Patient Preferences for Psoriasis Treatments

Process Characteristics Can Outweigh Outcome Attributes

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Objectives: To assess patients' preferences for psoriasis treatments and to identify the effect of sociodemographic and socioeconomic characteristics on these preferences.

Design: A computer-based conjoint analysis experiment was conducted to analyze the preferences of individuals with moderate or severe psoriasis for outcome attributes (probability, magnitude, and duration of benefit, as well as probability, severity, and reversibility of adverse effects) and process attributes (treatment location, frequency, duration, delivery method, and individual cost) of psoriasis treatments. Relative importance scores (RISs) for each attribute were calculated. The effect of sociodemographic (age, sex, and marital status) and socioeconomic (income and employment) characteristics and Psoriasis Area and Severity Index and Dermatology Life Quality Index scores on preferences was assessed using analysis of variance, post hoc testing, and multivariate regression analysis.

Setting: Outpatient dermatology clinic at a German university medical center.

Participants: Patients with moderate or severe psoriasis (N = 163).

Main Outcome Measure: Relative importance scores for treatment attributes.

Results: The attribute considered to be most important in patients' preferences for psoriasis treatments was treatment location (RIS, 26.76), followed by probability of benefit (RIS, 23.77) and method of delivery (RIS, 23.49). The RISs for all process attributes were higher than for adverse effect–related attributes. Older individuals (≥65 years) were less concerned about the probability of benefit ($\beta = -0.24$; $P = .005$) compared with younger individuals.

Conclusions: When choosing among treatment options, individuals with psoriasis appear to be willing to accept treatment-related adverse effects to obtain process attributes compatible with their personal and professional life. Incorporating preferences in shared decision making may facilitate treatment adherence and optimize outcome.

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P SORIASIS IS ONE OF THE MOST frequently occurring dermatologic diseases, affecting 2% to 3% of the population in Europe and the United States.[1] As a chronic debilitating inflammatory disease of the skin and joints, psoriasis can cause considerable physical impairment. Moreover, the disease can strongly affect the emotional and social well-being and socioeconomic status of patients.[2-5] Individuals with psoriasis often face significant social stigmatization and work discrimination.[5] The well-being of patients is influenced not only by the disease but also by its management. Many patients, especially those with severe psoriasis, are dissatisfied with the management of their disease and frustrated by the perceived ineffectiveness of treatments.[2,3,5]

In recent years, a wide range of treatment options has been established for psoriasis, including a variety of local therapies, phototherapy, traditional systemic antipsoriatic medications, and biologicals.[6-11] The clinical goal is to find the most efficient treatment, associated with the fewest possible adverse effects (AEs), at a reasonable cost. What can result is a process of treatment trial and error and inefficiencies in identifying an effective and patient-acceptable therapy.[12] Specifically, the processes and AEs associated with recommended treatments may not fit well with patients' social and work context and preferences.[13] Poor fit of a recommended treatment could contribute to the high level of

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dissatisfaction with[5,14] and low adherence to psoriasis treatments.[15-17] Nonadherence to prescribed treatment has been reported[18] in up to 40% of individuals with psoriasis.

To minimize the risk of nonadherence and poor clinical outcome, evidence-based treatment guidelines[10] call for increased patient participation in treatment decision making to build a sense of active partnership and empower patients for greater self-management of the disease. One important step to achieve this goal is to assess the preferences that individuals have for the attributes of their therapy. *Preferences* is an economic concept referring to the value that an individual attaches to different options when presented with a choice. More commonly acknowledged in other fields, the role and potential impact of patients' preferences is being increasingly recognized in the health care sector.[19] Previous studies[20,21] in psoriasis have used time trade-off or standard gamble preference elicitation methods in which participants are asked their willingness to trade off future life years or accept a risk of immediate death in exchange for returning to full health. Studies also have assessed health state utilities in psoriasis and psoriatic arthritis using willingness-to-pay analyses, visual analog scales,[20,22,23] the EuroQol-5 multiattribute health utility instrument,[24] and, recently, conjoint analysis (CA).[25-27]

In CA, also known as *discrete choice experiments*, participants are asked to choose between treatment options.[28] The treatment options are decomposed into and described by their attributes—allowing both process and outcome attributes to be included—which may more accurately reflect factors influential in treatment decision making. The objective of our study was to use CA to explore the relative importance of process and outcome attributes associated with available treatment options for psoriasis. Moreover, we wanted to assess whether individual preferences are influenced by sociodemographic and socioeconomic characteristics because factors such as age, employment, and marital status are known to influence adherence to antipsoriatic treatments.[16]

METHODS

STUDY PARTICIPANTS

Individuals with psoriasis aged 18 years or older who attended outpatient clinics at the Dermatology Department of the University Medical Centre Mannheim between December 1, 2009, and September 30, 2010, were asked to participate in the study. To ensure that the full range of antipsoriatic treatments (ie, local therapy, UV therapy, classic systemic therapy, or biologicals) would be valid options, only patients with moderate to severe psoriasis according to the criteria of the Committee for Medicinal Products for Human Use[29] were recruited. These included (1) those with a Psoriasis Area and Severity Index (PASI) of 10 or more[30]; (2) patients with psoriatic involvement of the hands, feet, or head; (3) patients with psoriatic arthritis according to Classification of Psoriatic Arthritis criteria[31]; and (4) those receiving systemic antipsoriatic therapy. Patients visiting our department for the first time, patients coming for follow-up visits, and those with and without ongoing antipsoriatic therapy were included. The study was approved by the Ethics Committee of the Medical Faculty Mannheim and performed according to the principles of the Declaration of Helsinki.

DATA COLLECTION

After providing written informed consent, participants were assigned an identification code used to access a computerized survey to be completed before their clinical consultation. Technical assistance was provided if requested. Within the survey, participants' preferences were explored using CA. Generation and evaluation of the CA exercises involved (1) identification of key attributes associated with the range of psoriasis treatments; (2) assignment of various levels to the identified treatment attributes; (3) creation of hypothetical treatment scenarios by combining these levels in a random fashion; (4) pairing of the treatment scenarios using an orthogonal design to maximize discrimination of the relative importance of attributes while minimizing the number of choice tasks needed in the set; (5) presentation of choice sets to respondents; and (6) measurement of preferences for the treatment attributes based on the choices made for the presented choice sets.[28] The range of currently available treatments was grouped into 6 outcome attributes (probability of benefit, magnitude of benefit, duration of benefit, probability of AEs, AE severity, and AE reversibility) and 5 process attributes (treatment location, frequency, duration, delivery method, and cost for the individual). Four realistic attribute levels, based on currently available treatments, were created for each attribute (**Table 1**).

