Improving patient adherence through data-driven insights

When patients fail to follow prescribed medical regimens, outcomes suffer. A McKinsey study points to areas pharmaceutical companies can address to combat this long-standing industry issue.

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Failure to adhere to prescribed-medication regimens is one of the principal reasons patients don't achieve the expected outcomes from their treatment. Solving this challenge has been a major goal for pharmaceutical and healthcare organizations for decades. Studies show that 50 to 60 percent of patients with chronic illnesses miss doses, take the wrong doses, or drop off treatment in the first year.[1] An estimated 125,000 lives are lost annually in the United States and additional healthcare expenditures of $290 billion are driven by nonadherence.[2] An estimated 10 percent of hospitalizations in older patients are considered avoidable through improved medication adherence.[3] Beyond the primary goal of healthier and longer lives for patients, improved adherence also has a direct impact on pharmaceutical-industry revenues.

In this article we delve into insights from a McKinsey study that examined differences in adherence across diseases, and among branded medications treating the same disease. We find interesting variations among diseases and drugs that we will explore further in this article. The study applied a 360-degree approach to examine factors that may influence patient adherence (see "A 360-degree approach to patient adherence"). We analyzed select patterns in adherence data for the top branded medications in eight disease categories.[4] The study principally examined patients in the United States, looking at pharmacy (prescription) data and medical claims using a data set covering millions of patients from Crossix Solutions,[5] a data-analytics company. The data contain a host of patient characteristics, including psychographics, socioeconomic indicators, and consumer-purchase patterns, which are referenced in examples throughout.

There are three principle measures of adherence:

■ *Persistence.* How long patients take a drug before either switching to a new drug or stopping treatment entirely. This is measured by how many patients continue to fill their prescriptions.

■ *Compliance.* How closely patients follow the prescribed treatment plan. This is measured by how many persistent patients fill their prescribed doses on schedule, based on the approved product label. We have considered patients to be compliant if at least 80 percent of doses, according to approved product label, were filled within the study period.

■ *Adherence.* Combined view of compliance and persistence, measured by the share of all patients, who fill their prescribed doses on schedule, based on the approved product label. Similar to compliance, we have considered patients to be adherent if at least 80 percent of doses, according to approved product label, were filled within the study period.

We explored two of these dimensions in our analysis: persistence and adherence.
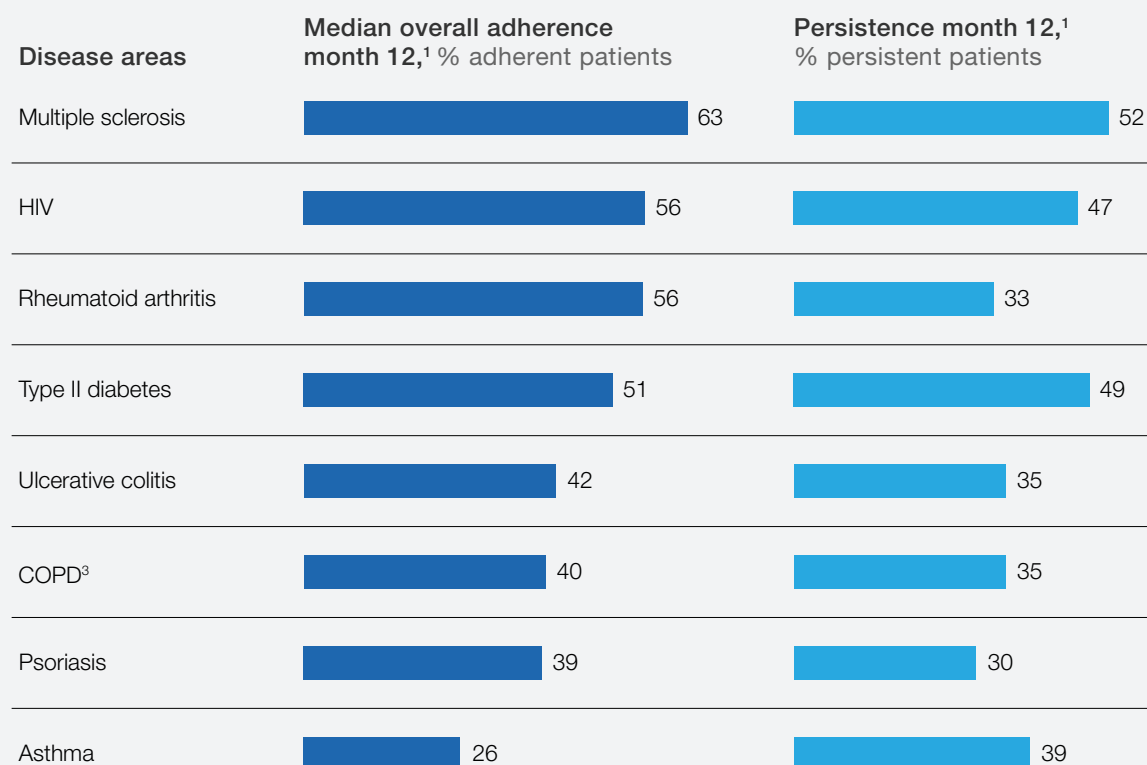
Adherence varies widely among medications treating the same disease

As might be expected, adherence rates varied noticeably among the disease categories examined. Exhibit 1 shows adherence and persistence rates across diseases.

