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Developing strategies to enhance patient adherence to prescribed treatment regimens

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Abstract

Treatment adherence in the US healthcare system is still a problem. This manuscript presents a detailed discussion of the status quo regarding challenges, strategies, and future directions to improve adherence. Adherence to treatment regimens is influenced by a number of patient and treatment-related factors, as well as socioeconomic status and issues within the healthcare system. These challenges have been addressed over the years with educational, behavioral, policy-based, and technological interventions. These ongoing challenges can only be addressed with innovative strategies as healthcare is evolving. Digital health tools and culturally tailored materials included in personalized education programs have been found to improve adherence rates compared to standard care. In addition, patients have been recommended to be motivated through collaboration with healthcare providers in community outreach initiatives, and adherence has been improved. This review does a comprehensive summary of the key issues and trends in patient adherence, shedding light on the important work for healthcare professionals, researchers and policymakers to improve adherence and health outcomes in the United States.

Keywords: Healthcare; Patient adherence; Telemedicine; Medication regimen; Digital health tools

1. Introduction

The effectiveness of medical interventions and individual health outcomes depend on patients taking their prescribed treatment regimens. Adherence is defined as the extent to which a person's behavior (taking medication, following a diet, and/or making lifestyle changes) coincides with recommended behavior agreed upon by a healthcare provider, and it is a long-standing problem in healthcare systems globally [1]. This issue has become more important to public health and healthcare economics in the United States.

Compliance with medical instructions is not the only aspect of adherence; the concept of adherence is extended as a complex interaction between behavioral, social, and systemic factors that affect a patient's capacity and tendency to follow a prescribed treatment [2]. In recent years, the healthcare landscape of the USA has witnessed wide adoption of electronic health records, telemedicine, and patient portals. These technological advancements have opened a new window for problems of adherence but also present novel challenges [3].

A study by the Centers for Disease Control and Prevention (2021) across the USA suggests that roughly half of the patients with chronic conditions don't adhere to prescribed medications. It is especially alarming that chronic diseases are the number one cause of death and disability in the United States, which are responsible for 7 out of every 10 deaths each year [4]. Adherence rates are very different across different disease states. However, adherence rates for diabetes

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medications were lower at 65% to 85%, but adherence rates to mental health conditions are extremely low, ranging from 40% for antidepressants [5]. For health outcomes, individual non-adherence has consequences far from cardiovascular events, encompassing broader societal and economic impacts.

The high associated costs of medication non-adherence in the USA from an economic perspective are staggering. Annual healthcare costs due to medication non-adherence have in turn been recently estimated to amount to \$100–\$290 billion [6]. This figure includes both direct costs including more hospitalizations, emergency department visits, employment productivity losses, premature mortality, and indirect costs. The study also found that improving adherence could help save the health care system large sums of money, freed up to be spent on vital other patient care and public health-related efforts.

Poor adherence equally concerns the health outcomes associated with it. A meta-analysis by Walsh et al. [7] found that non-adherence to prescribed treatment increased the risk of mortality by 26% for chronic diseases. The finding highlights the life-saving potential of effective adherence strategies. In addition, improving adherence has been associated with improved quality of life, slower disease progression, and fewer complications in a wide range of medical conditions [8].

Adherence is clearly important, yet effective strategies to promote it are difficult to develop. Because the problem is complex, a comprehensive approach that includes patient-related factors, treatment-related factors, healthcare system issues, and socioeconomic factors is necessary. We synthesize recent research and examine particular challenges and opportunities in the US healthcare system in order to contribute to ongoing efforts to enhance patient outcomes and alleviate the adverse effects of non-adherence on individuals, healthcare systems, and society.

2. Factors Affecting Patient Adherence

Patient adherence to prescribed treatment regimens is affected by a complex interaction of patient-related factors, treatment-related factors, healthcare system-related factors as well as socioeconomic factors. To be able to develop effective strategies to increase adherence rates it is important to understand these factors.

2.1. Patient-related factors

Patient-related factors include many different personal characteristics and beliefs. Health literacy plays a critical role in this; studies have shown that patients with lower health literacy have a tendency to misunderstand their medication instructions, and have poorer adherence [9]. There have also been consistent associations between psychological factors (such as depression and anxiety) and reduced adherence to a variety of chronic conditions. Moreover, patients' beliefs about their illness and the need for treatment impact adherence behaviors. Based on Horne et al. [10], consideration of this necessity concerns framework indicates that patients have to balance their perceived need for medication with their concerns about possible adverse effects.