The attributes were separated into 2 groups to avoid information "overload" during the CA exercises.[32] The first group included (1) magnitude of benefit, (2) duration of benefit, (3) probability of AEs, (4) AE severity, (5) AE reversibility, and (6) cost. The second group included (1) probability of benefit; (2) treatment location, frequency, duration, and delivery method; and (3) cost. Cost was included in both groups to verify internal consistency and to allow later comparison between groups. The hypothetical treatment scenarios were designed using commercially available conjoint analysis software (http://www.sawtoothsoftware.com). Of the 4096 ($4 \times 4 \times 4 \times 4 \times 4 \times 4$) treatment scenarios possible for each group of attributes, 12 pairs of scenarios were randomly selected by the software for each respondent. The random selection of scenario pairs was used to minimize possible bias associated with the order in which the scenario pairs were presented (**Table 2**). Respondents were asked to choose their most preferred treatment option (ie, the utility maximizing option) from each pair of treatment scenarios. *Utility* is the net benefit an individual would derive from a treatment option, assumed to be based on the option's attribute levels and the sum of their associated "part-worth" utilities.[28]

Sociodemographic (ie, age, sex, and marital status) and socioeconomic (ie, household income per month and working status) characteristics and the Dermatology Life Quality Index (DLQI)[33] were also assessed in the computerized survey. The PASI for each participant was scored by 2 of the study team investigators (M.-L.S. and A.S.).

STATISTICAL ANALYSIS

Relative Attribute Importance

Part-worth utilities for each attribute level were computed using logit regression. The part-worth utilities were then scaled to sum to zero within each attribute. Attribute importance was assessed by calculating the range between the highest and the lowest part-worth utility for each attribute. To allow comparison between attributes, the relative importance score (RIS) for each attribute was calculated as a percentage by dividing each attribute's range by the sum of all attribute ranges and multiplying by 100.[28] A RIS for each attribute was calculated for each participant and then averaged across all participants. To com-

Table 1. Outcome and Process Attributes and Levels Used in the Conjoint Analysis Survey

Treatment Attribute	Attribute Level
	Outcome
Probability of benefit	
I have	1. Almost a 100% chance of experiencing a significant reduction in my psoriasis
	2. About an 80% chance of experiencing a significant reduction in my psoriasis
	3. About a 60% chance of experiencing a significant reduction in my psoriasis
	4. About a 40% chance of experiencing a significant reduction in my psoriasis
Magnitude of benefit	
I will likely experience	1. Almost a 100% reduction in the size of my psoriasis
	2. About a 75% reduction in the size of my psoriasis
	3. About a 50% reduction in the size of my psoriasis
	4. About a 25% reduction in the size of my psoriasis
Duration of benefit	
The improvement in my psoriasis will last for	1. ≥1 y after completing all of my treatments
	2. 6-8 mo after completing all of my treatments
	3. 3-5 mo after completing all of my treatments
	4. 2 wk after completing all of my treatments
Probability of AEs	
There is	1. Almost a 100% chance that I will experience AEs from the treatment
	2. About a 50% chance that I will experience AEs from the treatment
	3. About a 10% chance that I will experience AEs from the treatment
	4. <1% Chance that I will experience AEs from the treatment
Reversibility of AEs	
If AEs occur, there is	1. Almost a 100% chance that I will completely recover once my treatments are stopped
	2. About an 80% chance that I will completely recover once my treatments are stopped
	3. About a 60% chance that I will completely recover once my treatments are stopped
	4. About a 40% chance that I will completely recover once my treatments are stopped
AE severity	
I may experience	1. Temporary, minor discomfort on my skin
	2. Constant, moderate discomfort on my skin
	3. Temporary, moderate AEs that can affect more than my skin
	4. Severe AEs that can affect more than my skin
	Process
Location	
My treatment will take place	1. At home
	2. At home with a follow-up at my local physician's office
	3. At an outpatient clinic
	4. While I stay in the hospital for 3 wk
Frequency	
My treatment will occur	1. Once every 3 mo
	2. Once every 2 wk
	3. 2 Times each wk
	4. Twice daily
Delivery method	
My treatment will occur by	1. Applying medication on my skin
	2. Taking tablets
	3. Having an injection/intravenous infusion
	4. UV light therapy
Duration	
Each treatment will take	1. 5 min to complete
	2. 15-30 min to complete
	3. 1 h to complete
	4. 2 h to complete
Cost	
I will have to pay	1. Nothing to cover the cost of my treatments
	2. An additional €50/mo to cover the cost of my treatments
	3. An additional €100/mo to cover the cost of my treatments
	4. An additional €200/mo to cover the cost of my treatments

Abbreviation: AEs, adverse effects.

pare results between attribute groups 1 and 2, attribute importance was translated to one list by matching the relative importance of cost as assessed in both groups.

Subgroup analysis was performed on the basis of sociodemographic factors (age, 18-35, 36-49, 50-64, or ≥65 years), sex (male or female), marital status (married or living with a partner, single, or widowed), socioeconomic factors (net monthly household income <€1000 [US $1437], €1000-€2000, or >€2000) and working status (employed or unemployed [including homemakers and retirees]), and PASI (0-5, 5.1-10, or

Table 2. Examples of Pair-wise Presented Treatment Options

From Each Pair of Scenarios, Please Pick the Treatment in Which You Would Most Like to Participate

Group 1

I may experience constant, moderate discomfort on my skin	I may experience severe AEs that can affect more than my skin
There is about a 50% chance that I will experience AEs from the treatment	There is about a 10% chance that I will experience AEs from the treatment
I will likely experience about a 25% reduction in the size of my psoriasis	I will likely experience about a 75% reduction in the size of my psoriasis
The improvement in my psoriasis will last for ≥1 y after completing all of my treatments	The improvement in my psoriasis will last for 3-5 mo after completing all of my treatments
If AEs occur, there is about a 40% chance that I will completely recover once my treatments are stopped	If AEs occur, there is about an 80% chance that I will completely recover once my treatments are stopped
I will have to pay an additional €50/mo to cover the cost of my treatments	I will have to pay an additional €200/mo to cover the cost of my treatments

