A Revolutionizing Solution to Medication Non-Adherence

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Introduction

One of healthcare's most pressing challenges is medication non-adherence. This problem occurs when a patient does not take a drug as prescribed, with the correct dosage, time, and frequency. There are endless factors that lead to non-adherence, one being, burdensome costs. In fact, studies have reported that 64% of patients earning less than $25,000 a year did not take their medications as prescribed [1]. The cost issue can also result in a lack of transportation, access to healthcare providers, and efficient resources to thoroughly inform a patient.

Mental health also factors into medication non-adherence, as patients with depression, substance use, or other impairments are less likely to adhere to their prescriptions [3]. Many may also actively choose not to take their medications, whether due to side effects, misunderstandings with their medical providers, or from a lack of visible results. Nonetheless, there is a powerful tool that may be used to address this widespread problem: artificial intelligence. By harnessing the power of AI, healthcare professionals can monitor prescription adherence and assess patient effects from medication, ultimately being able to provide better treatments and improve adherence. The incorporation of artificial intelligence to healthcare holds the potential to block the urgent issue of patient medication non-adherence.

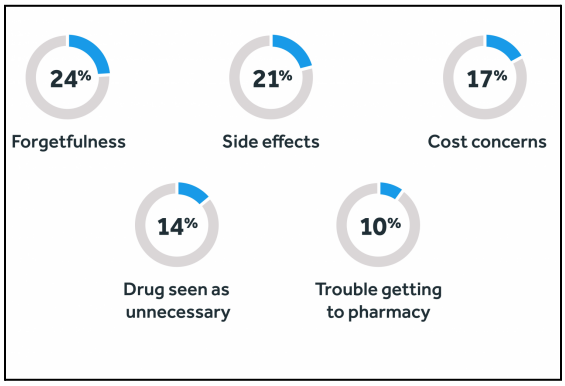

Figure 1: main causes of medication non-adherence

The Problem

Despite high-risk symptoms and visible effects, healthcare providers remain largely unaware of the issue of medication non-adherence. This non-compliance is currently costing lives, increasing hospitalizations due to worsening of conditions, and undermining trust in healthcare. Approximately 50% of patients worldwide do not adhere correctly, with an even higher percentage amongst those with chronic illnesses or those living in under-developed countries. Take chronic myeloid leukemia, for instance, where one third of its patients have been identified as nonadherent [4].

Poor medication adherence has contributed to roughly 275,000 deaths worldwide, with 125,000 in the United States alone. It has also resulted in over

$300 billion in preventable healthcare costs annually, as well as 25% of hospitalizations [4]. The surge in non-compliance is further causing prolonged conditions, unnecessary work, and higher costs. In fact, medication non-adherence was identified as a global concern by the World Health Organization. After all, it is not possible for healthcare professionals to know whether patients are adhering to instructions or monitor effects. Evidently, the critical challenge requires an transformative approach that will ensure patients are adhering to their prescriptions: artificial intelligence.

Artificial Intelligence: A Transformative Solution

Predictive Analytics

Artificial intelligence offers a wide array of ways to better medication adherence, one being the utilization of predictive analytics. By analyzing patient data, such as medical history and lab results, AI can be able to predict drug effects, non-adherence, and other complications using algorithms (Butt). This allows for early intervention by healthcare professionals, thus improving the healthcare system and individualizing drug delivery so that patients are more likely to adhere to their prescriptions.

The key underlying source to effective analytics is machine learning and big data analytics. Machine learning uses data to learn how humans operate, thus creating accurate predictions and trends. Currently, there are only less than a hundred machine learning-based devices used in the healthcare industry, as it is in its early stages of being incorporated. It can identify outside factors that contribute to medication noncompliance, take part in predictive analytics, and even assess the outcomes of nonadherence.

Big data analytics can be used to determine the effectiveness of interventions as well. These forms of artificial intelligence may be incorporated into a wide array of interventions, thus optimizing prescription compliance. Analytics can be used in developing targeted treatment plans, for instance, that take into account a person's demographics, lifestyle, and medical history. Personalized treatments support medication adherence by altering frequencies and exact times that a prescription should be taken, so that patients will not miss a dose [2].

