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Patient-reported reasons for the discontinuation of commonly used treatments for moderate-to-severe psoriasis

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Abstract

Background—Despite widespread dissatisfaction and low treatment persistence in moderate-to-severe psoriasis, patients' reasons behind treatment discontinuation remain poorly understood.

Objectives—To characterize patient-reported reasons for discontinuing commonly used treatments for moderate-to-severe psoriasis in real-world clinical practice.

Methods—1,095 patients with moderate-to-severe plaque psoriasis from ten dermatology practices who received systemic treatments completed a structured interview. Eleven reasons for treatment discontinuation were assessed for all past treatments.

Results—A total of 2,231 past treatments were reported. Median treatment duration varied by treatment, ranging from 6.0 to 20.5 months ($p < 0.001$). The frequency of each cited discontinuation reasons differed by treatment (all $p < 0.01$). Patients who received etanercept (OR 5.19; 95% CI, 3.23–8.33) and adalimumab (2.10; 1.20–3.67) were more likely to cite a loss of efficacy than those who received methotrexate. Patients who received etanercept (0.34; 0.23–0.49), adalimumab (0.48; 0.30–0.75), and UVB phototherapy (0.21; 0.14–0.31) were less likely to cite side effects than those who received methotrexate, while those who received acitretin (1.56; 1.08–2.25) were more likely to do so. Patients who underwent UVB phototherapy were more likely to cite an inability to afford treatment (7.03; 3.14–15.72).

Limitations—The study is limited by its reliance on patient recall.

Conclusions—Different patterns of treatment discontinuation reasons are important to consider when developing public policy and evidence-based treatment approaches to improve successful long-term psoriasis control.

Keywords

Psoriasis; Treatment discontinuation; Systemic treatments; Biologics; Phototherapy; Effectiveness; Safety; Inconvenience; Cost

Classifications

Psoriasis; Psoriasis therapy; Pharmacoepidemiology; Health services research; Biologics (Rx); Phototherapy; Methotrexate

Introduction

Psoriasis is a chronic inflammatory disorder of the skin and joints associated with significant impairments in physical health and psychosocial well-being.[1] Patients with moderate-to-severe psoriasis suffer from excess mortality risk, largely attributable to cardiovascular disease, independent of traditional risk factors.[2–11] Despite the availability of treatment options with established safety and efficacy profiles for moderate-to-severe psoriasis, studies have reported widespread treatment dissatisfaction, underutilization of systemic treatments, and poor adherence to treatment recommendations.[12–18]

Since psoriasis is a lifelong disease for which most patients do not achieve prolonged clinical remission and require maintenance therapies, it is crucial for patients to continue with their prescribed treatments in order to achieve long-term treatment success.[19–21] Nevertheless, studies have demonstrated annual treatment discontinuation rates of 15–25% among traditional systemic therapies and phototherapy.[18] Studies on biologics also showed a progressive loss of treatment persistence, with first-year attrition rate of 10–15%.[19, 20] As a composite surrogate marker of treatment efficacy, safety, tolerability, and overall

satisfaction, treatment persistence in moderate-to-severe psoriasis is low and may contribute to suboptimal treatment response and increased healthcare utilization.[17–20]

While treatment persistence has just started to be quantified, there is a paucity of research identifying why patients stop their psoriasis treatments.[22] Available data on treatment discontinuation are mostly derived from short-term clinical trials or chart reviews that emphasize efficacy and safety parameters.[20] Other patient-oriented factors that may affect long-term treatment persistence in clinical practice, e.g., treatment satisfaction, treatment process burden, cost, and other systemic barriers, remain poorly understood.

Consequently, efforts to promote treatment persistence lack an adequate evidence base for targeting specific patient needs and providing patients with better accepted treatment regimens.[23] The importance of incorporating patient perspectives in balancing clinical outcomes against treatment process burdens is now increasingly recognized.[24, 25] Therefore, improving our understanding of the patients' views on treatment discontinuation is essential to integrate patient needs more fully in shared decision-making and to optimize effective, patient-centered care with the goal of successful long-term psoriasis control.

