

Strategies for Addressing the Cost of Nonadherence in Diabetes

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Nearly 8%, or \$213 billion, of total healthcare spending in the United States is considered wasteful and avoidable.¹ About half of it, \$105.4 billion per year, results from medication nonadherence to treat chronic diseases. Diabetes has been estimated to have the second highest impact, accounting for \$24.6 billion in avoidable costs. Not included in this estimate are avoidable costs associated with diabetes-related complications and comorbidities, or conditions such as cardiovascular disease, for which diabetes is a major risk factor. Patient nonadherence to prescribed treatment can place a significant burden on the patient and the healthcare system, resulting in even greater increases in costs, morbidity, and mortality.¹

High Costs Associated With Medication Nonadherence

Patient nonadherence is among the largest factors associated with poor outcomes in patients with type 2 diabetes (T2D), the most common form of those diagnosed with diabetes.² The American Diabetes Association defines adequate adherence as 80% compliance (percentage of medications taken divided by the number of medications prescribed by the physician within a given time period).³ Approximately half of patients with T2D in their first year of therapy fail to take at least 80% of prescribed doses.⁴ Estimates show that 47.8% of adult patients with diabetes are not meeting the glycemic goal of glycated hemoglobin (A1C) <7%,⁵ illustrating that poor glycemic control in patients with T2D is very common.⁶ Conversely, clinical studies show that improved adherence is associated with improved glycemic control and decreased healthcare resource usage.⁷ Higher adherence has been shown to be associated with overall decreased costs, specifically lower acute care costs that lead to total cost reductions. Each 1% increase in adherence among 1000 patients with diabetes 65 years and older was associated with \$65,464 all-cause cost savings over 3 years.⁸

The progressive nature of diabetes and the resulting lifelong dependence on medications pose important challenges for many patients and the healthcare system. Despite improvements in efficacy and safety of available medications, the challenge with

ABSTRACT

Diabetes accounts for the second largest amount of avoidable healthcare costs in the United States—an estimated \$24.6 billion in wasteful and avoidable spending. Diabetes is a lifelong disease that is highly dependent on patient self-management. Unfortunately, studies demonstrate that almost 50% of patients with diabetes fail to reach the glycemic goal of glycated hemoglobin <7%. Patient nonadherence poses a significant barrier to effective management of diabetes and can place a significant burden on the patient and the healthcare system, resulting in even greater increases in costs, morbidity, and mortality. Therefore, effective treatment and long-term management of diabetes requires a patient-centered collaborative model of care with an understanding of the factors associated with nonadherence. This may help develop patient-, provider-, and system-focused strategies to help increase the rates of medication adherence, reduce complications associated with uncontrolled diabetes, and lower the overall cost of management.

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TABLE 1. Barriers to Medication Adherence^{3,9-13}

Barriers to Adherence	
Patient factors	<ul style="list-style-type: none"> • Patient demographics <ul style="list-style-type: none"> › Age › Gender › Ethnicity › Level of education › Sociocultural factors › Socioeconomic status › Marital status • Comorbid conditions • Personal beliefs/factors <ul style="list-style-type: none"> › Fear/patient's attitude toward health and disease › Health beliefs/medication beliefs › Confidence/motivation • Health literacy/disease education • Access to care
Provider factors	<ul style="list-style-type: none"> • Level of communication • Creating a patient-centered environment • Providing patient education • Patient support <ul style="list-style-type: none"> › Reminders for follow-ups › Monitoring › Support › Systematic patient assessment methods (eg, MTM Spider Web)
External factors	<ul style="list-style-type: none"> • Severity and duration of disease • Response to treatment • Cost of treatment • Medication regimen complexity • Access to care • Treatment of adverse events

MTM indicates medication therapy management.

adherence persists. Understanding the determinants of adherence may help develop patient-, provider-, and system-focused strategies to encourage and ensure improved adherence and ultimately clinical outcomes. Recent advances in technology may also help in easing the burden associated with nonadherence (eg, advances in insulin delivery systems [pens, pumps, continuous glucose monitoring, and closed-loop systems], methods for dose adjustments [bolus calculators and physician-directed smartphone apps], and a range of self-management apps).