The data show a significant lack of adherence across disease categories, all of which are chronic in nature. Across diseases, 26 to 63 percent of patients do not adhere to the treatment regimen indicated by the approved product label. Further, after one year, 50 percent or fewer patients remained on their treatment across all the diseases analyzed.

Contrary to studies that suggest severe conditions tend to have worse adherence rates,[6] our analysis showed that diseases with greater severity, measured by average disability-adjusted life years,

Across diseases, adherence and persistence vary widely.

Disease areas	Median overall adherence month 12,[1] % adherent patients	Persistence month 12,[1] % persistent patients
Multiple sclerosis	63	52
HIV	56	47
Rheumatoid arthritis	56	33
Type II diabetes	51	49
Ulcerative colitis	42	35
COPD[3]	40	35
Psoriasis	39	30
Asthma	26	39

[1]Calculated by averaging the 12-month values for each drug within each therapeutic area.
[2]Percentage of patients who are fully adherent (>80% overall adherence) after 12 months.
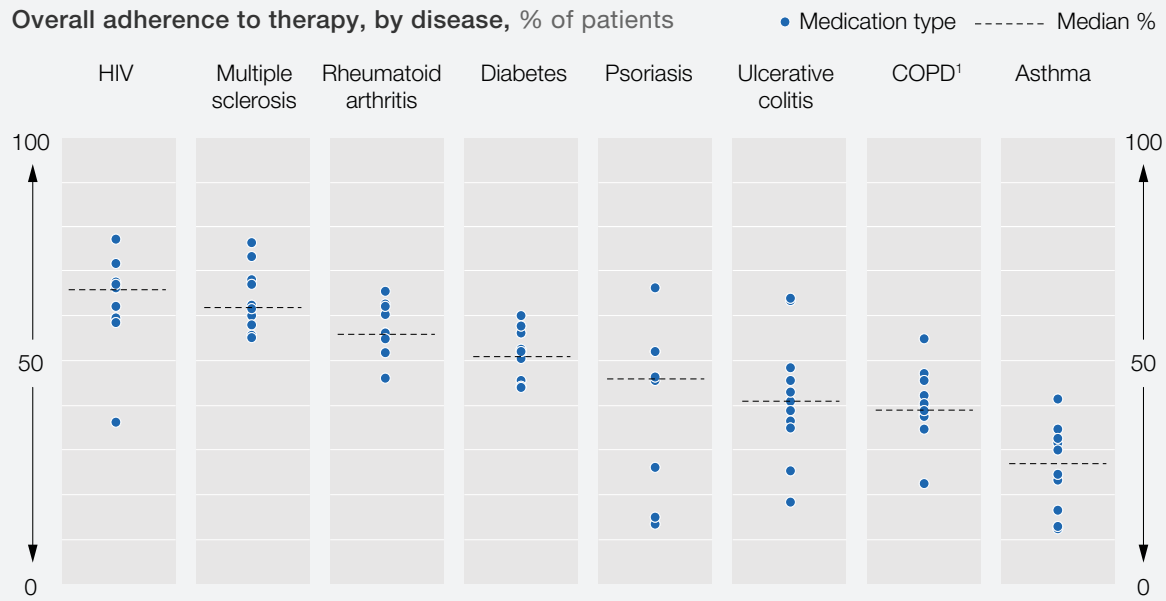[3]Chronic obstructive pulmonary disease.

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tended to have higher median adherence rates. For example, two of the most severe diseases in the study—HIV and multiple sclerosis—had significantly higher median adherence levels than other diseases.

Interestingly, our analysis also showed that adherence variations can be greater among medications for a specific disease category than the median variations across disease categories. Exhibits 2 and 3 show the range of adherence and persistence rates, respectively, for medications in each of the studied disease categories.

Within disease categories, adherence rates differed by about 20 to 50 percentage points based on the medication being prescribed (Exhibit 2). For example, in ulcerative colitis, the medication with the highest adherence rate had about 65 percent adherence, while the one with the lowest was approximately 20 percent, a 45-percentage-point gap.

Persistence shows a similar trend (Exhibit 3), although variations within disease categories are even wider. More than half of the diseases

Exhibit 2   Across diseases, adherence rates vary broadly by medication.