The purpose of this study was to assess and compare patient-reported reasons behind discontinuing systemic treatments, biologics, and phototherapy for moderate-to-severe psoriasis in routine clinical practice.

Methods

Study Design

As part of a multi-center comparative effectiveness study,[26] we conducted a cross-sectional study to determine the reasons for the discontinuation of systemic treatments, biologics, and phototherapy for moderate-to-severe psoriasis. The study was approved by the University of Pennsylvania and University of Utah Institutional Review Boards and conducted in accordance with the Declaration of Helsinki. Informed consent was obtained from all patients.

Setting

Data were collected by ten dermatologists and two physician assistants who are members of the Dermatology Clinical Effectiveness Research Network (DCERN) from February 2010 through June 2011. DCERN includes two academic medical centers (University of Pennsylvania and University of Utah, each with a hospital-based site and a separate community-based site) and six private practices in Georgia, Pennsylvania, New York, and Colorado (see www.dermcern.org for details). Patient data were collected prospectively at a single, regularly scheduled clinic appointment.

Participants

Broad inclusion criteria were used in enrolling consecutive patients seen by their dermatology provider in DCERN practices for a routine follow-up appointment to minimize selection bias. Eligible participants included patients established in the practice who currently receive or previously received a systemic treatment, biologic agent, or phototherapy for treating psoriasis, or were candidates for systemic therapy with a documented history of ≥5% body surface area involvement.[27] Patients new to the practice became eligible only at their subsequent regularly scheduled visit; in other words, all enrolled patients had at least one prior visit at that practice to qualify for study entry. Patients were excluded if they did not meet these criteria or were unable or unwilling to provide consent. Enrolled patients were compensated $10 upon study completion. In the

analysis presented herein, we included patients who had previously used and discontinued at least one treatment of interest for a primary indication of plaque psoriasis, which encompassed commonly used systemic treatments (methotrexate, acitretin, and cyclosporine), biologics (etanercept, adalimumab, and infliximab), and phototherapy (ultraviolet B (UVB) and oral psoralen plus ultraviolet A (PUVA)). To be considered as a past treatment, the duration since last treatment use must be ≥9 weeks for infliximab and ≥3 weeks for all other treatments. We did not analyze data on treatments for which few patients had reported discontinuation (e.g., only 12 patients discontinued ustekinumab within our study). Patients who did not report any past use of a treatment of interest for psoriasis or whose primary indication was a variant of psoriasis other than plaque psoriasis were excluded.

The study was descriptive in nature; therefore, the sample size for specific analyses was not determined *a priori*. We aimed to collect data for about 2,000 patients in the main comparative effectiveness study to yield precise estimates, with the half-width of the 95% confidence interval around rates for dichotomous variables being approximately 0.02.

Questionnaire and Variables

Trained study coordinators gathered data through structured patient interviews with confirmation by the patient's dermatology clinic record and assessments by the clinicians. Detailed data were collected on socio-demographic factors, medical history, body mass index, alcohol and tobacco use history, and psoriasis characteristics. All current and past use of systemic treatments, biologics, and phototherapy were specifically assessed. Eleven treatment discontinuation reasons were devised *a priori* by the principal investigator, with review by DCERN co-investigators and steering committee and the Outcomes Measurements Methods Core at University of Pennsylvania to ensure face and content validity. For each treatment, patients could select one or more of these eleven reasons for discontinuation and/or provide other reasons. Elaborations of the *a priori* reasons and other elicited reasons were recorded as free text.

Data Analysis

Descriptive statistics were used to summarize patient demographics and clinical characteristics. Reasons for treatment discontinuation were analyzed by treatment using χ^2 and Fisher's exact tests, as appropriate. Statistical significance is defined as $p < 0.05$ in two-tailed tests. Open-ended responses for other treatment discontinuation reasons were independently categorized by two authors (H.Y., J.W.) into *a priori* codes from the eleven predetermined reasons and other reasons. Substantial inter-rater agreement was observed ($\kappa = 0.79$)[28] and discordances were resolved through independent coding by a third rater (J.M.G.). All *a priori* reasons for treatment discontinuation were pooled for analysis, while other elicited reasons were presented separately.

