

# Noncompliance With Medication Therapy: An Analysis of Nationally Representative Data

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Poor adherence to treatment is a critical factor underlying treatment failure in dermatology. Nonadherence on a national scale is not well characterized. The purpose of this study was to examine nationally representative data on the factors associated with poor adherence and evaluate the rate of poor adherence reported by dermatology patients in comparison to that reported in other physician specialties. Data from the National Ambulatory Medical Care Survey (NAMCS) were analyzed from 1999 to 2007 for which "noncompliance with medication therapy" was noted as a reason for visit. Our focus included associated patient demographics, medications, and diagnoses, as well as the rates of reported noncompliance among dermatologist and other physician encounters. Reported noncompliance rates were low (0.04% of overall visits to the doctor). There was a small but significant increase ( $P = .02$ ) in the proportion of noncompliance-related visits over time. The rate of noncompliance reported at dermatology visits was lowest among all specialties. A major limitation of this study is that it captures patient-reported noncompliance and not actual noncompliance. Poor adherence to medication regimens is a problem common to all medical fields. Although noncompliance is a cause of treatment failure in dermatology, patients are unlikely to report noncompliance to dermatologists.

Compliance with a medication regimen generally is defined as the extent to which patients take medications as prescribed by their healthcare providers.<sup>1</sup> The term *adherence* has been preferred in recent

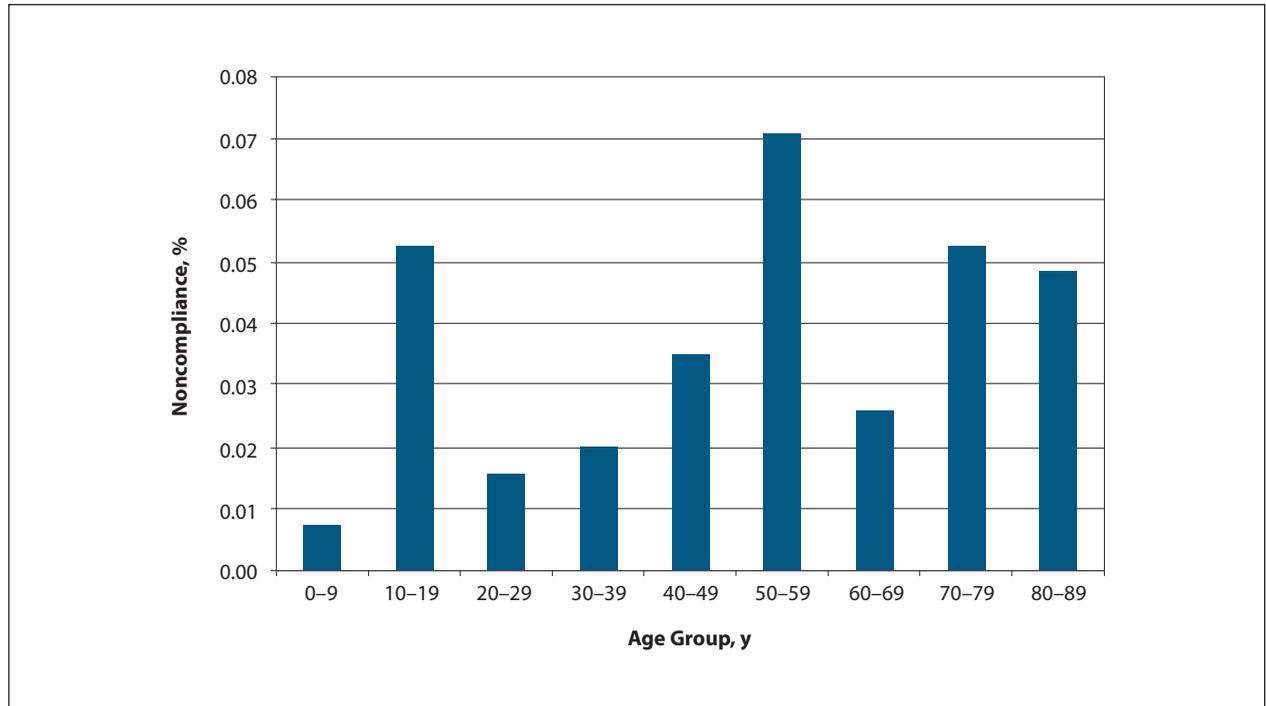
literature because of the linguistic implication of an active role for patients in their treatment.<sup>2</sup> Medication nonadherence in chronic conditions is a leading public health problem in the United States, contributing up to \$300 billion to healthcare costs.<sup>3</sup> Rates of nonadherence to treatment range from 20% to 40% for acute illnesses and 30% to 60% for chronic conditions.<sup>4</sup> In dermatology, the adherence rate is thought to be even lower, partially because of poor adherence to topical therapies in comparison with that to oral agents.<sup>5</sup>