Overall adherence to therapy, by disease, % of patients   ● Medication type   - - - - - Median %

| HIV | Multiple sclerosis | Rheumatoid arthritis | Diabetes | Psoriasis | Ulcerative colitis | COPD[1] | Asthma |

¹Chronic obstructive pulmonary disease.

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analyzed had a range of more than 40 percentage points in persistence rates across medications. Psoriasis showed the largest variation, a 45-percentage-point gap between the best performer, 53 percent, and the worst, 8 percent.

A multitude of factors specific to individual brands could be affecting adherence. This is apparent even for brands in the same drug class with similar efficacy, cost, and delivery mechanism. For example, interferons in multiple sclerosis showed a 13-percentage-point difference in adherence between the best- and worst-performing medications.

These findings highlight the importance of identifying specific drivers of adherence for each individual medication or brand—indicating that it is important to understand the specifics of each

medication or brand beyond just understanding the broad factors related to the disease category.
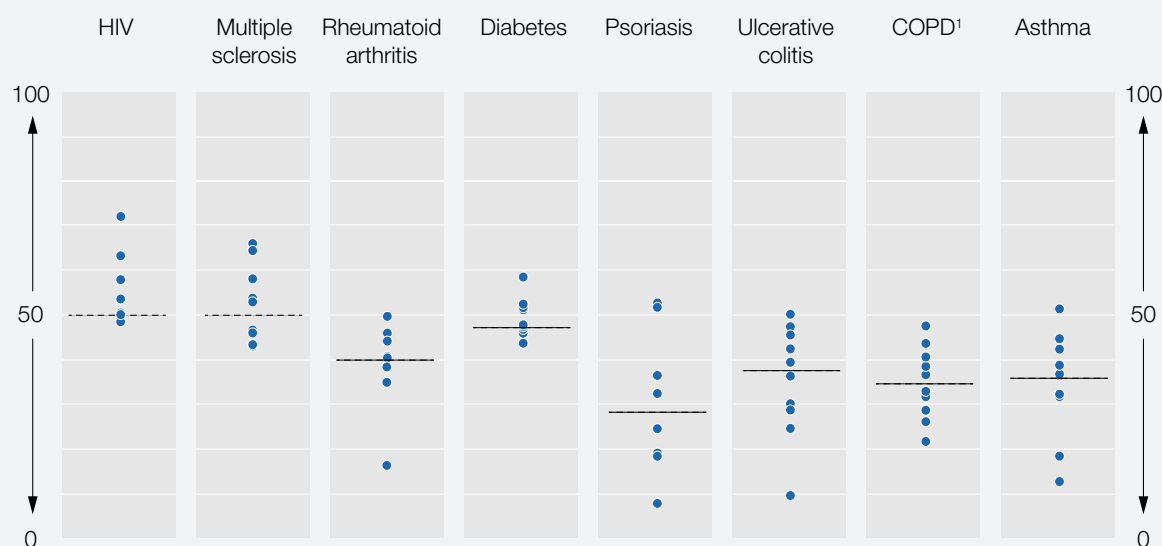
Factors that influence adherence
In analyzing data that included prescription, healthcare, and consumer variables, we gained preliminary insight into the types of factors that may be influencing adherence, which may play a role in explaining differences seen among different medications. Broadly, the drivers of adherence can be categorized into four dimensions: drug-related characteristics, factors related to the condition itself, healthcare-system factors, and sociodemographic and patient-related factors. This framework is displayed in Exhibit 4.[7]

To help illustrate these dimensions, the study included a preliminary analysis of select factors that may be

Exhibit 3 Low persistence rates were found across disease categories, with significant variation by medication within each category.

Persistence across all products, by disease,
% of patients continuing therapy after 12 months

• Medication type   ------- Median %

| HIV | Multiple sclerosis | Rheumatoid arthritis | Diabetes | Psoriasis | Ulcerative colitis | COPD[1] | Asthma |

[1]Chronic obstructive pulmonary disease.