Group 2

My treatment will take place at home	My treatment will take place at the outpatient clinic
My treatment will occur twice daily	My treatment will occur once every 2 wk
Each treatment will take 15-30 min to complete	Each treatment will take 2 h to complete
I have about an 80% chance of experiencing a significant reduction in my psoriasis	I have about a 60% chance of experiencing a significant reduction in my psoriasis
I will have to pay an additional €100/mo to cover the cost of my treatments	I will have to pay nothing to cover the cost of my treatments
My treatment will occur by applying medication on my skin	My treatment will occur by having an injection intravenously

Abbreviation: AEs, adverse effects.

Table 3. Sociodemographic and Socioeconomic Characteristics of 163 Study Participants

Characteristic	No. (%)[a]
Sex	
Female	67 (41.1)
Male	96 (58.9)
Age, y	
18-35	28 (17.2)
36-49	56 (34.4)
50-64	52 (31.9)
65-80	27 (16.6)
Marital status	
Cohabitation[b]	99 (60.7)
Single	58 (35.6)
Widowed	6 (3.7)
Monthly household income, €	
<1000	27 (16.6)
1000-2000	59 (36.2)
>2000	77 (47.2)
Working status	
Working	96 (58.9)
Not working	67 (41.1)
PASI	
0-5	100 (61.3)
5.1-10	39 (23.9)
>10	24 (14.7)
DLQI	
0-5	79 (48.5)
6-10	34 (20.9)
11-20	42 (25.8)
>20	8 (4.9)

Abbreviations: DLQI, Dermatology Life Quality Index; PASI, Psoriasis Area and Severity Index.
[a] Because of rounding, percentages may not total 100.
[b] All participants living with a partner.

cients were calculated and reported to enable comparison of the effect of each independent variable on the RIS, although different measurement units were used for the independent variables. Significance was again assessed at $P \leq .05$.

>10) and DLQI (0-5, 6-10, 11-20, or >20). For dichotomous variables, the RIS differences between subgroups were tested for significance using analysis of variance. If there were more than 2 groups, a post hoc test was applied. Significance was assessed at $P \leq .05$.

Regression Analysis

To further investigate the influence of participants' sociodemographic and socioeconomic characteristics on the RIS, multivariate linear regression analysis was performed. In these models, the RIS for each attribute was used as the dependent variable, and age, sex, marital status, income, and PASI and DLQI were included as independent variables. Working status was not included in the regression analyses because of possible multicollinearity (working status was highly correlated with income). A model was created for each treatment attribute using the function $RIS = \beta_0 + \beta_1 \text{ sex} + \beta_2 \text{ age} + \beta_3 \text{ marital status} + \beta_4 \text{ income} + \beta_5 \text{ PASI} + \beta_6 \text{ DLQI}$, with β_0 as a constant for neglected factors and β_{1-6} as the coefficients to be estimated.[34] β indicates how the value of the RIS changes when one of the independent variables is changed and the other independent variables are held constant. Standardized regression coeffi-

RESULTS

During the study period, 197 outpatients with psoriasis were asked to participate. Sixteen potential participants (8.1%) declined enrollment and 18 potential participants (9.1%) were excluded because the psoriasis was classified as mild. All 163 participants completed the computerized survey. Mean (SD) age was 49.3 (14.1) years (range, 18-80 years). Further sociodemographic and socioeconomic characteristics are reported in **Table 3**. Despite the fact that only participants with moderate to severe psoriasis were included, the mean (SD) PASI was relatively low (5.6 [5.5]; range, 0-32.8) because most participants were receiving antipsoriatic treatment at the time of data collection. The mean (SD) DLQI was 7.6 (6.9; range, 0-29, Table 3).

PREFERENCES FOR TREATMENT ATTRIBUTES

Averaged across all study participants, the attribute regarded as most important was treatment location (RIS, 26.76), followed by probability of benefit (RIS, 23.77) and method of delivery (RIS, 23.49) (**Figure 1**).
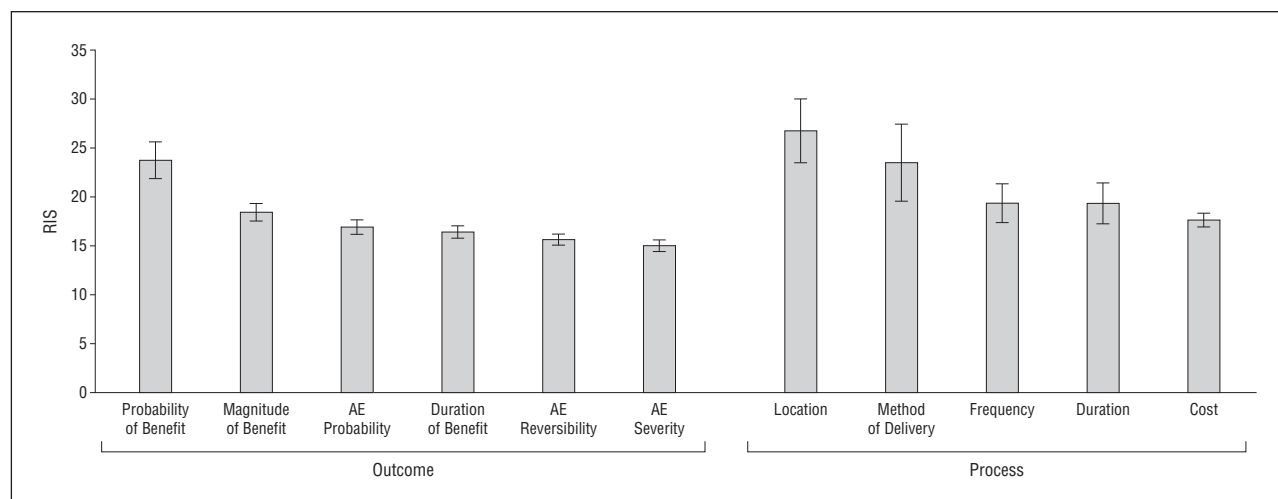
Figure 1. Treatment preferences averaged across the study sample (N=163) using relative importance scores (RISs). Treatment location was the most important attribute (mean [SEM] RIS, 26.76 [3.24]), followed by probability of benefit (23.77 [1.84]). AE indicates adverse effect.