Barriers to Medication Adherence

Patient medication adherence is a key component to effective treatment, and adherence to prescribed therapies can prevent or delay the onset of complications, reduce the risk of hospitalization, and decrease direct healthcare costs.¹ Adherence goes beyond the passive act of following a prescriber's recommendation. It includes an agreement by the patient to purchase the medication(s) and take the medication(s) according to the dose and schedule prescribed by

the healthcare provider.⁹ However, lack of medication adherence is not always the fault of the patient. Barriers to adherence can be grouped into 3 general categories: patient factors, provider factors, and external factors (Table 1^{3,9-13}).⁹

Patient-Related Barriers to Treatment Adherence

Patient-related barriers include patient demographics, such as age, gender, ethnicity, level of education, sociocultural factors, socioeconomic status, marital status, comorbid conditions, fear, or health beliefs.^{3,9,10,14} An interesting study highlights how a combination of demographics can differentially impact adherence. A study of Hispanic men and women with diabetes showed that Hispanic women were less likely to receive treatment support and faced greater barriers to treatment than Hispanic men. Among Hispanic women, perceived support was significantly associated with better self-efficacy, which in turn was significantly associated with better self-care adherence.¹⁴

Health literacy and medication beliefs, along with the patient's knowledge of the disease and its treatment, also play an important role in whether the patient will adhere to the treatment regimen.⁹ Positive attitudes tend to be associated with better adherence outcomes.¹² One survey of patients with T2D showed that beliefs about treatment benefit were significantly associated with the intent to adhere to treatment, while negative beliefs were associated with reduced medication adherence.¹⁵ Disease education plays a crucial role in how the patient views the disease and its perceived threat.⁹ However, knowledge of diabetes alone is not sufficient for successful self-management.¹² Studies of patients with diabetes consistently show that knowledge of diabetes is not the only factor related to adherence to self-care, diet, exercise, or medication. Confidence, motivation, and access to care also play important roles.^{9,12} Finally, comorbidities and behavioral factors, such as cognitive function, mental illness, stress, and substance abuse, are important patient factors that determine adherence.^{9,10}

Provider-Related Barriers to Treatment Adherence

Healthcare providers play a key role in treatment adherence through their relationship with the patient. Creating an environment that is patient centered, ensuring open communication and providing patient education, can help patients successfully overcome barriers to adherence.^{3,9,10} Ensuring that patients meet their follow-up appointments and have adequate support and patient monitoring are important factors in providing effective healthcare and encouraging patients to adhere to treatment.⁹ Systematic patient assessment methods, such as the medication therapy management (MTM) Spider Web, which explicitly considers patient adherence as among the many factors affecting clinical outcomes, can be helpful for training clinicians to consistently integrate adherence considerations into patient-centered care plans that promote, not hinder, patient adherence.¹¹

External Barriers to Treatment Adherence

External factors can be related to the disease or the treatment itself.^{9,10} The severity of the disease, its duration, and response to treatment all play important factors that influence a patient's perception of their disease and likelihood of adherence. Factors related to the medication are some of the most common reasons for nonadherence to insulin treatment. These include regimen complexity, pain and fear associated with injections, cost, access to care, or adverse effects.^{3,9,10,13} A cross-sectional study of 507 patients with diabetes demonstrated that only 22.3% of patients with type 1 diabetes and 24.9% of patients with T2D had high adherence to treatment.¹⁶ Adverse events related to the treatment, including injection-site reactions, feeling worse after insulin injection, and weight gain, were significantly associated with low adherence ($P < .01$).¹⁶ Insulin shortage, cost, and difficulties in preparing the injection were also significantly associated with low adherence ($P \leq .01$).¹⁶

Cost of treatment, particularly for patients with a low socioeconomic status, may be a limiting factor to medication adherence.¹² Studies have shown that the cost of diabetes treatment may result in newly diagnosed patients not seeking medical care after a diagnosis, or inconsistent or inappropriate use of medication.¹²

A bivariate and regression analysis of the 2011-2013 Medical Expenditure Panel Survey and the National Health Interview Survey 2012-2014 showed that, among privately insured adults with diabetes, comparing individuals with no deductible with those with a low deductible (<\$1000 for an individual or <\$2400 for a family), the low-deductible group had 27% fewer primary care visits, 39% fewer checkups, and 77% fewer specialty care visits.¹⁷ This disparity was even greater when comparing individuals with no deductible to those with a high deductible (>\$1000 for an individual or >\$2400 for a family). Those with a high deductible had 42% fewer primary care visits, 65% fewer checkups, and 86% fewer specialty care visits. Lower-income patients can also be those with greater medication usage rates, making cost barriers of possibly greater consequence. A study using MarketScan data revealed that for patients with diabetes using insulin, the Medicare-Medicaid dual-eligible group had higher overall medication usage (87.0 vs 54.4 mean annual prescription claims, $P < .001$) and insulin usage (8.6 vs 5.7 mean annual prescription claims, $P < .001$) than the more affluent traditional Medicare patients.¹⁸