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influencing adherence in psoriasis, a chronic skin condition, and one of the eight diseases examined.[8]
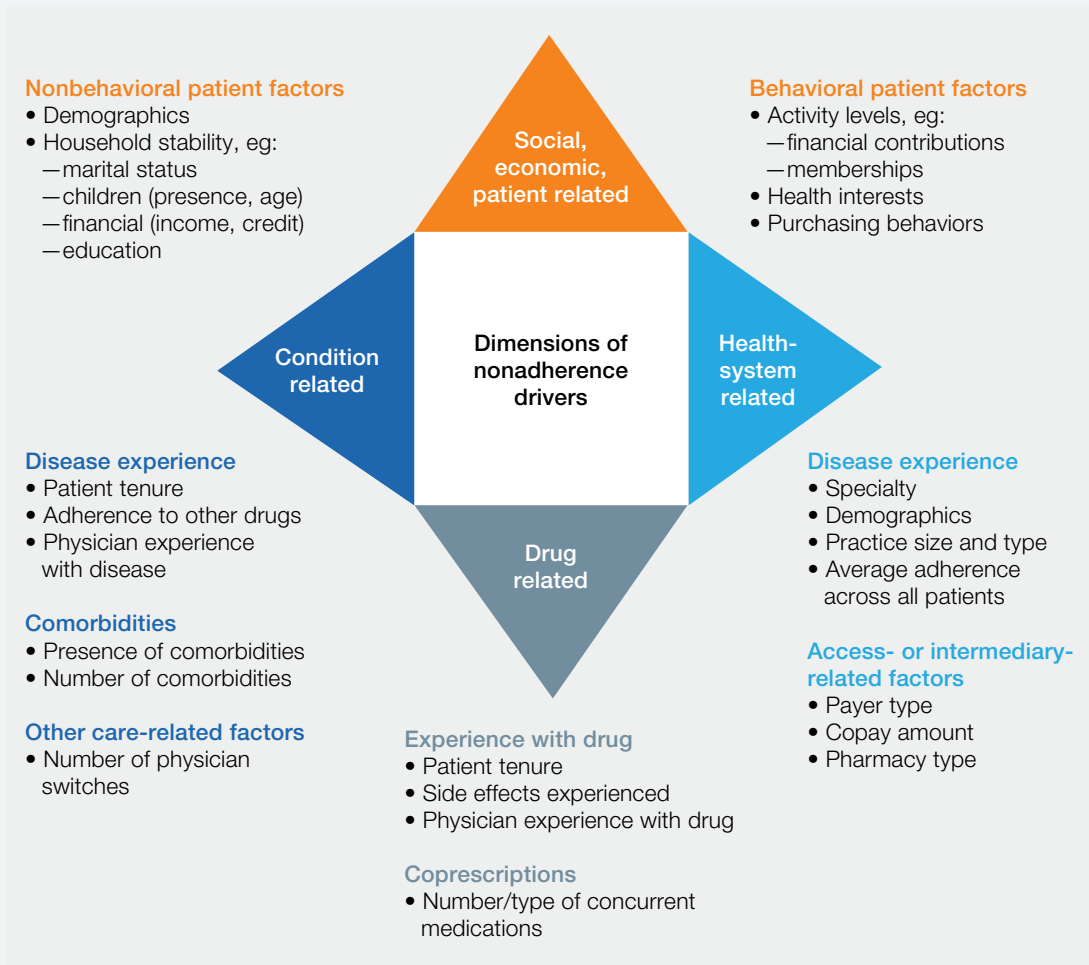
Spotlight on psoriasis
Psoriasis had the lowest median persistence rate among the diseases studied and substantial variations in both persistence and adherence levels among medications. Many brands in this disease area are accompanied by patient-support programs. Understanding the drivers of nonadherence could enable those programs to be better targeted and more effective.

We analyzed adherence levels for eight common drugs for treating severe psoriasis and found significant variations (Exhibit 5).

Adherence is generally an issue across all products. Even the best-performing medication, Product 1, had a third of patients take fewer doses than required in the first year of therapy, according to the approved product label. The product also only retained half of its patients by the end of the first year.[9]

As noted previously, substantial variation also exists across products. The medications analyzed included first-line or initial treatments (Medications 6–8), as well as those for later stages. Among those for later stages (Medications 1–5), adherence and persistence rates are slightly higher, though substantial differences still exist across products, with a variation of 20 to 30 percentage points per metric. Differences are mainly driven by the first few

Exhibit 4   Multiple dimensions of variables can drive adherence.

Nonbehavioral patient factors
- Demographics
- Household stability, eg:
  —marital status
  —children (presence, age)
  —financial (income, credit)
  —education

Social, economic, patient related

Behavioral patient factors
- Activity levels, eg:
  —financial contributions
  —memberships
- Health interests
- Purchasing behaviors

Condition related

Dimensions of nonadherence drivers

Health-system related

Disease experience
- Patient tenure
- Adherence to other drugs
- Physician experience with disease

Comorbidities
- Presence of comorbidities
- Number of comorbidities

Other care-related factors
- Number of physician switches

Drug related

Disease experience
- Specialty
- Demographics
- Practice size and type
- Average adherence across all patients

Access- or intermediary-related factors
- Payer type
- Copay amount
- Pharmacy type

Experience with drug
- Patient tenure
- Side effects experienced
- Physician experience with drug