Among outcome attributes, the probability of benefit (RIS, 23.77) and magnitude of benefit (RIS, 18.49) were considered most important, followed by the probability of AEs (RIS, 16.96) and duration of benefit (RIS, 16.37), whereas AE severity and reversibility appeared less relevant (Figure 1).

Among process attributes, participants attached importance to treatment location (RIS, 26.76), method of delivery (RIS, 23.49), treatment frequency (RIS, 19.36), and treatment duration (RIS, 19.31). Remarkably, cost to be covered by the individual was found to be least relevant (RIS, 17.60). Most process attributes had a higher RIS compared with the outcome attributes.

TREATMENT PREFERENCES IN DIFFERENT SOCIODEMOGRAPHIC AND SOCIOECONOMIC SUBGROUPS

The effect of sociodemographic, socioeconomic, and disease-related factors on treatment preferences was estimated in descriptive analyses (**Figures 2**, **3**, and **4**) and multivariate logistic regression models (**Table 4**). When participants were stratified according to sex (Figure 2A, Table 4) and marital status (Figure 2C, Table 4), no significant differences were found. However, when different age groups were compared, it was striking that, on average, older participants (≥65 years) found the probability of benefit to be less important than younger participants did (Figure 2B). This finding was confirmed in our regression analysis (β=−0.24; P=.005, Table 4).

On average, participants with an intermediate monthly household income between €1000 and €2000 found the duration of benefit to be more important compared with those with lower income (<€1000 per month; β=0.26; P=.02, Table 4) and viewed the severity of AEs as less important (P=.02 in descriptive analyses, Figure 3A; β=−0.25; P=.03 in regression models, Table 4). Furthermore, participants with intermediate incomes (€1000-€2000 per month) attached less importance to the treatment delivery method compared with participants with lower income (β=−0.32; P=.005). Notably, the importance of treat-

ment cost covered by the individual did not differ significantly between income groups (data not shown). When attribute importance was compared between employed and unemployed participants (Figure 3B), employed participants were significantly more concerned about the reversibility of AEs (P=.006; data not shown). Preferences for other attributes were largely independent of the working status.

Grouping according to PASI (0-5, 5.1-10, and >10) produced no significant differences in the descriptive analyses (Figure 4A). However, surprisingly, regression analyses indicated that participants with a higher PASI considered the probability of benefit less important (β=−0.18; P=.02) but the frequency of treatment more important (β=0.17; P=.04; Table 4) compared with participants with a lower PASI. When subgroups according to disease-related quality-of-life impairment were created (Figure 4B), those with a DLQI between 11 and 20 (demonstrating relatively poor quality of life) regarded the probability of improvement as significantly more important than did patients with a DLQI between 0 and 5 (P=.02 in descriptive analyses). However, this result did not persist in our multivariate regression analysis (Table 4).

