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Summary

**Business Overview**

The healthcare ecosystem is changing. It is becoming more people-centric and driven, prevention-focused, personalized, data & algorithm-enabled, and seamlessly integrated. By 2030, healthcare will become more accessible with harmonized regulation. Not only that, but ecosystems will also become key to improving outcomes, and costs for innovative treatments will be value-based, balanced by effective gains.

Within the scope of diabetes, pharma and biotech companies have partnered and invested in developing ecosystems that enable connected care (e.g. continuous glucose monitoring), devices (e.g. digitally connected insulin pens), and digital tools (e.g. mobile apps). These ecosystems cover but are not limited to, dosing support, insulin management, lifestyle change, supply convenience, advisory, and analytics. While current digital health solutions focus on later-stage diabetes treatment reliant on injectables, we want to expand the focus to include oral drugs. We want to create a unique digital ecosystem that will support people living with type 2 diabetes who are on medications and are initiating treatment. While there is an abundance of therapies, glycemic control remains difficult to achieve for people living with type 2 diabetes.

**Business Problem**

Diabetes is a metabolic disorder that results in high levels of blood glucose. This chronic condition has no cure, but it can be managed by lifestyle changes (e.g. diet and exercise), frequent monitoring of blood sugar levels, and medications that combat the body’s inability to produce insulin or to use it effectively. Diabetes can be separated into two types: type 1 diabetes occurs in early in life for people who don’t produce insulin, whereas type 2 diabetes occurs later in life when the body becomes resistant to insulin. More than 95% of people with the disease have type 2 diabetes and they have an increased risk for heart attacks, strokes, and kidney failure. Treatment comes in the form of injectable or oral therapies, but regardless of regimen, approximately 50% of people living with type 2 diabetes tend to drop off treatment within the first year of being prescribed medication. Despite the proliferation of thousands of reminder apps, sticking with chronic disease medication for the long run remains a challenge to many. Successful long-term disease management requires people living with diabetes to follow instructions and take the proper amount of medication at designated time intervals.

Non adherence to medication poses a significant problem for the effective management of type 2 diabetes. It places a significant burden on the healthcare system and the patient. This can result in higher cost, morbidity and mortality (AJMC).

**Objective**

The goal is to design a comprehensive strategy that explores new paths to transform the early stage of the journey for people living with type 2 diabetes.

**Stakeholders**

One key assumption is that all stakeholders will benefit from improved medical adherence.

The key stakeholders involved in the process include:

* Patient
* Pharmacists
* Medical doctors
* Insurance providers
* Health care providers
* Medical device companies

**Literature Review**

According to (Osterberg L, Blaschke T) Adherence to a medication regimen is usually defined as the extent to which patients take medications as prescribed. Furthermore, It refers to taking medication according to medical advice and is assessed as the number of drugs taken or injected by a patient within a certain period of time being at least 80% of the number of drugs prescribed by the physician at the same time (Raebel MA and Giugliano D).  Adherence to prescribed medications is an important aspect of quality healthcare. Before a solution is designed it is imperative to understand why diabetes non-adherence happens. A literature review will be performed to find out what the top causes are.

Here are some of the barriers to type 2 diabetes adherence

According to Patient related, socioeconomic, condition related, health system related, therapy related (McGovern & Sabate)

patient-related factors encompass a patient's resources, knowledge, beliefs, perceptions, and expectations. Patient-related factors in diabetes may vary significantly depending on the extent of both nonpharmacologic and pharmacologic lifestyle changes that must be made and maintained.

Socioeconomic factors also figure in patient adherence to diabetes medication regimens. Lower socioeconomic status, illiteracy (and low health literacy), low educational level, lack of social support (including family instability), changing living situation (e.g., homelessness), culture, and high-cost medications have been reported to affect adherence.

Condition-related factors are elements specific to a particular disease state. For patients with type 2 diabetes, these may include symptom and complication severity (e.g., cardiovascular disease), level of disability (e.g., amputation), rate of disease progression, and availability of pharmacotherapy options

Health system–related factors may include inadequate time with a provider, insurance coverage and reimbursement (or lack thereof), poor follow-up, and difficulties with medication-distribution systems (e.g., drug shortages).