Coprescriptions
- Number/type of concurrent medications

Source: *Adherence to long-term therapies: Evidence for action*, World Health Organization, 2003, who.int; McKinsey analysis
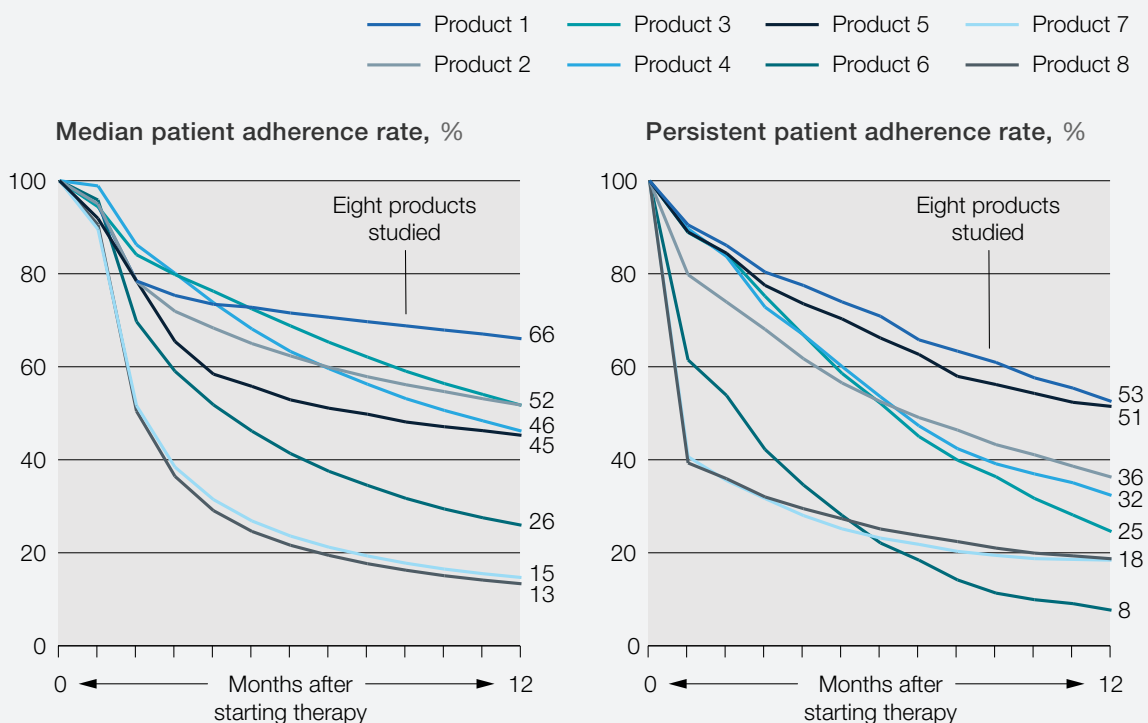
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months or prescriptions, while most products tend to have a similar rate of decline, across metrics, after approximately six months.

Interesting variations also exist across metrics for a given product. For example, Product 3 has relatively high adherence by 12 months (52 percent), but persistence is much lower (25 percent). In other words, patients who continue to use the drug do so according to the prescribed plan. On the other hand, Product 5 has an opposite trend, where persistence is the second highest (51 percent), yet adherence is in the bottom half of products (45 percent). This indicates patients are continuing

Exhibit 5   **Psoriasis**-treatment adherence rates vary by up to 50 percentage points.

Median patient adherence rate, %

Legend: Product 1, Product 2, Product 3, Product 4, Product 5, Product 6, Product 7, Product 8

Eight products studied

Values: 66, 52, 46, 45, 26, 15, 13

Months after starting therapy (0 to 12)

Persistent patient adherence rate, %

Eight products studied

Values: 53, 51, 36, 32, 25, 18, 8

Months after starting therapy (0 to 12)

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to fill prescriptions but are missing or stretching doses.

Drug-related factors: The impact of the medication experience

Among drug-related factors, efficacy, a simple, consistent dosage schedule, and an easy delivery mechanism were shown to have a profound impact on adherence—together, they form part of the overall product experience. Exhibit 6 displays adherence and persistence rates over time for the eight psoriasis products, aggregated by level of efficacy.[10] Exhibit 7 displays the metrics at a delivery mechanism level (for example, oral tablet versus injectable).

Our analysis indicated that the most efficacious psoriasis medications demonstrated much higher adherence levels in both persistence and adherence (Exhibit 6). That said, even the most efficacious medications have a third of patients not adhering by the end of the first year.

Delivery mechanisms also showed a range of adherence rates for psoriasis treatments. Across both metrics, topical ointments performed much worse than oral drugs or injections (Exhibit 7). The relationship could be related to the severity of the condition (topical medications are generally prescribed for less severe cases), efficacy, or other factors. For example, the greasy nature of the topicals may play a part—since patients report disliking

Exhibit 6   **Efficacy** affects **psoriasis**-treatment adherence.