COMMENT

Perhaps the most interesting finding of our study is that participants attach great importance to process attributes in treatment selection. Across all study participants, the attribute regarded as most important—even more important than probability and magnitude of benefit—was treatment location. In Germany, as in some other European countries, local therapy with anthralin (dithranol), often in combination with UV light, is still a major option for treatment of moderate and severe psoriasis.[10,35,36] This treatment is most often performed in an inpatient or day hospital setting with patients hospitalized for 2 to 3 weeks because application is tricky and anthralin stains skin and sometimes even clothing if not completely washed off after treatment. However, after broad introduction of bio-
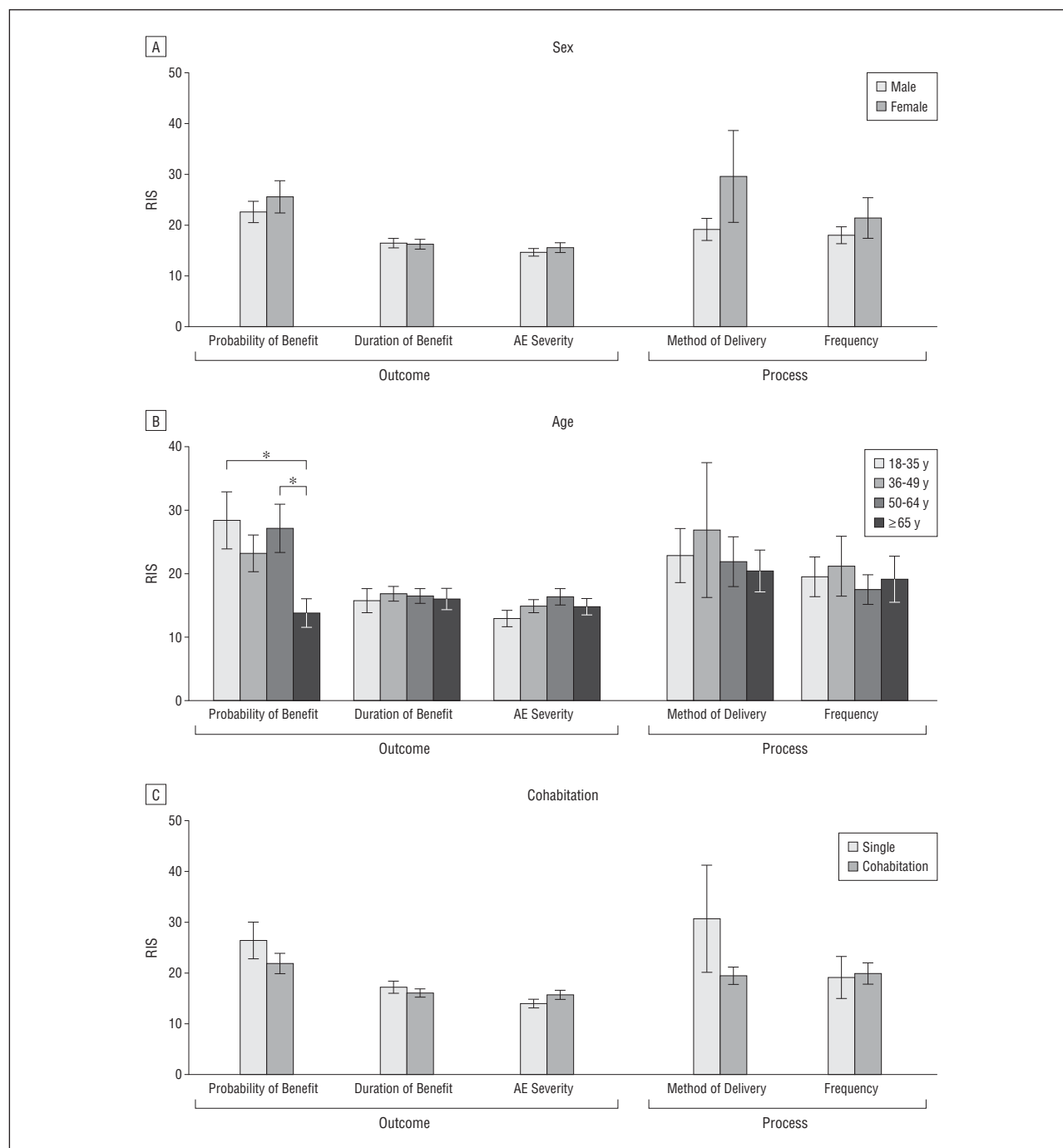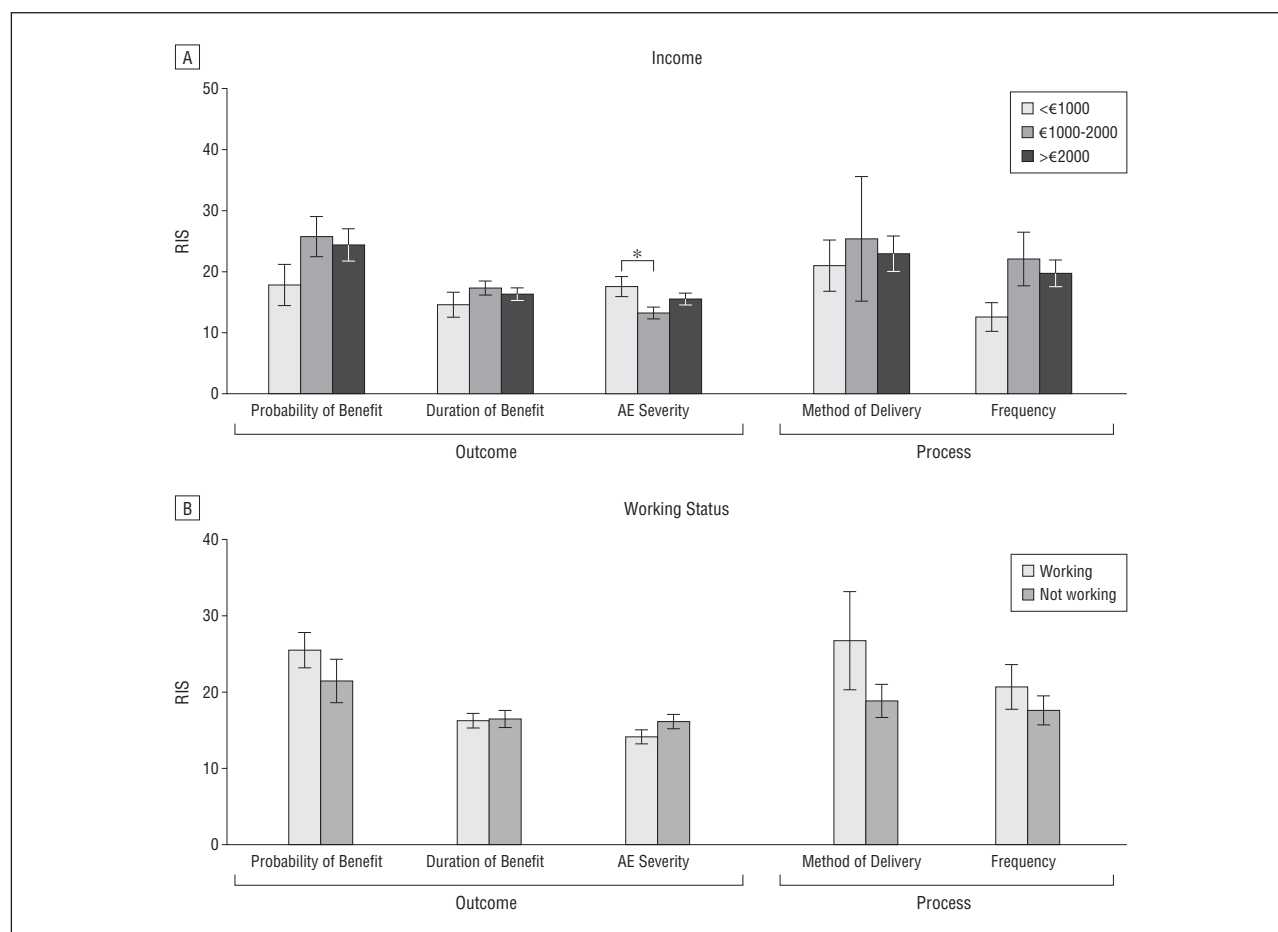
Figure 2. Treatment preferences among sociodemographic subgroups. Differences between relative importance scores (RISs) obtained for sociodemographic subgroups were tested for statistical significance using analysis of variance (for dichotomous variables) or post hoc tests (for >2 groups). A, No significant differences were found with respect to sex. B, When stratifying by age categories, the probability of benefit was significantly less important for participants 65 years or older (mean [SEM] RIS, 13.74 [2.25]) than for those aged 18 to 35 years (28.40 [4.50]) and those aged 50 to 64 years (27.11 [3.84]). C, Preferences of individuals living with a partner were similar to those of singles. *P=.05. AE indicates adverse effect.

logicals, this regimen is often replaced by outpatient therapy with biologicals.[10,11,37] Although our findings may be partly attributable to bias arising from sampling individuals attending our outpatient clinic, they underscore that patients prefer outpatient treatment. The high impact of treatment location may also limit patient acceptance of UV therapy, excluding home phototherapy, which requires frequent visits at outpatient dermatology offices or clinics. The observation that treatment location, as well as most other process attributes, have a higher RIS compared with AE-related attributes suggests that patients may be willing to accept AEs in trade for a treatment compatible with their personal and professional lifestyle. Treatments poorly compatible with personal and professional demands may include, in addition to inpatient and UV therapy, time-consuming local therapies and systemic therapies requiring frequent laboratory workup.