The relationship between poor adherence and poor outcomes with respect to dermatologic treatment has been well documented in clinical trials.<sup>6</sup> Nonadherence in clinic populations is not well characterized. The purpose of this study was to examine the factors associated

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**Figure 1.** Age distribution of noncompliance-related visits 1999 to 2007. Percent noncompliance calculated by dividing the frequency of noncompliance-related visits by total number of visits for a given age group.

with noncompliance in a nationally representative sample of US outpatient practices.

## METHODS

The National Ambulatory Medical Care Survey (NAMCS) compiles data from non-federally employed physicians regarding outpatient visits in the United States. The NAMCS uses a multistage probability sample design to produce representative national estimates from outpatient clinic information.<sup>7-9</sup> During a randomly assigned 1-week reporting period, 3000 physicians are selected to provide data for a randomized sample of approximately 30 visits. The physician records information regarding the reason for the visit, diagnoses, services provided, medications prescribed, referral practices, and demographic characteristics.

The NAMCS Patient Record allots space for up to 3 complaints, symptoms, or other reasons for the visit in the patient's own words. Information collected in this survey item is coded according to a Reason for Visit Classification for Ambulatory Care. Our data sample comprised NAMCS patient encounters from 1999 to 2007 for which "noncompliance with medication therapy" was noted as a reason for visit. The data were analyzed to identify factors associated with patient reports of noncompliance, including patient demographics, medication mentions, and physicians' diagnoses. Up to 3 diagnoses may be listed per visit. A medication mention in the NAMCS is defined

as medication currently taken by the patient, dispensed in the office, or prescribed by the physician at the visit.

The data also were analyzed to determine the rates of reported noncompliance among various specialties of physicians. The rates of noncompliance reports were calculated by dividing the frequency of noncompliance-related visits by the total number of NAMCS visits recorded for a given specialty. Linear regression accounting for the variability in the survey methodology was calculated using SAS software.

## RESULTS

Among NAMCS records from 1999 to 2007, there were an estimated 2.9 million reports of noncompliance as a reason for visit. The most common age group seen for noncompliance was 50 to 59 years, although the age distribution was bimodal, with an additional peak at 10 to 19 years (Figure 1). Reports of noncompliance were more common among African Americans than among white and Asian patients (relative risk, 1.23, 0.99, and 0.67, respectively). Smokers were less likely to report medication noncompliance as a reason for visit (relative risk, 1.31). The most frequent diagnoses associated with noncompliance were hypertension, hyperlipidemia, diabetes, and obesity (Table 1). Medications most commonly mentioned in these visits included aspirin, lipid-lowering drugs, and antihypertensive and hypoglycemic agents (Table 2). Analysis also revealed a small but significant

TABLE 1

### Most Frequent Diagnoses Associated With Noncompliance Visits, 1999-2007

Diagnosis	NAMCS Frequency <sup>a</sup>	Noncompliance Visits, % <sup>a</sup>	Diagnosis With Reported Noncompliance, % <sup>b</sup>
Essential hypertension	852,002	29.2	0.13
Hyperlipidemias	490,918	16.8	0.16
Diabetes mellitus	459,342	15.7	0.14
Obesity	270,429	9.3	0.32
Attention deficit disorder of child with hyperactivity	267,929	9.2	0.56
Aortic valve disorders	153,617	5.3	1.42
Hypothyroidism	140,039	4.8	0.16
Sleep apnea	107,771	3.7	0.48
Major depressive disorder	105,677	3.6	0.30
Chronic rhinitis	96,915	3.3	0.29

Abbreviation: NAMCS, National Ambulatory Medical Care Survey.

<sup>a</sup>Percent noncompliance visits calculated by dividing the frequency of the given diagnosis in noncompliance-related visits by the total number of visits from 1999 to 2007.

<sup>b</sup>Percent reported noncompliance for each diagnosis calculated by dividing the frequency of the given diagnosis in noncompliance-related visits by the total frequency of the diagnosis from 1999 to 2007.