Median patient adherence rate, %

High efficacy

Moderate efficacy

Low efficacy

0 ← Months after → 12
starting therapy

Persistent patient adherence rate, %

High efficacy

Moderate efficacy

Low efficacy

0 ← Months after → 12
starting therapy
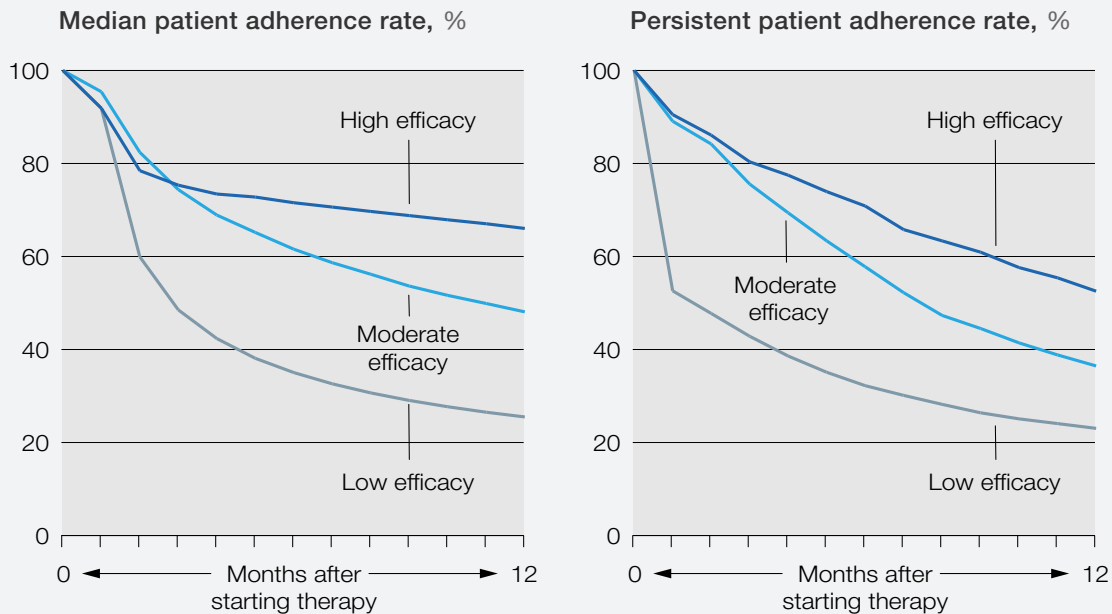
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the consistency and appearance of topicals—along with the inconvenience of applying them. Perhaps surprisingly, the analysis found very little difference in adherence between orals and injectables, which may indicate that the efficacy of the injectables overcomes the inconvenience of using them.

We also found a positive correlation between higher dosing frequency and higher adherence rates. This may indicate that routine and predictability are important factors related to adherence.

### Health-system factors: Recognizing the healthcare provider's impact

Adherence may also be affected by factors linked to the healthcare system, such as the expertise, experience, and quality of the physicians and the structure of their practices. Across several different diseases, we found that patient adherence varied

greatly by the physicians who treated them.[11] Exhibit 8 shows this variation in psoriasis by the share of persistent patients per physician (of all patients they prescribe psoriasis medication to).

Among biologic therapies for psoriasis—later-stage medications—36 percent of physicians have 20 percent or fewer persistent patients at 12 months, while 13 percent of physicians have more than 80 percent of persistent patients in that time frame.

This variation among patient-persistence levels across physicians could be driven by many factors. For one medication in another disease area, for example, predictive analyses of hundreds of physician and practice characteristics showed patients were twice as likely to adhere to their regimens when being treated at large, specialist clinics rather than in smaller offices.

Exhibit 7 **Delivery methods** show wide variations in **psoriasis**-treatment adherence.

Median patient adherence rate, %

Persistent patient adherence rate, %
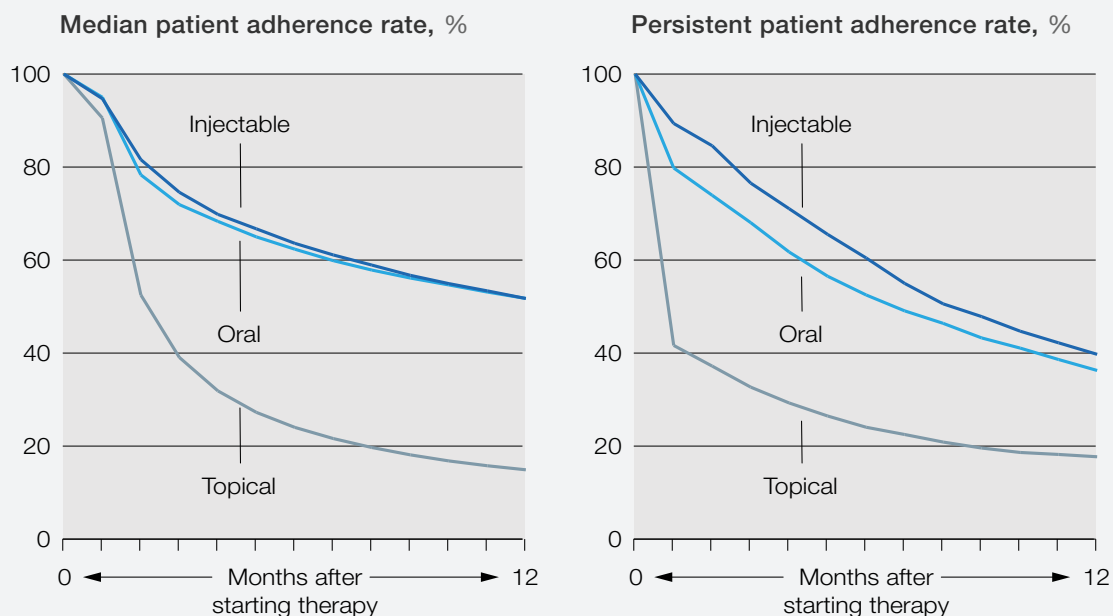
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Condition factors: Understanding and mitigating condition factors