It is important to educate patients that saving some money today by nonadherence to treatment may mean spending much more money in the future. For patients with diabetes, nonadherence can increase risk for all-cause hospitalization (odds ratio [OR]: 1.58; $P < .001$) and can increase risk for all-cause mortality (OR: 1.81; $P < .001$).¹⁹ Studies have also shown that lack of medication adherence can result in approximately 3 times higher hospitalization rates and almost double the associated healthcare costs.^{20,21} The results of one retrospective study showed that the annual healthcare cost for a

low-adherence (between 1% and 19% adherence) patient with T2D was \$16,498 compared with \$8886 for a high-adherence (between 80% and 100%) patient.²¹ In addition, the risk of hospitalization was 25% less for high-adherence patients with T2D. This study also demonstrated that a 20% increase in adherence can save \$1074 in total healthcare spending for each patient with T2D.²¹

Overcoming Barriers to Adherence

In most cases, nonadherence results from a culmination of factors rather than 1 isolated barrier or behavior. However, patient-related barriers are the most common causes of nonadherence. A recent meta-analysis of systematic reviews showed that a patient's level of education tends to be related to the patient's beliefs about their condition and treatment.¹⁰ Lack of knowledge about the disease and treatment was shown to be associated with poor patient motivation, which was linked with poor medication adherence. Similarly, the number of comorbidities tends to increase with age.¹⁰ Nonadherence has many possible determinants and barriers, such that eliminating a single barrier may not have a significant impact on adherence.² Therefore, improvement in adherence may require multiple points of action combined to create programs based on individual need.

Cost

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.

Data from a 2013 National Health Interview Survey found that 14% of adults with diabetes who participated in the survey reported cost-related nonadherence (CRN).²³ The likelihood of CRN increased with greater perceived financial stress and financial insecurity with healthcare. Proactively discussing the cost of treatment and offering lower-cost options may be 1 way that prescribers and pharmacists can improve adherence to treatment. Prescriber and patient awareness of each patient's formulary coverage for medications is critical to optimize the cost of a patient's medication regimen. Recognizing that diabetes medications often represent only a portion of the patient's total medication regimen is also important. A study comparing medication regimen complexity of 4 common chronic disease cohorts found the diabetes cohort was using a mean of 10.4 total medications per patient, with only a mean of 1.9 medications being for diabetes; almost half of the cohort was using more than 11 total medications.²⁴ Offering assistance with preapprovals,

TABLE 2. Core Elements of the Chronic Care Model³

Delivery System Design	Self-Management Support	Decision Support	Clinical Information Systems	Community Resources and Policies	Health Systems
<ul style="list-style-type: none"> • Driving toward a proactive delivery system • Team-based approach with coordinated planned visits 	<ul style="list-style-type: none"> • Healthcare providers provide education and tools to help patients with self-management 	<ul style="list-style-type: none"> • Care is evidence based, using published guidelines 	<ul style="list-style-type: none"> • Providers have access to registries that provide patient-specific and population-based support 	<ul style="list-style-type: none"> • Developing resources that promote and support healthy lifestyles 	<ul style="list-style-type: none"> • Create a quality-oriented culture

prior authorizations, or enrollment in savings programs offered by pharmaceutical companies may also help patients limit their out-of-pocket expenses.

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.²⁵ Referrals to appropriate programs or clinicians for more in-depth education for problem areas can be key. The goal of a patient education program should be to alter patient behavior in a manner that promotes healthy lifestyle choices, disease self-management, and prevention of diabetes complications. Part of the program should be identification of self-management problems, and subsequent development of strategies to solve those problems.³

Patient beliefs and attitudes toward their diabetes and its treatments also influence adherence rates.²⁶ A positive perception of the benefits of medications is positively and strongly associated with the intention of treatment adherence.¹⁵ A recent study of older adults found that 41% of the adults reported at least 1 nonadherence behavior, with a strong relationship between low perceived benefit of medications and nonadherence.²⁷ A survey of patients with diabetes and caregivers attending a large diabetes education conference revealed that the most frequently reported helpful methods for improving medication adherence were taking medications as part of a daily routine and using pill boxes.²⁸ The most commonly identified motivating factors to improve adherence were knowing that diabetes medications work effectively to lower blood glucose, knowing how to manage adverse effects from medication, and understanding medication benefits.²⁸

While many patient barriers to treatment, such as socioeconomic status or age, cannot be easily addressed by healthcare professionals,

interventions designed to improve adherence must have a patient-centered approach that focuses on individual barriers to adherence. Open communication and increased patient knowledge may help overcome barriers, such as cultural beliefs or perceived treatment risk/benefit, and improve self-management behaviors.²⁵

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 (Table 2).^{3,26}

This approach may include individualized counseling sessions conducted by pharmacists or nurses.²⁶ 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. An online survey of 807 adults with diabetes found that adherent patients were more likely to have received information about their condition and/or treatment from their healthcare provider.²⁹