( $P < .02$ ) increase in the proportion of noncompliance-related visits over time (Figure 2).

Noncompliance was most commonly reported at visits to psychiatrists, allergists, and cardiovascular specialists (Figure 3). Dermatology had the lowest rate of reported noncompliance among specialties included in

the NAMCS. In comparison to rates in dermatology, the rate of noncompliance reported per total office visits was 37.5 times higher in both psychiatry and allergy, and 12.1 times higher in internal medicine (Table 3).

Using linear regression models, there is a statistically significant ( $P < .001$ ) association between the number

TABLE 2

### Top 10 Medications Mentioned With Noncompliance Visits, 1999-2007

Medication	NAMCS Frequency	Noncompliance Visits, % <sup>a</sup>
Aspirin	355,682	12.2
Lipitor	239,348	8.2
Glucophage	166,976	5.7
Zocor	145,741	5.0
Metoprolol	141,754	4.9
Synthroid	140,441	4.8
Actos	132,228	4.5
Hydrochlorothiazide	128,490	4.4
Allegra-D	118,944	4.1
Advair Diskus	116,334	4.0

Abbreviation: NAMCS, National Ambulatory Medical Care Survey.

<sup>a</sup>Percent noncompliance visits calculated by dividing absolute frequency of the given medication mention in noncompliance-related visits by total number of noncompliance-related visits.

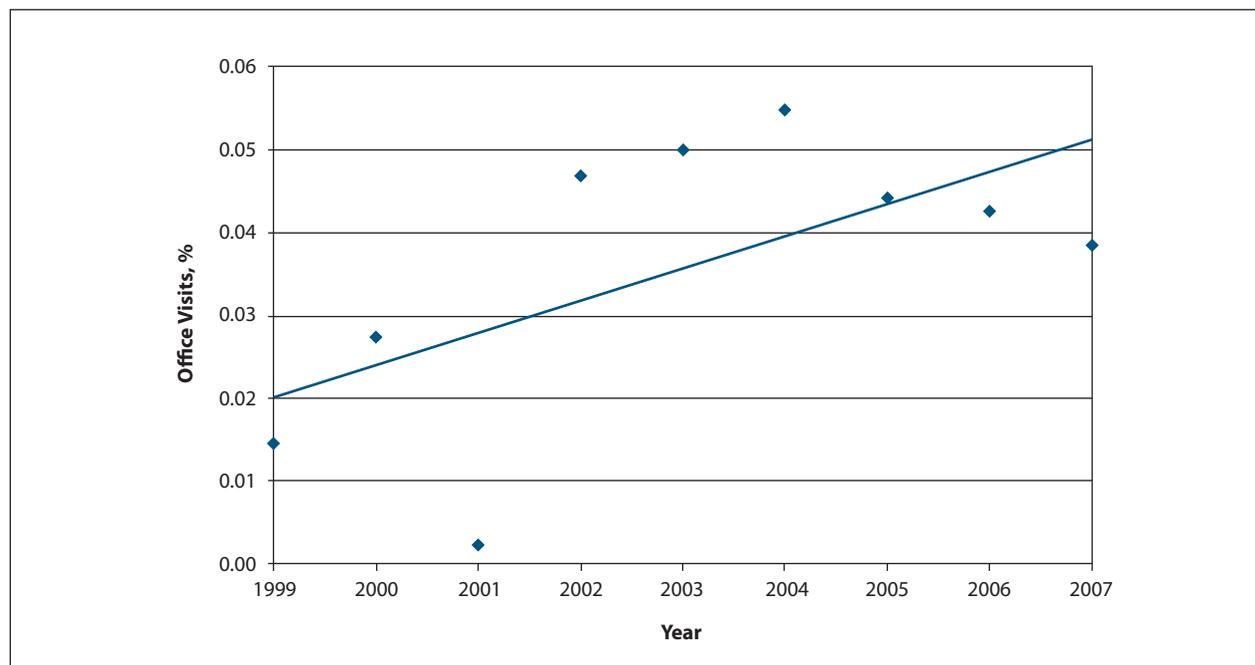
of diagnoses listed for a patient and the percent of visits with noncompliance as a reason for visit (Figure 4). There also was an association between the percent of visits related to noncompliance and the number of medications listed ( $P = .05$ ).