Figure 3. Treatment preferences among socioeconomic subgroups. Analysis of variance (in case of dichotomous variables) and post hoc tests (for >2 groups) were performed to test differences in relative importance scores (RISs) for significance. A, Participants with a monthly household income of €1000 to €2000 viewed the severity of adverse effects (AEs) (mean [SEM] RIS, 13.20 [0.90]) as less important than participants with an income of less than €1000 (17.50 [1.68]). B, Stratification according to employment status showed no significant differences between the attributes shown. *P=.02.

Moreover, we found that participants were willing to trade an increased risk of AEs for increased probability and magnitude of therapeutic benefit. This finding is in contradiction to the previously reported work of Seston and colleagues,[27] who showed that patients with psoriasis prioritized low risk of AEs (skin cancer and liver damage) and that they were willing to trade time to achieve moderate (50%) skin improvement to minimize the risk of these AEs. In the CA exercise performed by the Seston group, AEs were precisely named, which may have influenced the measured preferences. However, preferences to avoid AEs were traded against "time to achieve moderate improvement" rather than against probability and magnitude of improvement, making it difficult to compare their results with our own.

Other studies[2,14,23,38,39] performed on patient preferences for psoriasis treatments have compared selected treatment options. However, the available evidence on preferences for or satisfaction with the existing systemic therapies and phototherapies is surprisingly limited, and, in a recent systematic review,[39] it was not possible to rank therapies according to patient preferences. For example, studies[2,14,23,38] comparing preferences for classic systemic antipsoriatic therapies vs phototherapies have reported variable outcomes, with some studies showing preference for oral therapy and some for UV therapy. Patients who obtained biologicals appear to prefer these therapies over other treatments.[38] Correspondingly, in a prospective study,[40] patients with psoriatic arthritis achieved a rapid and sustained gain in health utility when receiving tumor necrosis factor antagonists.

When we performed subgroup analyses, we found that preferences are, in part, dependent on sociodemographic and socioeconomic characteristics. Older patients (≥65 years) appear to care less about the probability of improvement compared with younger individuals. In most other studies[20,21] using time trade-off, willingness to pay, and visual analog scales to assess health state utilities in psoriasis, utilities were largely independent of age. However, psoriasis-related impairment may be perceived differently among different age groups. For example, it has been reported[5,12,40,41] that older patients experience psoriasis more physically than mentally compared with younger patients. Correspondingly, younger patients with psoriasis were shown[22] to have greater willingness to pay for social comfort and emotional health than were older patients. Our descriptive analyses also showed the tendencies that women care more about the probability of improvement than men and that singles place greater value on this attribute compared with individuals living with a partner (Figure 2A and C). Although differences did not achieve
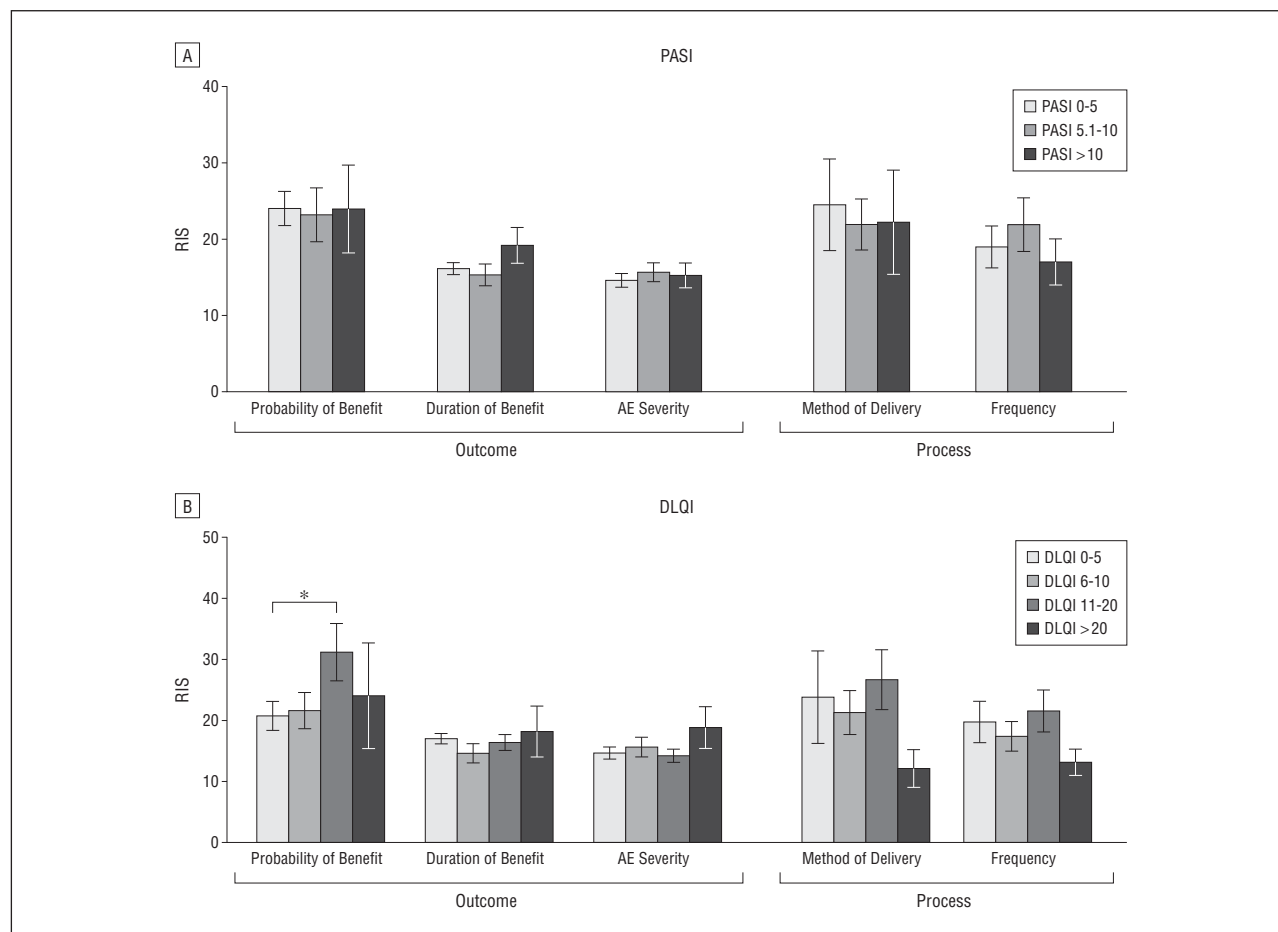
Figure 4. Preferences of subgroups based on psoriasis severity measurements. Differences in relative importance scores (RISs) were tested for significance by post hoc tests. A, Grouping according to Psoriasis Area and Severity Index (PASI) showed no significant differences in the descriptive analyses, but regression models demonstrated interdependence between PASI and RISs for probability of benefit and treatment frequency (Table 4). B, Patients with a Dermatology Life Quality Index (DLQI) between 11 and 20 were significantly more concerned about the probability of benefit than were those with a score between 0 and 5 (mean [SEM] RIS, 31.22 [4.63] vs 20.71 [2.40]). However, this result did not persist in multivariate regression analysis (Table 4). AE indicates adverse effect.
*P=.02.