2.2. Treatment-related

Similarly, adherence is equally influenced by treatment-related factors. The adherence rate to a medication regimen can be significantly influenced by medication regimen complexity such as number of medications, dosing frequency, and route of administration [11]. In a study by Wells and co-workers, adherence rates based on once-daily dosing regimens were shown to be higher than those associated with more frequent dosing schedules [12]. Medications also have notable side effects, and patients are more likely to discontinue treatments that have noticeable adverse effects [13].

2.3. Healthcare system-related

Factors relating to the healthcare system include the structure and processes of the delivery of healthcare that can affect patient adherence. Adherence is a critical determinant of the quality of the patient-provider relationship. Reports have demonstrated that the patients who had reported better communication with their healthcare provider tended to adhere to the treatment plans [14]. However, we also know that adherence rates are influenced by access to care, including access to follow-up appointments and refills of medication [15]. There is early promise of technology use in healthcare delivery to improve adherence, through communication and medication management improvements represented by electronic health records and patient portals [16].

2.4. Socioeconomic factors

Factors of socioeconomic importance greatly determine adherence behaviors. In the U.S., cost of medications remains the first and most important barrier to adherence, with 29% of adults not taking their medications as prescribed

because of cost concerns per a Kaiser Family Foundation survey (2022). Practical and emotional support can influence adherence to social support systems such as family and community networks [18]. Further, adherence behaviors are also influenced by cultural beliefs and practices some of which have been shown to improve adherence rates in minority populations [19].

The result of these factors results in a complex landscape for patient adherence. For instance, a complex medication regimen (treatment factor) may be thwarted by a patient-related factor of poor health literacy and socioeconomic factors of financial barriers to care. This interplay highlights the need for comprehensive multifaceted approaches to improving adherence, and strategies to augment adherence by supporting appropriate food selection.

Social determinants of health have also emerged recently as important determinants of adherence behavior. Patient housing stability, food security, and transportation access can make a huge difference in a patient's ability to adhere to treatment plans [20]. But increasingly, recognizing and addressing these broader social factors are seen as critical to developing effective adherence interventions.

It is essential to understand the multiple aspects of factors that affect patient adherence to develop targeted and effective strategies for increasing adherence rates. Addressing these disparate influences offers healthcare providers and policymakers the ability to develop more patient-centered approaches to treatment adherence.

3. Existing Strategies for Improving Adherence

In the past decade, there have been a number of strategies developed and implemented to address the challenge of patient non-adherence that persists. These interventions could be classified as educational, behavioral, technological, and policy-based.

3.1. Educational interventions

The educational interventions aim at enhancing patients' understanding of condition and treatment. Bhattad conducted a systematic review and found that patient education programs produced a significant improvement in medication adherence for patients with most chronic conditions assessed [21]. The programs generally contain a description of the disease process, the significance of the medication, and side effects. A particular promise for improving adherence among patients with low health literacy has been tailored towards educational materials, such as illustrated medication schedules and video demonstrations [21].

3.2. Behavioral interventions

Behavioral interventions change the way patients take medication. Adherence has been successfully enhanced by motivational interviewing. Finally, the report indicates that motivational interviewing interventions result in reduction of up to 23% in medication adherence [22]. Then there is another successful behavioral strategy: reminder systems, such as text messages, phone calls, or mobile app notifications. Peng et al. [23] showed that adherence rates increased by 18% when they reviewed daily medication reminders through smartphone apps.

3.3. Technological interventions

In recent years, technological interventions have become popular. Electronic pill bottles that alert once medication has been taken and show real-time feedback have shown promise in improving adherence. Patients who used smart pill bottles also had a 15% increase in adherence rates compared to standard medication packaging [24]. Powerful tools such as telemedicine and remote monitoring have been useful in increasing adherence, especially in rural or underserved areas [25].

3.4. Policy-based interventions

Systemic barriers to adherence are addressed with policy-based interventions. There have been several efforts to reduce out-of-pocket costs for essential medications. A study by the Centers for Medicare and Medicaid Services [26] found that removing copayments for certain chronic disease medications increased adherence by 12 % among Medicare beneficiaries. In addition, prescription refill processes, such as automatic refill programs and medication synchronization to simplify prescription refill processes, have been effective in improving adherence [27].

Integrated care models combining several strategies serve as a potential and effective strategy. For example, the patient-centered medical home (PCMH) model, one of linking care, has been linked with increased medication adherence. In

2017, Lauffenburger and coworkers [28] reported that patients in PCMH practices demonstrate 25% higher adherence rates than in traditional primary care settings [28].