As shown, a patient's condition can correlate with the adherence rate. In psoriasis, moderate-to-severe cases displayed the highest adherence levels. In addition, the study showed that comorbidities—conditions that accompany a disease—tend to negatively correlate with adherence. In patients with moderate-to-severe psoriasis, those with a greater number of comorbidities, at least three, had adherence levels that were nearly five percentage points lower than those with the fewer comorbidities.[12] This gap was more pronounced for individual medications, with one medication having a difference of almost ten percentage points in average adherence rates between patients with higher and lower numbers of comorbidities.
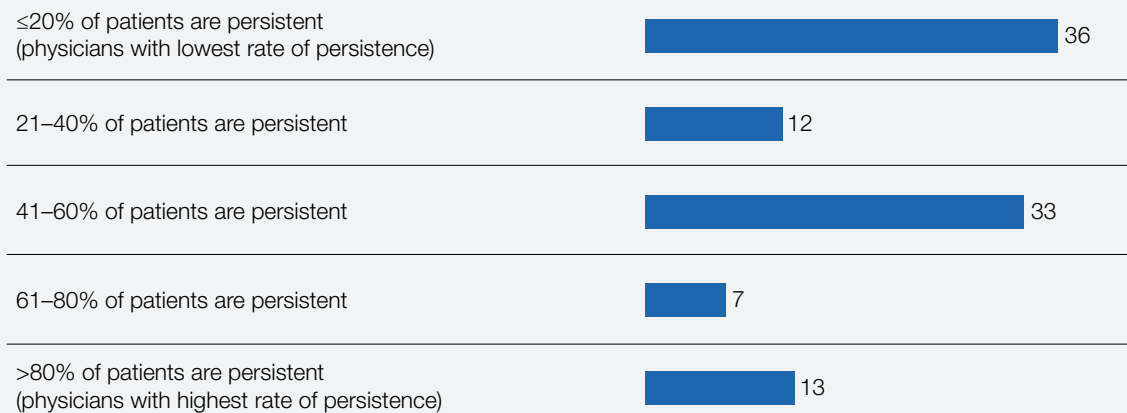
The sheer number of medications a patient is taking can also be an important factor. In multiple clients, across disease areas, multivariate analyses showed that patients taking multiple medications concurrently tended to be significantly less adherent.

Patient-related factors: Addressing patients' and caregivers' unique needs

Many patient-related factors can contribute to a patient's failure to adhere, including social, behavioral, and demographic factors. Recurring trends across diseases show that a patient's level of involvement in the community and family-related factors are significant influencers. For instance, in a rare-disease area, one pharmaceutical client found that patients involved in community-related causes and those with large families and grandchildren had

Exhibit 8 **Persistence** varies significantly by physician.

Share of physicians by patient persistence at 12 months, psoriasis biologic therapies only, %[1]

≤20% of patients are persistent
(physicians with lowest rate of persistence) ████████████████████ 36

21–40% of patients are persistent ██████ 12

41–60% of patients are persistent ███████████████████ 33

61–80% of patients are persistent ███ 7

>80% of patients are persistent
(physicians with highest rate of persistence) █████ 13

[1]Figures may not sum to 100%, because of rounding.

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a 69 to 75 percent greater likelihood of adherence. This helped the company to tailor their patient programs by encouraging patients to be active in their social communities, as well as providing more caregiver support for a subsegment of patients with a smaller support system.

Implications for pharmaceutical and healthcare organizations

These insights have practical business implications for pharmaceutical companies, healthcare systems, and health practitioners, including the following:

- *Clinical trial design and product development.* The findings indicate that product experience and formulation design could impact adherence. Understanding and incorporating these factors early in the development cycle are important to understanding the impact they may have on patient adherence levels going forward. Accordingly, leading pharmaceutical

companies have begun incorporating product-experience factors to inform decisions earlier in the development cycle, leading to different formulations and companion patient apps used as early as clinical trials.

