Care Provider
 NICE = National Institute for Clinical Excellence
 Trt = Treatment
 US =The United States of America
 UK =The United Kingdom of Great Britain and Northern Ireland

Conflict of Interest

The authors declare that they have no conflict of interest.

Authors' Contributions

SG defined the construct of this manuscript, the problem statement and the solution. MG participated in the design of the solution and operating model. SG and MG were both involved in drafting and finalizing the manuscript. Both authors read and approved the final manuscript for submission to the journal.

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