Mixed-effects logistic regression models were fitted to compare specific discontinuation reasons (lack of efficacy, loss of efficacy, any side effect, and cannot afford treatment) among treatments.[29] Since each patient may contribute data on multiple past treatments, the models adjusted for response clustering at the patient level as random effects as well as socio-demographic and disease-related confounders as fixed effects. Methotrexate was chosen as reference as it is often considered the standard to which other therapies are compared. Covariates were selected using a backward elimination approach and significance was assessed with likelihood-ratio tests. Sensitivity analyses were conducted by further adjusting for all other discontinuation reasons due to potential competing risks among reasons and by excluding treatments with duration less than 6 months. All statistical analyses were performed using Stata 12.1 (College Station, TX).

Results

Sample Characteristics

Data were collected on 1,755 eligible patients (5% of patients declined to participate). Among the 1,158 patients who reported any previous treatment for chronic plaque psoriasis, 1,095 patients reporting at least one previous biologic, systemic, or phototherapy were included in the analysis. Patient demographics and clinical characteristics are shown in Table I. Based on self-reported categories on the extent of psoriasis involvement at its worst, 29.5% of patients reported 3–10% body surface area involvement, while 60.5% of the patients reported >10% body surface area involvement.

Patterns of Past Treatments

A total of 2,231 past treatments of interest were reported (Table II). Patients reported a median of 2 past treatments (interquartile range, 1–3). Treatment duration varied widely by treatment ($p < 0.001$), ranging from 20.5 months with etanercept to 6 months with acitretin, cyclosporine, UVB and PUVA. Time of last treatment use also differed significantly by treatment, with median ranging from 1–2 years ago for biologics, 3–4 years ago for systemic treatments and UVB, to >4 years ago for PUVA ($p < 0.001$).

Reasons for Treatment Discontinuation

While most past treatments (70.8%) had only one discontinuation reason indicated, 22.6% had two reasons and 6.5% had three or more reasons. The frequency of citing each of eleven discontinuation reasons differed significantly by treatment (Table III). The most common reason for stopping etanercept was that it “worked well at first but stopped working well”; for adalimumab was that it “did not work well enough”; for infliximab, methotrexate, acitretin, and cyclosporine was non-life threatening side effects; for UVB was treatment inconvenience and “psoriasis improved and prefer not to be on continuous treatment”; and for PUVA was treatment inconvenience.

Of note, non-life threatening side effects were often reported in patients stopping systemic therapies, infliximab and PUVA (21.0–36.3%). This contrasts with life threatening side effects, seen predominantly with infliximab (9.1%). Treatment inconvenience was noted by 22.3–31.5% of patients treated with UVB and PUVA phototherapy, as opposed to no more than 4% among those treated with systemic therapies and biologics. Denied insurance coverage was cited most often in stopping biologics and PUVA (4.7–7.5%); *post hoc* analyses did not reveal significant difference in the proportions citing insurance denial among the three biologics ($p = 0.55$).

Four specific reasons were analyzed in fully adjusted regression models (Table IV). Despite indications that the random effects may not be normally distributed, the models have high discriminative abilities with area under the receiver-operating characteristic curve ranging from 0.80 to 0.98. Compared to patients who received methotrexate, those who received adalimumab were more likely to cite that the treatment “did not work well enough”, while those who received etanercept, adalimumab, and infliximab were more likely to cite that the treatment “work welled at first but stopped working well.” Patients who received etanercept, adalimumab, and UVB phototherapy were less likely to stop treatment due to side effects than those who received methotrexate; in contrast, patients who received acitretin were more likely to stop treatment due to side effects. Patients who underwent UVB phototherapy were more likely to report an inability to afford treatment in its discontinuation than those who received methotrexate.