Table 4. Multiple Regression Models Showing the Effect of Sociodemographic and Socioeconomic Characteristics, PASI, and DLQI on Treatment Attributes' RIS[a]

| | Outcome Variable | | | | | | Process Variable | | | |
| | Model 1, Probability of Benefit | | Model 2, Duration of Benefit | | Model 3, AE Severity | | Model 4, Delivery Method | | Model 5, Frequency | |
Characteristic	β	*P* Value	β	*P* Value	β	*P* Value	β	*P* Value	β	*P* Value
Male sex	−0.004	.96	0.03	.75	0.05	.54	−0.01	.88	0.03	.74
Age	**−0.24**	**.005**	0.03	.77	0.10	.27	0.16	.07	0.004	.96
Single[b]	0.03	.69	0.04	.61	−0.06	.50	0.02	.79	−0.16	.07
Monthly household income, €[c]										
1000-2000	0.19	.09	**0.26**	**.02**	**−0.25**	**.03**	**−0.32**	**.005**	0.20	.08
>2000	0.18	.12	0.22	.06	−0.13	.29	−0.11	.37	0.09	.46
PASI	**−0.18**	**.02**	−0.10	.22	0.06	.44	−0.07	.42	**0.17**	**.04**
DLQI	0.08	.33	0.03	.70	0.04	.60	0.03	.67	−0.12	.14

Abbreviations: DLQI, Dermatology Life Quality Index; PASI, Psoriasis Area and Severity Index; RIS, relative importance score.
[a] β Values shown are the standardized regression coefficients. A positive β value indicates that an attribute becomes more important, and a negative β value signifies that the attribute loses importance when the patients' characteristic increases or, in case of binary variables, changes. Significant differences between the groups are highlighted in bold.
[b] The reference group for the category "single" comprised all participants living with a partner. Widowed participants were excluded because of the small size of this group.
[c] The reference category for monthly household income was income of less than €1000.

statistical significance in our sample, it seems likely that women and singles attach special importance to appealing appearance, not the least because of expectations from society and from potential partners.

The relationship between socioeconomic status and treatment preferences appears to be more complex. According to our results, participants with intermediate household incomes (€1000-€2000 per month), mostly belonging to the working class, attach great importance to long-lasting improvement. To achieve improvement, they are more willing to risk AEs than are participants with lower household incomes (<€1000 per month) who are likely in Germany to be supported by social benefits. Psoriasis is known to have a negative effect on individuals' professional life and employment status.[5,42] Therefore, individuals who are employed in moderate-income occupations may be more likely to demonstrate preferences for treatment compatible with work constraints, ie, a treatment with long-lasting benefit that minimizes time lost from an hourly wage job. In descriptive analyses, we also observed the tendency that participants with a monthly income of more than €1000 care more about the probability of benefit than do those with an income below that level (Figure 3A). The same applies to participants who are working compared with those who are homemakers, unemployed, or retired (Figure 3B). Although differences were not significant, our findings may indicate that individuals with an occupation attach greater importance to appearance, possibly because of expectations at work and from society. Remarkably, and in accordance with previous willingness-to-pay analyses in psoriasis,[21,22] income was not a predictor for the effect of individual cost on preferences. Cost to be covered by the individual was the process attribute regarded as least important, ie, participants were prepared to trade copayments for more convenient treatment modalities independent of their income.

When stratifying participants according to the PASI and DLQI, patients with greater impairment of the quality of daily life (DLQI >10) attached greater importance to the probability of improvement compared with those with a lower DLQI, as expected. By contrast, the PASI was negatively correlated with participants' preference for the probability of improvement. This finding may reflect the low correlation between objective clinical severity and psychological disability in psoriasis.[43] However, the PASI measured in this study does not reflect the severity of psoriasis in these participants because many had achieved significant control with use of systemic medications. Finally, patients who place great value on the probability of improvement are likely to adhere to prescribed treatments, resulting in favorable outcomes shown in a low PASI.

A great advantage of the CA exercise performed in our study is that it realistically reflects the decision-making process undertaken by patients and physicians in daily clinical practice. The attributes and attribute levels represented in the choice experiments realistically characterize all treatment options available for moderate and severe psoriasis. To our knowledge, our study is the first to explore and compare preferences for process and outcome attributes for all available psoriasis treatments. Clearly, our findings should be verified in larger and more diverse patient samples before generalizations can be made. Our study included only a subpopulation of patients with moderate to severe psoriasis treated in a German university hospital, and patient preferences may be different among individuals with mild psoriasis. We cannot imply that our findings are transferable to patients in other cultures and health systems. Furthermore, the effects of other disease-related factors, such as disease duration, previous treatment experience, and comorbidities, on patient preferences for psoriasis treatment need to be explored.