Point-of-service counseling coupled with follow-up communication by an appointed healthcare professional may help improve adherence to treatment and ensure timely treatment initiation.³⁰ In an intervention study, adherence and physician initiation of treatment increased (2.1% and 38%, respectively, compared with a control group) when patients received in-person counseling by a pharmacist.³¹ The pharmacist-led counseling included a follow-up call after each refill, a counseling session at the time of first treatment fill, information about treatment of known comorbid conditions, and an offer to discuss initiation of treatments needed with the patient's physician. Furthermore, the interventions had a return on investment of approximately \$3 for every \$1 spent.³¹

Promotion of a more coordinated and systematic approach to medication management across providers and health systems has the potential to improve patient adherence and clinical outcomes on a

wide scale. MTM programs provided through Medicare Part D plans, or broader comprehensive medication management programs that include elements of collaborative care and long-term follow-up, have been shown to improve adherence.³² A systematic review of MTM literature found medication appropriateness, adherence (measured either by doses taken or achieving a threshold percent adherence level that is disease-appropriate), and reduced medication dosing (reduced number of doses per day) were all significantly improved via MTM intervention in the studies included.³³

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. Many support programs offered by drug manufacturers and pharmacies include phone calls or text messages to remind patients to take their medications. Patients should also be encouraged to download apps for their smartphones that function as medication reminders.

An effective method for improving patient adherence is to encourage use of therapies that can reduce the complexity of a medication regimen, such as using combination agents or insulin pumps. Usage of insulin pens, or devices that help ease the burden or pain associated with insulin injections, may improve adherence in some patients.^{3,34-36}

Insulin delivery systems have come a long way from the vial-and-syringe method of insulin delivery. They now include pens, pumps, inhaled devices, continuous glucose monitors, and closed-loop systems. Insulin pens not only result in greater patient satisfaction and adherence, but they allow patients to have greater independence in their overall lifestyle, are easier and more convenient to use, have superior accuracy, and are more socially acceptable than insulin vials and syringes.³⁷ However, it is important for healthcare providers to educate patients on proper injection techniques to prevent dosing errors. Recent combination treatment pens allow for fewer injections and may help reduce regimen complexity.³⁷

Insulin pumps are small electronic devices that can deliver insulin in bolus doses or continuous doses.³⁸ They are much more commonly used in type 1 diabetes, but can improve outcomes in patients with T2D who require multiple daily injections and whose disease is poorly controlled.³⁹ Use of insulin pumps may help improve predictability of insulin levels and glucose levels,

resulting in increased adherence and fewer injections.³⁸ However, insulin pumps are usually expensive and may not be appropriate for all patients.³⁸

The connection between combination therapies and adherence may not be quite as clearly defined. Combination therapies are often seen as the solution to issues with complexity of dosing and treatment regimens. Patients tend to be less compliant with complex regimens, and more adherent to simpler regimens and those with fixed-dose combinations.⁴⁰⁻⁴² Fixed-dose combination therapy with metformin has repeatedly been shown to have higher treatment adherence than loose-pill combinations.^{40,41} Simplicity of the dosing regimen and the frequency and timing of dosing are also important indicators of potential adherence—once-daily dosing is associated with higher rates of adherence than twice-daily dosing.⁴¹ However, it cannot be assumed that a combination treatment will increase adherence. For example, newer insulin pens come with fixed-dose combinations of a basal insulin and a glucagon-like peptide-1 receptor agonist, thus reducing the number of injections and simplifying the dosing schedule. However, because they are recent approvals, these pens also cost more than the combined price of the individual drugs. Cost is a major factor in treatment adherence and compliance and cannot be ignored. Diabetes is a disease that requires long-term treatment. As such, it is important to ensure that patients are aware of all their treatment options so that the factors important to them can be used to determine the treatment regimen they are most likely to adhere to over the long term.⁴³

Conclusion

Diabetes is a chronic, progressive, and costly disease, one that is dependent on self-management behaviors and a patient-centered collaborative model of care for effective long-term management. Medication nonadherence poses a significant barrier to effective management of diabetes, with issues for patients. While studies have demonstrated that treatment adherence is associated with improved glycemic control, almost 60% of patients with diabetes fail to reach their glycemic goals. Understanding the factors associated with nonadherence may help develop patient-, provider-, and system-focused strategies to help increase the rates of medication adherence, reduce complications associated with uncontrolled diabetes, and lower the overall cost of management. Treatment advances and improvements in delivery systems, along with innovative technologies, can also be used to help patients overcome some of the challenges associated with the management of diabetes. ■

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