



Predictive analytics: saving lives and lowering medical bills



BY TODD STEFFES

Non-adherence to medication prescriptions is a health epidemic in the United States.

Nearly half of all medication prescriptions are not followed, resulting in an estimated 125,000 premature deaths in the United States each year [1]. The epidemic is serious enough that it has become a priority for U.S. Surgeon General Dr. Regina Benjamin, who is partnering with the National Consumers League in their "Script Your Future" campaign,

to help focus the healthcare community and patient advocates on addressing this issue.

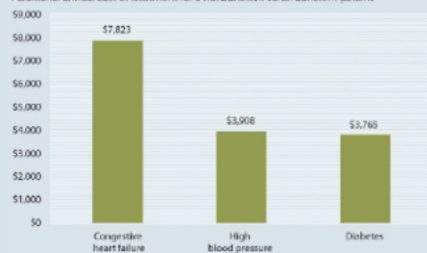
Beyond the human toll, the financial cost of non-adherence is staggering. Medication non-adherence costs more than \$290 billion per year in avoidable medical costs, such as hospitalizations and surgeries [2]. That is equivalent to 13 percent of all U.S. healthcare expenditures. Reigning in these astronomical figures could have a significant impact on

public policy, government deficits and the out-of-pocket costs that average Americans must bear.

A 2011 study [3] showed that a non-adherent patient with high blood pressure spends an average of \$3,908 more per year for healthcare than an

Figure 1: Costs of medication nonadherence

Additional annual cost of treatment for a nonadherent vs. an adherent patient



Source: Medication Adherence Leads To Lower Health Care Use And Costs Despite Increased Drug Spending, Health Affairs (2011)

Figure 2: Solving the limitations to current nonadherence tactics

Current Tactic	Why It's Limited	How FICOP Medication Adherence Score Can Help
Monitoring	Backward looking. Patients are exposed to negative health outcomes once treatment has been interrupted; it becomes more difficult to re-engage.	Predicts how likely a patient will become nonadherent, enabling engagement strategies to be proactive rather than reactive.
Point-of-care interaction	Hard for practitioners to know which patients are in most need of counseling, and for time and resources to be allocated appropriately.	Enables practitioners to quickly determine which patients are most in need of counseling at the point of care, and allocate time and resources appropriately.
Behavioral surveys	Limited by low response rates and spurious self-reported information.	Provides a broad baseline assessment of adherence propensity across the entire patient population. Requires no survey participation.
Patient education	Usually conducted using a "one-size fits all" approach; thus valuable resources are used on patients who take their medication on time and in full.	Ranks a patient population by probability of nonadherence, enabling more nuanced, segmented approach to customer engagement.



adherent patient. For congestive heart failure, the additional patient cost is estimated to be \$7,823, and for diabetes it is \$3,765.

NEW ANALYTIC TECHNOLOGY COMBATING SILENT KILLER

Existing strategies to fight non-adherence often do too little, too late. This is because most strategies are based on doctors observing negative health consequences after patients have stopped taking their meds. By that time, the damage is done. A retrospective approach simply does not work.

That is why predictive analytics is poised to have an enormous impact on adherence.

By alerting doctors, pharmacists and health plans to patients who are most vulnerable to non-adherence, preventative measures can be taken before patients experience negative health outcomes.

An example of this type of analytic approach is the FICO Medication Adherence Score. This score is based on models developed from publicly available data. Factors such as a patient's age, gender, marital status and time in their current residence have proven to be highly predictive of medication adherence. These factors, combined with data about the patient's geographic region and disease, enabled analytic scientists to build a scoring model – with a range of 1-500 – that

indicates the probability of a patient adhering to a prescription for the first year of therapy.

The score was created using de-identified data from a large pharmacy-benefits manager. The benefits manager provided a random sample of data on more than one million patients who had been diagnosed with asthma, depression, diabetes, high cholesterol or hypertension. Using those five data sets, the analytic scientists were able to track the patterns of patients who filled and refilled prescriptions and those who didn't. From there, the scientists identified the variables most associated with medication adherence and developed separate prescription-adherence

models for each of the five diseases.

Patients whose Medication Adherence Scores fell in the top decile on the 1-500 scale stuck to their prescriptions for an average of 129 more days (in a one-year period) than patients whose scores fell in the bottom decile. For patients with serious health conditions, such a dramatic discrepancy in medication adherence can literally mean the difference between life and death.

RISK SCORES PROVIDE ACTIONABLE INFORMATION

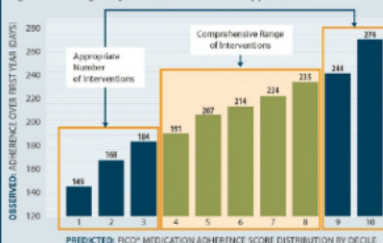
Tens of millions of patients in the United States are living with serious, chronic diseases. It is not realistic for healthcare

Figure 3: Accurately predicting medication adherence for hypertension



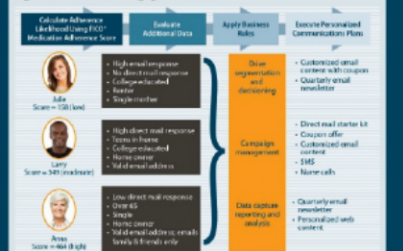
FICO Medication Adherence Score accurately ranks patients from least to most likely to be adherent over the subsequent year.