#### COMMENT

Pharmaceutical development is based on the implicit assumption that new treatments are needed to improve treatment outcomes. However, the effectiveness of many treatments has not yet been optimized. A critical therapeutic obstacle is getting patients to use existing treatments better. Identifying predictors of nonadherence may help identify which patients are at highest risk for nonadherence and, ultimately, what can be done to ameliorate this costly problem.

Our results suggest that nonadherence may be more common among teenaged and middle-aged patients, a finding consistent with previously published demographic studies.<sup>10</sup> Higher rates of patient-reported noncompliance were seen in African Americans in our study. Interestingly, visits for noncompliance in our study were negatively associated with smoker status, a finding that apparently contradicts epidemiologic studies showing smoking to be a risk factor for poor adherence.<sup>11,12</sup> This discrepancy may be explained by the probability of a lower likelihood that smokers admit noncompliance to their physician.

The most common diagnoses associated with noncompliance-related visits included components of metabolic syndrome as well as obesity-related chronic conditions such as sleep apnea and congestive heart failure. The association of noncompliance with these



**Figure 2.** Percentage of noncompliance-related visits over time. Percent noncompliance calculated by dividing the frequency of noncompliance-related visits by total National Ambulatory Medical Care Survey visits for a given year. Linear regression shows overall trend and demonstrates increase in noncompliance-related visits over time ( $P=.02$ ).

entities is not surprising given the established correlation of noncompliance with chronicity of disease, as well as the finding that noncompliance with diet and exercise recommendations and poor adherence to medication therapy often go hand in hand.<sup>1</sup> The most common medications noted in these visits similarly reflected the treatment of these and other chronic conditions. Five of the top 20 associated diagnoses were psychiatric, including attention deficit disorder, depression, anxiety, and dysthymia. These results are consistent with the findings of a study by Renzi et al<sup>13</sup> in which psychiatric comorbidity was the strongest predictor of poor adherence among dermatologic patients.

The proportion of visits related to noncompliance showed a rising trend from 1999 to 2007. This finding may reflect a true increase in noncompliance rates over the past decade. Alternatively, this trend may suggest increasing willingness of patients to disclose noncompliance and/or a growing recognition and reporting of noncompliance by physicians. Additional studies are needed to further characterize this trend.

A striking finding in our study was that the rate of noncompliance reported in dermatology visits was lowest among all surveyed specialties. Given the overwhelming evidence for poor adherence among dermatologic patients, the low rate of reported noncompliance in dermatology relative to that in other specialties may reflect a problem

with physician-patient communication rather than actual adherence rates. Patients substantially underreport non-adherence behavior to their dermatologists.<sup>14</sup> In a study of psoriasis treatment, patients reported 90% to 100% compliance, whereas surreptitious electronic monitors revealed only 55% compliance.<sup>6</sup> In a study of atopic dermatitis, the electronically monitored adherence rate was estimated at 32%.<sup>14</sup> In a dermatologic visit, establishing a diagnosis and deciding on treatment are often prioritized, which leaves limited time for treatment support, education, and building a therapeutic relationship that fosters openness of communication. In borrowing from the behavioral-medicine discipline of psychiatry, asking questions in a supportive, nonjudgmental, and unassuming manner may help improve patients' candor.

It is important to note that our data sample of non-compliance as a reason for visit is not a direct, objective measure of noncompliance. The true rate of noncompliance would be expected to be substantially higher, as most patients who do not take their medications as prescribed do not report this as a reason for visit. Although this limits the conclusions that we can draw with respect to actual rates of noncompliance, these data provide for a unique assessment of compliance reporting in that the patients are voluntarily admitting noncompliance to their healthcare provider. Such reporting presumably involves patients' insight into the effect of noncompliance on