The term *therapy-related factors* refers to treatment modalities. Some factors include complex regimen, frequent treatment changes or adjustments, lack of obvious benefit, and side effects. All of these have significant implications for a diabetes medication regimen, especially if insulin is involved.

(Świątoniowska-Lonc N et al) highlighted that The studies analysed showed negative effects of anxiety, diabetes distress, older age, poor communication with physicians, stress, concerns about medicines and cognitive impairment on levels of self-care and medication adherence are some of the key barriers to medical adherence.

(Polonsky, W. H., & Henry, R. R) also saw similar barriers. They alluded to the fact that poor medication adherence is linked to key nonpatient factors (eg, lack of integrated care in many health care systems and clinical inertia among health care professionals), patient demographic factors (eg, young age, low education level, and low income level), critical patient beliefs about their medications (eg, perceived treatment inefficacy), and perceived patient burden regarding obtaining and taking their medications (eg, treatment complexity, out-of-pocket costs, and hypoglycemia).

To tackle the issue of non-adherence for type 2 diabetes patients it would involve all stakeholders working together to drive a positive outcome

A number of approaches can be taken to counter barriers to adherence. Some interventions are simple, others involve multiple stakeholders.

Here are a number of potential interventions.

Patient education

Educating patients about their medical condition and treatment are key to changing attitudes toward adherence. Patient education, including comprehensive medication reviews as part of MTM, can empower patients and improve treatment adherence.

During the patient education process, clinicians should identify and address underlying psychological issues that pose potential barriers to adherence. These can include anxiety, depression, and eating disorders, which have all been shown to lower rates of treatment adherence.

While patient education is the foundation of long-term adherence, it is becoming obvious that psychological and behavioral interventions in concert with education are probably more effective than education alone

Cost based intervention

One of the most significant barriers to medication access for patients is cost. One method to improve the affordability of medications is to reduce co-payments for expensive diabetes medications that are proven to improve clinical outcomes and patient adherence. One study evaluating the impact of value-based benefit design on adherence to diabetes medications found that a 36.1% reduction in co-pay reduced the number of nonadherent patients by 30%.22 Although this would shift the cost of medications from the patient to the managed care organization (MCO), the MCO can benefit from reduced hospitalization costs.

Medication support

Overcoming medication-related barriers to treatment includes helping patients remember to take medications, making treatment administration easier, reducing medication regimen complexity, and improving delivery systems.

Patients are very likely to forget to take medications or not follow instructions carefully. Various simple tools are available to help overcome the barrier of medication forgetfulness. These tools can include setting reminders for taking medications, using pill organizers or boxes, or encouraging manufacturers to place pills in blister packs.

Provider based support

Healthcare professionals can help improve patient adherence by reducing barriers to medication access, counseling patients on the importance of pharmacologic therapy, and directing patients toward tools to reduce forgetfulness. Many of the strategies aimed at improving treatment adherence in diabetes focus on using a multidisciplinary care team incorporated within the Chronic Care Model. This approach may include individualized counseling sessions conducted by pharmacists or nurses. These models offer greater opportunity to provide patients with education regarding their condition and their treatment, as well as occasions for patients to ask questions and have their concerns heard.

Self-Efficacy tools

There are tremendous opportunities to use smartphones to potentially improve medication adherence. Nearly two-thirds of adults in the United States are smartphone users and use their phones to get health information. Mobile health technologies can be used to deliver health education, enhance self-management of chronic disease, and assist patients in improving adherence. Apps could be used for

* verify their regimens and clarify any inaccuracies after hospital discharge
* providing simple reminders to take medications and pick up refills
* can also track doses taken or missed
* text message to remind patients with diabetes to take their medications has led to improved adherence
* engaging patients with their electronic medical records (EMRs) so they can easily verify and help to maintain the accuracy of their medication list to reflect their actual medication-taking.

**Solution Design**

Based on the different approaches to tackling barriers to non-adherence for type 2 diabetes a smartphone application would be the best tool to encompass the different approaches. It would have the following featurss

Here is mockup of a type-2 diabetes adherence app

**Benefits**

The benefits of using this solution is that

**Next Steps**

**Conclusion**

**References**