These results were largely robust to sensitivity analyses. After adjusting the models for all other reasons, point estimates of the associations between treatments and specific discontinuation reasons remained largely similar, except the odds ratios between acitretin and treatment "did not work well enough" and inability to afford treatment reached significance (data not shown). After excluding treatments that were received for less than 6 months, point estimates of the associations also remained similar.

Other Reasons

Various other discontinuation reasons were reported (data not shown). The most commonly reported other reason was due to switching treatments with no particular reported reason for the switch. Personal issues – e.g. job, moving, or travel-related issues – and patient preference – e.g. desire to try new treatment or to substitute with natural sunlight in summer months – were noted frequently in stopping UVB and PUVA phototherapy. Pregnancy and desires to become pregnant were implicated in discontinuing methotrexate, cyclosporine, etanercept, and PUVA. The need for vaccination and surgical procedures was cited with stopping biologics, although we could not discern if the discontinuation was temporary or permanent. Issues with treatment monitoring, particularly regarding liver biopsy, were cited with methotrexate.

Discussion

This study comprehensively characterized patient-reported reasons for discontinuing commonly used treatments for moderate-to-severe psoriasis in clinical practice. We demonstrated different patterns of reasons among systemic, biologic, and phototherapy treatments. Perceived treatment inefficacy and side effects were the predominant issues leading to treatment withdrawal; however, treatment inconvenience and economic barriers were also commonly cited, emphasizing the value of patient-oriented factors in long-term psoriasis treatment.

The paradigm for psoriasis treatment has evolved with the introduction of biologic agents, inspiring prospects of controlling acute flares and maintaining disease remission using an appropriate long-term treatment.[20, 21] In our study, patients stopped systemic treatments and phototherapy after medians of 6 to 12 months and biologic agents after medians of 12 to 20.5 months. One previous study also showed median treatment durations for psoriasis monotherapies were at most 12 months.[26] These treatment persistence figures are modest for a lifelong disease and highlight an unmet need for effective, well-tolerated, accessible, and acceptable treatments for long-term use.

The substantial proportion of patients citing treatment inefficacy and side effects in discontinuation underscored the importance of achieving good clinical outcomes. More patients treated with etanercept and adalimumab reported discontinuation due to a loss of treatment efficacy than those treated with methotrexate. There is evidence for the loss of efficacy in some patients receiving etanercept, adalimumab and infliximab.[30–32] Our findings are consistent with a registry study noting the loss of efficacy as the predominant reason for discontinuing these three tumor necrosis factor inhibitors.[20] Our results are robust to the sensitivity analysis excluding treatments received for less than 6 months, suggesting that the loss of treatment efficacy was independent from short-term dosing changes; however, we did not obtain treatment dosing data to exclude the possibility of premature discontinuation due to suboptimal regimens.

More patients treated with adalimumab reported discontinuation because the treatment "did not work well enough" than those treated with methotrexate. This result sharply conflicts with the established superior efficacy of adalimumab over methotrexate.[26, 33] Channeling

bias, which occurs when different drugs are prescribed according to different baseline prognoses, may explain part of this difference. For instance, since adalimumab was the newest therapy for moderate-to-severe plaque psoriasis among those studied (approved by the Food and Drug Administration in 2008), it might have been prescribed preferentially to patients failing older treatments, including previous biologics, thus allowing for a greater degree of lack of efficacy. Competing risks (e.g., patients are more likely to stop methotrexate from side effects) may also introduce error in comparing drug discontinuation reasons. Given these limitations and the poor correlation between objective disease improvement and patients' perception of treatment effectiveness, this finding should be cautiously interpreted.[34]