- *Patient program design and management.* By understanding the specific drivers of nonadherence for a patient, companies can seek to mitigate pain points through targeted programs. For example, one pharmaceutical company discovered that patients with certain preexisting gastrointestinal conditions were 20 percent more likely than others to drop off the company's therapy in the first three months. A known potential side effect of the formulation was mild gastrointestinal issues. To try to improve adherence, the company provided more targeted education about how to manage these side effects. In another case, looking to weight-loss programs for inspiration, studies have shown that involving

family and friends in the effort can increase adherence rates by 21 percentage points.[13]

- *Physician targeting and engagement strategy.* While many adherence programs concentrate on patients, attention should be given to healthcare providers "at risk" of having nonadherent patients, who can benefit from tailored adherence messages and support programs. One leading pharmaceutical company—whose medication is administered by physicians—identified physicians who had low average patient adherence and provided them with additional training, leading to an increase of more than 10 percent in the number of adherent patients seen by those physicians in just six months.

- *Data management and integration.* To truly understand the drivers of nonadherence, it is important to take a multidimensional view. This starts with constructing a patient-level data cube with metrics spanning the four dimensions of adherence drivers. Multiple data vendors enable such data integration, and internal data (for example, patient-program data, and customer-relationship-management data) can also be tapped for additional insights.

Identifying and addressing the barriers to adherence using a 360-degree approach

Pinpointing the factors across the four dimensions of nonadherence is necessary to effectively address patient adherence. By analyzing integrated data, pharmaceutical and healthcare companies can group patients into microsegments based on the different factors identified and design tailored interventions to support them. With this method, leading pharmaceutical companies have improved adherence levels by 10 to 15 percent for targeted segments. Employing this approach can help patients along the path to better adherence, saving hundreds of thousands of lives a year worldwide. ◼

1 Hayden B. Bosworth et al., "Medication adherence: A call for action," *American Heart Journal*, 2011, Volume 162, Issue 3, pp. 412–24, ncbi.nlm.nih.gov.

2 Estimate on lives saved is from *Accelerating progress in promoting prescription medicine adherence: The adherence action agenda*, National Council on Patient Information and Education, October 2013, bemedwise.org; and expenditures saved is from *Thinking outside the pillbox: A system-wide approach to improving patient medication adherence for chronic disease*, New England Healthcare Institute (NEHI), August 2009, nehi.net.

3 Aurel O. Iuga and Maura J. McGuire, "Adherence and health care costs," *Risk Management and Healthcare Policy*, 2014, Volume 7, pp. 35–44, ncbi.nlm.nih.gov.

4 Top branded medications in disease areas determined based on 2016 product net revenues. In certain disease categories (for example, psoriasis), fewer than ten products were included in the study due to data availability or comprehensiveness.

5 Crossix Solutions is a US company that connects health and non-health data on consumers and healthcare professionals. The company's SafeMine™ technology integrates longitudinal patient data across traditional pharmaceutical measures such as product usage; healthcare treatment path, using claims, electronic medical records, and lab results; and socio-demographic and consumer data showing patient attitudes, media usage, behaviors, and consumption patterns. The effort fully complies with the US Health Insurance Portability and Accountability Act (HIPAA) privacy standards.

6 For one example, see M. Robin DiMatteo, Kelly B. Haskard, and Summer L. Williams, "Health beliefs, disease severity, and patient adherence: A meta-analysis," *Medical Care*, 2007, Volume 45, Issue 6, pp. 521–8, journals.lww.com.

7 For details of McKinsey's 360-degree approach to understanding patient adherence, see Brian Fox, Jason Hichborn, Sari Kaganoff, and Nisha Subramanian, "A 360-degree approach to patient adherence," August 2017, McKinsey.com.

8 Psoriasis presents in many forms, with the most common being plaque psoriasis, which causes cells to build up quickly on the skin's surface and leads to raised patches of skin that develop silver scales. Psoriasis causes itchiness and irritation, may be painful, and can detract from patients' quality of life, for instance impacting their social lives. There is no cure for psoriasis, but treatment can ease symptoms.

9 Note, this analysis did not omit patients who may have stopped therapy for appropriate reasons such as side effects or tolerability issues.

10 A product's efficacy was measured based on a 90 percent reduction in psoriasis area and severity index, an industry standard known as PASI-90. High efficacy was defined as a PASI-90 greater than 50; medium efficacy, between 20 and 50; and low efficacy, below 20.

11 Includes only physicians with two or more patients in the analysis cohort.

12 Common comorbidities to psoriasis include psoriatic arthritis, depression, and cardiovascular diseases.

[13] Robert W. Jeffery and Rena R. Wing, "Benefits of recruiting participants with friends and increasing social support for weight loss and maintenance," *Journal of Consulting and Clinical Psycholog*y, 1999, Volume 67, Issue 1, pp. 32–8, experts.umn.edu.

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