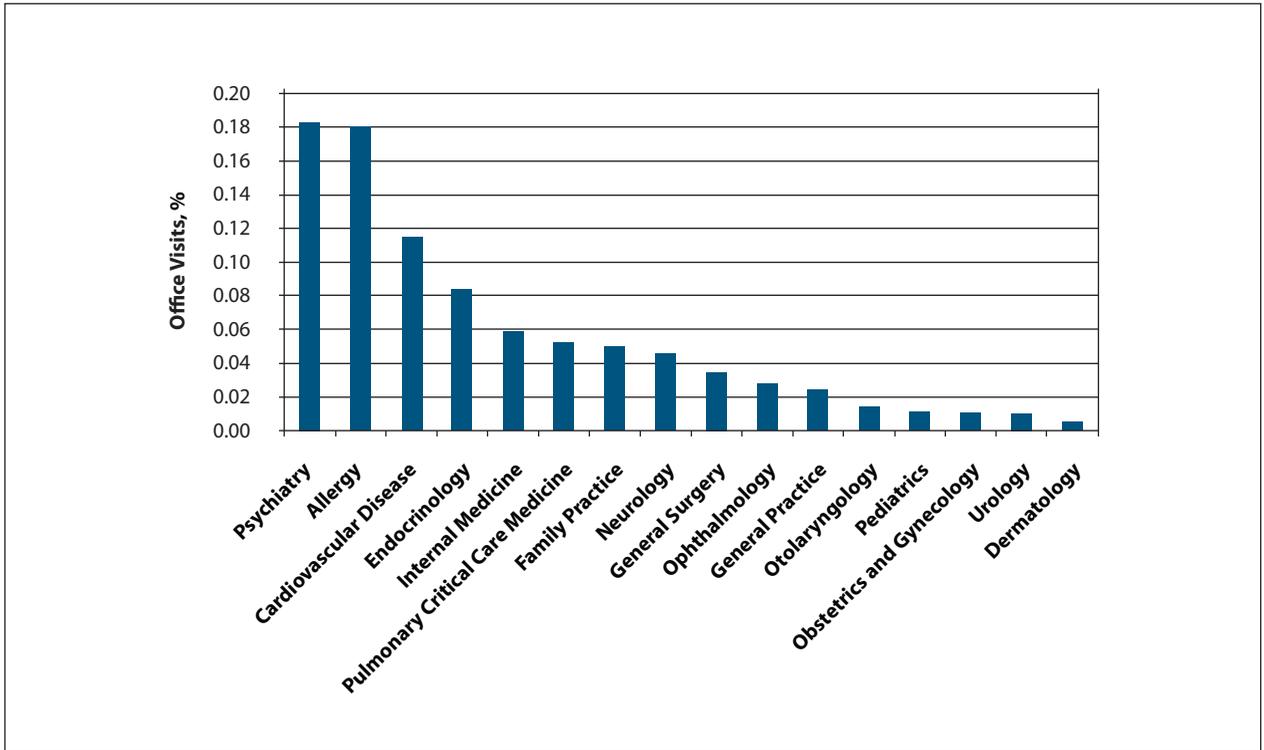
TABLE 3

## Noncompliance Rates Among Physician Specialties

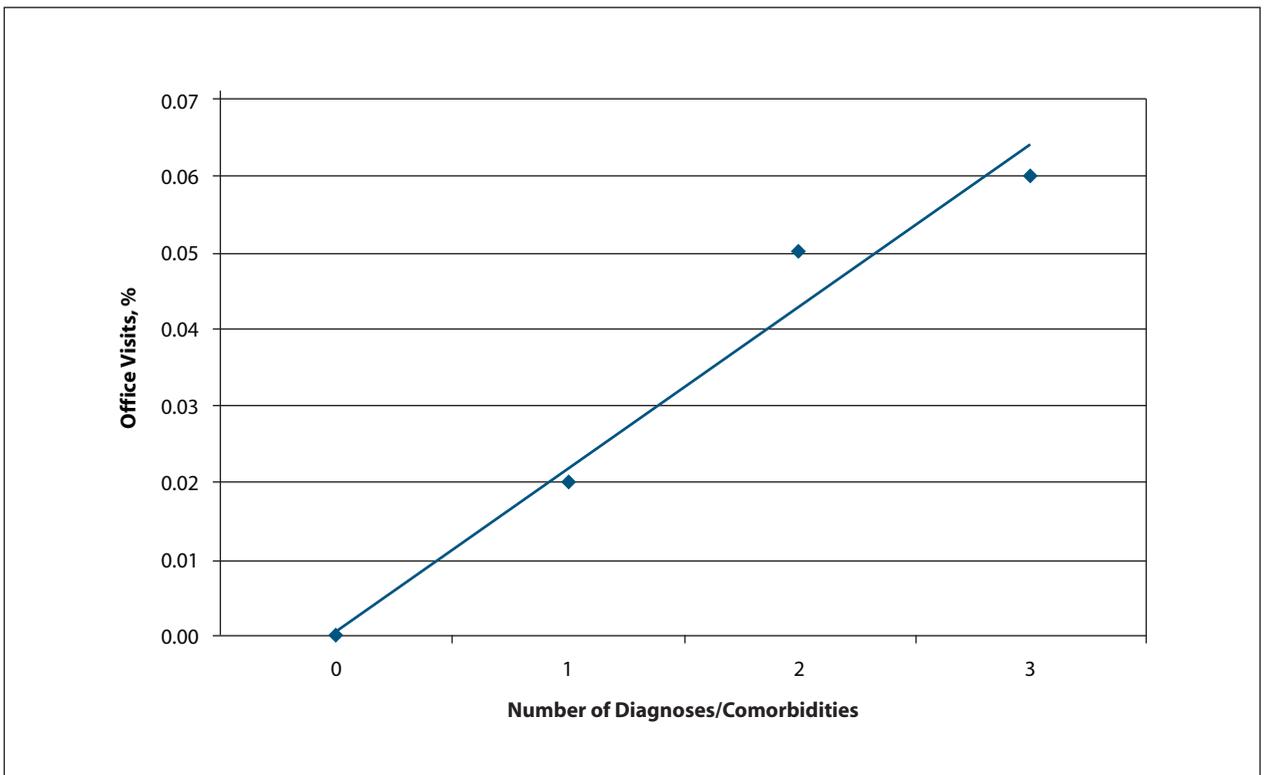
Specialty	Noncompliance Frequency	Total Visits	Noncompliance Rate, % <sup>a</sup>	Relative Rate, % <sup>b</sup>
Psychiatry	438,579	240,184,457	0.183	37.5
Allergy	85,059	47,165,570	0.180	37.0
Cardiovascular diseases	251,661	219,680,000	0.115	23.5
Endocrinology	31,791	38,051,143	0.084	17.1
Internal medicine	751,088	1,274,600,000	0.059	12.1
Pulmonary critical care medicine	10,445	19,970,583	0.052	10.7
Family practice	852,083	1,713,209,988	0.050	10.2
Neurology	48,413	106,227,304	0.046	9.4
General surgery	59,084	171,220,000	0.035	7.1
Ophthalmology	130,392	466,140,000	0.028	5.7
General practice	37,137	155,370,000	0.024	4.9
Otolaryngology	22,823	166,460,000	0.014	2.8
Pediatrics	105,749	950,190,000	0.011	2.3
Obstetrics and gynecology	62,777	596,493,930	0.011	2.2
Urology	15,980	159,440,000	0.010	2.1
Dermatology	14,748	302,680,000	0.005	1.0

<sup>a</sup>Noncompliance rate calculated by dividing absolute frequency of noncompliance-related visits by total number of visits seen by the given specialty.

<sup>b</sup>Relative rate calculated by dividing noncompliance rate of each specialty by the dermatology noncompliance rate.



**Figure 3.** Distribution of noncompliance rates by specialty. Noncompliance rate calculated by dividing frequency of noncompliance-related visits of the specialty by total number of visits seen by the given specialty.



**Figure 4.** Linear regression of the percent of noncompliance-related visits. Reported noncompliance with medications increases with the number of comorbidities listed in the National Ambulatory Medical Care Survey ( $P < .001$ ).

their health and, hence, the reason for visit, as well as a comfort level and openness with their physician. An additional limitation of our study is that the relatively small sample size limits subset analysis. As a result, factors associated with noncompliance-related visits specific to dermatology cannot be further characterized.

In summary, poor adherence to medication regimens is a problem common to all medical fields. Although noncompliance is a critical factor underlying treatment failure in dermatology, patients are less likely to report noncompliance as a reason for visit to dermatologists than they would as a reason for visit to other specialists.<sup>14</sup> This discrepancy may indicate the potential for improving recognition of adherence issues in dermatologist-patient communication. When encountering treatment failure, physicians may assess the potential for poor adherence by nonjudgmental confrontation. Adherence can be boosted by emphasizing the value of the treatment, simplifying the treatment regimen, and encouraging the patient to openly discuss factors contributing to poor compliance. In addition to promoting forthrightness, a collaborative approach to treatment has proven to augment measured adherence rates.<sup>1</sup> Arriving at an accurate diagnosis and choosing the appropriate treatment are only part of the process of being an effective physician. Establishing a therapeutic relationship with the patient that reinforces good adherence can help ensure positive treatment outcomes.

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