Side effects are important limiting factors for treatment persistence, particularly for conventional systemic therapies with long-term cumulative toxicity. Fewer patients treated with adalimumab and etanercept cited side effects as the reason for discontinuation compared to those treated with methotrexate. These results are consistent with a meta-analysis showing higher rates of treatment withdrawal from adverse events due to methotrexate than adalimumab, etanercept, and infliximab.[35] The high percentage of infliximab discontinuation due to serious side effects also reflected the results from a cohort study, whereby infliximab showed a 5.9 times higher incidence of treatment withdrawal due to serious adverse effects than etanercept.[36]

Treatment logistics outweighed efficacy and safety concerns as the main reasons for stopping UVB phototherapy. UVB phototherapy has been shown to be safe, effective, and one of the preferred, first-line treatments for moderate-to-severe psoriasis.[37] Our data similarly showed that side effects were the least likely to be reported by patients treated with UVB phototherapy. Given the frequent office visits required, inconvenience was understandably one of the most cited barriers for continuing phototherapy. Inability to afford UVB phototherapy was also frequently cited. In commercial health insurance plans, patients face higher out-of-pocket costs for multiple phototherapy sessions than for the more costly biologic agents ($3,040 vs. $920 for the first year of treatment, respectively).[38, 39] Indirect costs to the patient from loss of work earnings and travel also contribute to its financial burden. Given the favorable cost-effectiveness of UVB phototherapy, increasing access to phototherapy centers, reducing out-of-pocket costs, expanding home phototherapy, and eliminating other systemic barriers may promote patient use of UVB phototherapy, reduce healthcare expenditure, and improve long-term outcomes.[39, 40]

Our study should be reviewed in the context of its limitations. Its reliance on patient recall could be subject to bias: for instance, median time elapsed since last treatment use was the longest for PUVA and shortest for biologics, which might introduce differential recall among treatments. We adjusted for the time of last treatment use and numerous other confounders in multivariate analyses; nevertheless, residual confounding from unmeasured factors, e.g., the effects of other financial resources (philanthropic organizations) and constraints (Medicare "doughnut hole"), on treatment discontinuation, cannot be excluded as potential sources of error. Medical records at the time of discontinuation were not acquired to corroborate with patient reports of treatment inefficacy or side effects or to analyze the effects of drug dosing. Psychometric properties of the survey instrument should be further established. Despite the multi-centered setting, broad eligibility criteria and high response rate, external validity of the study could be extended by including more patients from various regions across the United States. Given the paucity of patient-oriented comparative effectiveness research, future prospective studies will be necessary to confirm our results and to elaborate on the patients' views on psoriasis treatments.

A broad range of clinically relevant, patient-oriented reasons may explain why patients discontinue treatments. Our data highlighted key areas to target in order to improve long-term treatment use, including: 1) maintenance of long-term effectiveness for biologic agents; 2) improvement in treatment tolerability and safety for systemic treatments; and 3) elimination of logistical and financial barriers for phototherapy. These results may inform the development of public policy and evidence-based strategies to improve treatment satisfaction and to maintain successful long-term psoriasis control.

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Abbreviations

DCERN	Dermatology Clinical Effectiveness Research Network
PUVA	Oral psoralen-ultraviolet A
UVB	Ultraviolet B

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Capsule summary

1. Patients with moderate-to-severe psoriasis have low long-term treatment persistence, but little is known about why they stop treatments.
2. Discontinuation reasons for various treatments highlight the importance of treatment effectiveness, safety, convenience, cost, and other patient-oriented factors in long-term treatment use.
3. These results may inform the development of public policy and evidence-based strategies to improve successful long-term psoriasis control.

Table I

Baseline patient and psoriasis characteristics (N = 1,095).