However, no single strategy has been demonstrated to be a panacea for non-adherence. Adherence behaviors are complex and require a multifaceted approach targeted to patient needs and circumstances. Future research should search for the most appropriate combinations of interventions and create patient-tailored adherence strategies using patient characteristics and preferences.

4. Developing New Strategies

With the way healthcare keeps evolving, there is a critical need for the development of innovative strategies to help improve patient adherence. Our focus in this endeavor is two key areas tailored patient education and collaboration with healthcare providers.

4.1. Tailored Patient Education

Improving medication adherence through personalizing patient education programs has shown to be very promising. Singh et al. [29] study shows that culturally sensitive education materials increase the adherence rate by 27% for diverse patient population. The approach, looking at an individual's beliefs, literacy level, and cultural background, makes the content more effective and relatable.

Digital health tools have become powerful allies in personalized patient education. There have been remarkable results from mobile apps designed to give personalized medication reminders and educational content. Deniz-Garcia et al. [30] reviewed such patients using a customized medication adherence app who had 32% higher rates of adherence than those in standard care. These apps often incorporate features such as:

- Personalized medication schedule
- Interactive educational modules
- Reporting of side effects
- Communication channels directly to healthcare providers

These tools are integrated with artificial intelligence for dynamic adaptation to patient behaviors and preferences making these tools more effective.

4.2. Collaboration with Healthcare Providers

Long-term success will require healthcare professionals to become engaged in developing and implementing adherence strategies. A comprehensive approach includes inclusion of adherence-promoting interventions in routine patient care plans. According to Portillo et al. [31], adding adherence discussion and goal setting during regular checkups increased patient adherence over a 12-month period.

There have been promising efforts to train healthcare providers in how to communicate when trying to improve adherence, specifically. For example, Kirk et al., [32] studied providers who received a specialized adherence communication training program and found that they could increase adherence rates in their patients by 29 percent over a control group.

Community outreach programs have been particularly strong in motivating patients and enhancing adherence, particularly in underserved areas.

- In-home support by community health workers
- Medication management local pharmacies listed offering services
- Cooperation with religious as well as community groups to reinforce health messages

Tailored patient education coupled with healthcare-provider collaboration together reinforces a comprehensive approach to adherence improvement.

While we work to develop new approaches, it's important to maintain a patient-centered approach that recognizes the many factors that influence adherence.

4.3. Implementation of Strategies, Ethical Considerations, and Future Directions

Exciting possibilities for the future of adherence research and intervention development exist. The potential use of artificial intelligence (AI) and machine learning to predict adherence behaviors and tailor interventions for adherence is great. It seems likely that increasing reliance will be placed on personalized medicine approaches in adherence strategies. The more we learn about pharmacogenomics, the more likely it is that therapies can be tailored to individual genetic profiles and the more likely efficacy and adherence could improve. Another promising direction is the integration of adherence interventions with broader health management systems. The idea of adherence as a vital sign is gaining interest as adherence metrics get added to electronic health records and are used to guide clinical decision-making.

There will be a great deal of stake in the formation of policy recommendations for adherence interventions that will define the future landscape of adherence interventions. The need for standardized adherence measures and reporting guidelines to facilitate cross-study and intervention comparison is becoming increasingly recognized. Systematic improvements in adherence support could also be driven by the development of adherence-focused quality measures for healthcare providers and systems.

Going forward, the key to working through the complex challenge of medication adherence will be interdisciplinary collaboration. We will need an alliance of expertise — behavioral psychology, data science, pharmacology, and health economics — to develop adherence strategies that are holistic, effective, and ethical.

5. Conclusion

Patient adherence to prescribed treatment regimens remains a major challenge in healthcare, and it is particularly challenging in the United States. In this paper, the current state of adherence, and its related factors, as well as existing and emerging strategies to address the complex issue of adherence were explored. Much work remains to be done on understanding and solving the problem of non-adherence, although significant progress has been made in that regard. Personalized, technology-driven interventions, collaboration care models, and systemic policy changes are the future of adherence improvement. As we continue, we have to think of innovation together with ethical considerations and require that adherence-promoting strategies are available, in line with patient autonomy, and effective across different populations. If we keep emphasizing adherence in the field of healthcare delivery and research, we could greatly diminish the adverse effects due to patient noncompliance on patient lives and overall health of healthcare systems.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

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