The Incorporation of AI

AI may also be incorporated into apps or other notification systems that will send personalized reminders to help patients take their medications on time. This may include automated follow-ups and confirmations on intake, without a patient having to set up anything, making it far more easier for patients to adhere to their prescriptions. AI-incorporated apps may also include a chatbot or virtual health assistants, which the patient can go to at any time of the day in order to ask questions about their prescription or convey their concerns when a medical professional is not readily accessible.

In most cases, this allows for patients to receive immediate responses, therefore being more likely to comply. These AI assistants can even help patients understand their treatments, informing them of benefits, side effects, and results, hence significantly

building patient trust in the healthcare system. Although patients are also able to search up their concerns, these results are generalized to the public, not to the user as AI can do. As a result, patients tend to be less engaged and less likely to adhere to medications.

Additionally, AI assistants are able to check in on patients and provide the care that medical professionals cannot afford to give [6]. Check-ins can occur at any time of day at any location, and may include both mental and physical support. The incorporation of AI also reduces financial burdens as they lower labor costs and ultimately do not cost anything to speak with[5]. These assistants overall allow individuals to easily schedule appointments, report symptoms, and receive reminders in a personalized manner, all of which have been reported to help patients adhere to their medications.

Figure 2: smart pill dispenser

Further on, there are several devices and tools that incorporate artificial intelligence to prevent medication nonadherence, one being, smart pill dispensers. These portable machines deliver medications at predetermined times, provide reminders, and track drug intake, thus helping patients take prescriptions regularly [7]. They remove the hassle of manually sorting and measuring pills so that it is incredibly simple, especially for those with multiple medications or doses.

Smart dispensers also eliminate the risk of incorrect dosages and frequencies that are inevitable human mistakes. In fact, they are able to provide reliable, real-time data to healthcare providers that can intervene when needed, by connecting to electronic health records. Intelligent dispensers can inform caretakers or family members as well, notifying them when a dosage is missed or advising them on a patient's trends. Although smart pill dispensers are still on the rise, they will continue to become more integrated into the healthcare system as advancements in AI are made.

How AI Supports Medical Professionals

The most important outcome of incorporating artificial intelligence may be the fact that healthcare providers are able to individualize treatments and better assess patients. Not only will they be able to evaluate side effects, but professionals will also be able to monitor medication adherence.

Whether through connected devices or sensors, providers can become aware of specific tendencies and lifestyles, thus being able to create more personalized treatments that will be easier for patients to adhere to. When patients seem to be noncompliant, professionals may intervene early on, thus preventing long-term medication nonadherence that will lead to more health effects and preventable costs.

Why AI?

Unlike artificial intelligence, other interventions have zero to minimal effects. For decades, there have been tailored Internet interventions, non-AI reminder systems, and counseling interventions targeted at the various roots of nonadherence (Hugtenberg). Nonetheless, these interventions cannot track long-term effects, or live data that actively monitors a person's medication intake. Manual reminder systems must be set up by humans, which always carries the risk of forgetting. The Internet is generalized to the public, so those interventions are not tailored to each patient, therefore not being as supportive and engaging as AI assistants.

Without machine learning, other interventions are unable to predict future consequences, tendencies, and adherence results. To put simply, artificial intelligence is a revolutionizing tool that no other intervention can replicate.

Overall Deductions

Although medication non-adherence poses a significant threat, artificial intelligence offers a transformative array of solutions that can be incorporated into the healthcare system. Through predictive analytics, AI will predict patient behavior and side effects, perhaps creating personalized treatments as a result. Virtual health assistants are readily available for patients, providing care that is otherwise difficult to obtain. Smart technologies ensure that patients are adhering, warning designated individuals when they do not.

As artificial intelligence further advances, patients will be more apt to take medications as prescribed. AI holds the potential to overcome medication non-adherence, and therefore prevent hundreds of thousands of deaths and billions of unnecessary healthcare costs.

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