Characteristic	N (%)
Age, median (IQR), y	49 (37–60)
Female sex	532 (48.6)
Practice setting of dermatologist	
Academic	714 (65.2)
Private	381 (34.8)
Race	
White/Caucasian	935 (85.4)
Black/African American	43 (3.9)
Other[a]	117 (10.7)
Hispanic ethnicity	50 (4.6)
Body mass index (BMI) (kg/m2), median (IQR)	28.7 (25.0–33.3)
Total number of comorbidities[b], median(IQR)	2 (1–4)
Age of psoriasis onset, median (IQR), y	23 (15–36)
Duration of psoriasis, median (IQR), y	20 (10–31)
Psoriatic arthritis diagnosed by a physician	308 (28.1)
Self-reported worst severity of psoriasis, body surface area affected	
1–2 palms	109 (10.0)
3–10 palms	323 (29.5)
11–20 palms	330 (30.1)
> 20 palms	333 (30.4)

Note: Percentages may not total 100% due to rounding errors or missing data, which did not exceed 0.5% for any particular characteristic.

[a] Includes responses of American Indian/Alaskan, Hawaiian/Pacific Islander, Asian, Multiracial, Other, or prefer not to answer.

[b] Including cardiovascular, lung, infection, gastrointestinal, renal, endocrine, musculoskeletal, psychiatric, neurologic, malignant or autoimmune diseases

Table II

Past treatment use pattern (N = 1,095).[a]

Type	Treatment	Patients		Duration	Time of Last Treatment Use (%)[b]				
		N	%	median (IQR), mo	<6 mo	6–12 mo	1–2 y	3–4 y	>4y
Systemic	Methotrexate	446	40.7	12 (5–39.6)	15.7	10.3	22.0	12.8	37.0
	Acitretin	204	18.6	6 (2–12)	12.3	5.9	26.0	14.2	39.7
	Cyclosporine	151	13.8	6 (2–12)	11.9	12.6	22.5	14.6	37.7
Biologic	Etanercept	393	35.9	20.5 (7–36)	15.8	8.7	36.1	18.8	19.3
	Adalimumab	200	18.3	11 (5–16.8)	25.5	18.0	38.5	12.5	4.5
	Infliximab	99	9.0	12 (4–24)	15.2	10.1	35.4	9.1	28.3
Phototherapy	UVB	590	53.9	6 (2–12)	15.3	7.8	20.7	11.0	44.4
	PUVA	148	13.5	6 (3–24)	2.7	2.0	9.5	6.8	79.1

UVB, ultraviolet B; PUVA, oral psoralen plus ultraviolet A

[a]The number of treatments totaled n = 2,231 since the N = 1,095 patients may each have received one or more past treatment.

[b]Percentages may not total 100% due to unknown/missing data, which did not exceed 2.3%.

Table III

Reasons for discontinuing past treatments.[a]

Discontinuation Reasons, n (%)	Systemic Treatment			Biologic			Phototherapy		
	Methotrexate (N = 446)	Acitretin (N = 204)	Cyclosporine (N = 151)	Etanercept (N = 393)	Adalimumab (N = 200)	Infliximab (N = 99)	UVB (N = 590)	PUVA (N = 148)	*P* Value[b]
Did not work well enough	94 (21.1)	65 (31.9)	37 (24.5)	102 (26.0)	68 (34.0)	20 (20.2)	136 (23.1)	32 (21.6)	0.004
Worked well at first but stopped working well	56 (12.6)	25 (12.3)	24 (15.9)	126 (32.1)	44 (22.0)	21 (21.2)	58 (9.8)	20 (13.5)	< 0.001
Non-life threatening side effects	126 (28.3)	74 (36.3)	43 (28.5)	48 (12.2)	29 (14.5)	24 (24.2)	49 (8.3)	31 (21.0)	< 0.001
Life threatening side effects[d]	3 (0.7)	2 (1.0)	1 (0.7)	2 (0.5)	3 (1.5)	9 (9.1)	2 (0.3)	2 (1.4)	< 0.001[c]
Developed illness unrelated to treatment	19 (4.3)	3 (1.5)	8 (5.3)	33 (8.4)	15 (7.5)	7 (7.1)	9 (1.5)	0 (0.0)	< 0.001
Concern about safety of continuous treatment	54 (12.1)	9 (4.4)	14 (9.3)	18 (4.6)	6 (3.0)	2 (2.0)	31 (5.3)	17 (11.5)	< 0.001
Psoriasis improved and prefer not to be on continuous treatment	78 (17.5)	26 (12.8)	18 (11.9)	16 (4.1)	12 (6.0)	5 (5.1)	180 (30.5)	33 (22.3)	< 0.001
Too inconvenient	10 (2.2)	2 (1.0)	0 (0.0)	8 (2.0)	1 (0.5)	4 (4.0)	180 (30.5)	35 (23.7)	< 0.001
Cannot afford treatment[e]	19 (4.3)	11 (5.4)	9 (6.0)	22 (5.6)	9 (4.5)	4 (4.0)	68 (11.5)	7 (4.7)	< 0.001
Insurance denied[e]	8 (1.8)	3 (1.5)	3 (2.0)	21 (5.3)	15 (7.5)	7 (7.1)	11 (1.9)	7 (4.7)	< 0.001[c]
Delay in obtaining refills from doctor, pharmacy, or insurance company[e]	43 (9.6)	5 (2.5)	6 (4.0)	22 (5.6)	20 (10.0)	4 (4.0)	7 (1.2)	2 (1.4)	< 0.001