Figure 4: Moving away from a one-size-fits-all approach



Instead of using a broad-brush approach to engagement and education strategies, the FICO Medication Adherence Score can be used to segment individuals into higher- and lower-risk groups. Here, patient risk levels were broken into deciles showing the observed average number of days adherence in each group. The scores can then be used to find the appropriate number and level of interventions in the different risk categories, with more intensive strategies applied to higher risk segments (deciles 1, 2 and 3).

Figure 5: Personalized engagement tactics



Here's an example of a predictive analytics approach to patient engagement and education. Patients are segmented into similar risk groups using the FICO Medication Adherence Score. Additional key data—including factors known to affect adherence and preferred communication channels—are incorporated in the communications strategy. Then, business rules and testing can be applied to provide differentiated communications strategies across patient populations.



providers to shower extra attention on every patient. However, a risk score that accurately determines the probability of medication adherence can enable providers and insurers to target the most vulnerable patients. From there, healthcare providers can develop intervention tactics and protocols to match the needs of their patients. Among the many tactics that might be employed to help at-risk patients adhere to their prescriptions are:

- sending daily, automated e-mail or text reminders;
- simplifying drug regimens to avoid confusion;
- offering information about co-pay cards, subsidized drug programs and other financial resources that are available to help patients cover the cost of their prescriptions;
- providing instructions in a patient's native language; and
- in extreme cases, having a nurse visit a patient to ensure that medications are taken properly.

Predictive analytics allow healthcare providers to apply these nuanced tactics

and concentrate their engagement and education programs where they will do the most good. For example, a pharmacist may not have the time or incentive to engage with every patient about adherence. But if a patient is at a particularly high risk of non-adherence, the pharmacist may be instructed to provide more detailed instructions or initiate a special adherence program, such as a daily reminder call to remind the patient to take her or his medication.

NEXT STEP: TEST & LEARN

Now that hospitals, pharmacies and insurance plans have a mechanism for measuring the risk of non-adherence, the next step is to implement formal test-and-learn strategies to evaluate and optimize the efficacy of their tactical approaches to increasing medication adherence.

In fact, these types of test-and-learn projects are already underway in other areas of healthcare. For example, a company engaged in a multi-year, disease-management pilot program implemented a test-and-learn program for diabetes patients. The company tested potential messaging for nurses to use when discussing disease management programs with patients to determine the most impactful way to engage. The messaging was pre-tested in focus groups

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to gauge audience understanding and responsiveness, and was tested again in a nationwide attitudinal survey.

Based on an analysis of patient responses to specific messaging, the company was able to segment patients into six groups and develop tailored engagement strategies for each segment. The result of this test-and-learn program was that medication adherence among the test subjects was 36 percent higher than would have been expected based on a purely random sample of patients who were not exposed to any special effort to increase adherence.

These types of test-and-learn studies are likely to become even more important in the fight against non-adherence as communications channels such as smartphones and social media continue to grow. Engagement tactics that work well in a doctor's office may not work nearly as well for a patient who is reading a text message or a Facebook post.

NAVIGATING TRICKY WATERS

Managing any aspect of healthcare is difficult. Patients are often not completely forthcoming about their behavior

with their caregivers, and HIPAA regulations place limits on access to personal medical information.

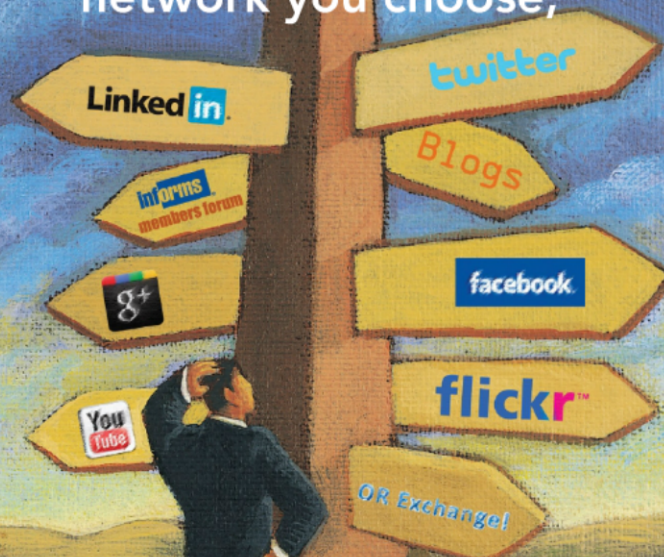
Although predictive analytics isn't a cure all, it has the potential to address a healthcare epidemic without being compromised by these factors. By applying analytic science to publicly available data, healthcare providers now have a powerful diagnostic tool to fight non-adherence. This epidemic has cost the United States too many lives and too much money for far too long. We now have an elegant approach that can enable sustainable programs for healthier living. ■

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