UVB, ultraviolet B; PUVA, oral psoralen plus ultraviolet A

[a]The number of treatments totaled n = 2,231 since the N = 1,095 patients may each have received one or more past treatment. Percentages do not total 100% since patients may have more than one reason for discontinuing any particular treatment.

[b]Chi-square test

[c]Fisher's exact test

[d]Includes side effects that were life-threatening or required hospitalization

[e]Correlations among these treatment discontinuation reasons are low (Pearson's r = 0.25 between "cannot afford treatment" and "insurance denial", r = 0.14 between "cannot afford treatment" and "delays in obtaining refills"), thus the role of "cannot afford treatment" on treatment discontinuation may not be entirely attributed to the other two reasons.

Table IV

Adjusted odds ratios of citing specific discontinuation reasons

Discontinuation Reasons, OR (95% CI)	Systemic Treatment			Biologics			Phototherapy	
	Methotrexate	Acitretin	Cyclosporine	Etanercept	Adalimumab	Infliximab	UVB	PUVA
Did not work well enough[a]	1.00 [ref.]	1.56 (0.97–2.46)	0.75 (0.46–1.23)	1.28 (0.89–1.83)	1.74 (1.11–2.74)	0.59 (0.30–1.15)	0.90 (0.63–1.30)	0.67 (0.39–1.17)
Worked well at first but stopped working well[b]	1.00 [ref.]	0.86 (0.46–1.62)	1.43 (0.77–2.68)	5.19 (3.23–8.33)	2.10 (1.20–3.67)	2.07 (0.95–4.51)	0.88 (0.55–1.40)	1.09 (0.56–2.12)
Any side effect[c,d]	1.00 [ref.]	1.56 (1.08–2.25)	1.08 (0.70–1.67)	0.34 (0.23–0.49)	0.48 (0.30–0.75)	1.30 (0.78–2.17)	0.21 (0.14–0.31)	0.66 (0.41–1.06)
Cannot afford treatment[e]	1.00 [ref.]	2.06 (0.76–5.61)	1.47 (0.51–4.20)	1.45 (0.68–3.10)	0.83 (0.29–2.32)	0.89 (0.21–3.82)	7.03 (3.14–15.72)	2.40 (0.75–7.61)

OR, odds ratio; CI, confidence interval; UVB, ultraviolet B; PUVA, oral psoralen plus ultraviolet A

[a] Adjusted for duration of psoriasis diagnosis, heavy drinking, time of last treatment use, treatment duration, and number of past treatments

[b] Adjusted for treatment duration and number of past treatments.

[c] Includes non-life threatening side effects and/or life threatening side effects

[d] Adjusted for age, sex, marital status, household income level, and health insurance status.

[e] Adjusted for age, health insurance status, heavy drinking, psoriatic arthritis, and time of last treatment