In conclusion, although patients with psoriasis attach significant importance to the probability and magnitude of benefit, it appears that process attributes, such as location and method of delivery of treatment, may be even more important. A careful history of patient preferences must be incorporated into therapeutic decision making, with particular attention to age and work context. Synthesizing evidence-based medicine with shared decision making may have the potential to enhance treatment satisfaction, facilitate adherence, and optimize efficiency and clinical outcomes.

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REFERENCES

1. Chandran V, Raychaudhuri SP. Geoepidemiology and environmental factors of psoriasis and psoriatic arthritis. *J Autoimmun.* 2010;34(3):J314-J321.
2. Nijsten T, Margolis DJ, Feldman SR, Rolstad T, Stern RS. Traditional systemic treatments have not fully met the needs of psoriasis patients: results from a national survey. *J Am Acad Dermatol.* 2005;52(3, pt 1):434-444.
3. Stern RS, Nijsten T, Feldman SR, Margolis DJ, Rolstad T. Psoriasis is common, carries a substantial burden even when not extensive, and is associated with widespread treatment dissatisfaction. *J Investig Dermatol Symp Proc.* 2004;9(2):136-139.
4. Choi J, Koo JY. Quality of life issues in psoriasis. *J Am Acad Dermatol.* 2003;49(2)(suppl):S57-S61.
5. Krueger G, Koo J, Lebwohl M, Menter A, Stern RS, Rolstad T. The impact of psoriasis on quality of life: results of a 1998 National Psoriasis Foundation patient-membership survey. *Arch Dermatol.* 2001;137(3):280-284.
6. Menter A, Gottlieb A, Feldman SR, et al. Guidelines of care for the management of psoriasis and psoriatic arthritis, section 1: overview of psoriasis and guidelines of care for the treatment of psoriasis with biologics. *J Am Acad Dermatol.* 2008;58(5):826-850.
7. Menter A, Korman NJ, Elmets CA, et al; American Academy of Dermatology. Guidelines of care for the management of psoriasis and psoriatic arthritis, section 3: guidelines of care for the management and treatment of psoriasis with topical therapies. *J Am Acad Dermatol.* 2009;60(4):643-659.
8. Menter A, Korman NJ, Elmets CA, et al. Guidelines of care for the management of psoriasis and psoriatic arthritis, section 5: guidelines of care for the treatment of psoriasis with phototherapy and photochemotherapy. *J Am Acad Dermatol.* 2010;62(1):114-135.
9. Menter A, Korman NJ, Elmets CA, et al. Guidelines of care for the management of psoriasis and psoriatic arthritis, section 4: guidelines of care for the management and treatment of psoriasis with traditional systemic agents. *J Am Acad Dermatol.* 2009;61(3):451-485.
10. Nast A, Boehncke WH, Mrowietz U, et al. S3-Guidelines for the treatment of psoriasis vulgaris Update 2011 [in German]. *J Dtsch Dermatol Ges.* 2011;9(suppl 2):S1-S104. doi:10.1111/j.1610-0379.2011.07680.x.
11. Pathirana D, Ormerod AD, Saiag P, et al. European S3-guidelines on the systemic treatment of psoriasis vulgaris. *J Eur Acad Dermatol Venereol.* 2009;23(suppl 2):1-70.
12. Rapp SR, Feldman SR, Exum ML, Fleischer AB Jr, Reboussin DM. Psoriasis causes as much disability as other major medical diseases. *J Am Acad Dermatol.* 1999;41(3, pt 1):401-407.
13. Gokdemir G, Ari S, Köşlü A. Adherence to treatment in patients with psoriasis vulgaris: Turkish experience. *J Eur Acad Dermatol Venereol.* 2008;22(3):330-335.
14. Dubertret L, Mrowietz U, Ranki A, et al; EUROPSO Patient Survey Group. European patient perspectives on the impact of psoriasis: the EUROPSO patient membership survey. *Br J Dermatol.* 2006;155(4):729-736.
15. Renzi C, Picardi A, Abeni D, et al. Association of dissatisfaction with care and psychiatric morbidity with poor treatment compliance. *Arch Dermatol.* 2002;138(3):337-342.
16. Zaghloul SS, Goodfield MJ. Objective assessment of compliance with psoriasis treatment. *Arch Dermatol.* 2004;140(4):408-414.
17. Richards HL, Fortune DG, O'Sullivan TM, Main CJ, Griffiths CE. Patients with psoriasis and their compliance with medication. *J Am Acad Dermatol.* 1999;41(4):581-583.
18. Richards HL, Fortune DG, Griffiths CE. Adherence to treatment in patients with psoriasis. *J Eur Acad Dermatol Venereol.* 2006;20(4):370-379.
19. Ross CK, Steward CA, Sinacore JM. The importance of patient preferences in the measurement of health care satisfaction. *Med Care.* 1993;31(12):1138-1149.
20. Zug KA, Littenberg B, Baughman RD, et al. Assessing the preferences of patients with psoriasis: a quantitative, utility approach. *Arch Dermatol.* 1995;131(5):561-568.
21. Schmitt J, Meurer M, Klon M, Frick KD. Assessment of health state utilities of controlled and uncontrolled psoriasis and atopic eczema: a population-based study. *Br J Dermatol.* 2008;158(2):351-359.
22. Delfino M Jr, Holt EW, Taylor CR, Wittenberg E, Qureshi AA. Willingness-to-pay stated preferences for 8 health-related quality-of-life domains in psoriasis: a pilot study. *J Am Acad Dermatol.* 2008;59(3):439-447.
23. Opmeer BC, Heydendael VM, deBorgie CA, et al. Patients with moderate-to-severe plaque psoriasis preferred oral therapies to phototherapies: a preference assessment based on clinical scenarios with trade-off questions. *J Clin Epidemiol.* 2007;60(7):696-703.
24. Gülfe A, Kristensen LE, Saxne T, Jacobsson LT, Petersson IF, Geborek P. Rapid and sustained health utility gain in anti–tumour necrosis factor–treated inflammatory arthritis: observational data during 7 years in southern Sweden. *Ann Rheum Dis.* 2010;69(2):352-357.
25. Kjaer T, Bech M, Gyrd-Hansen D, Hart-Hansen K. Ordering effect and price sensitivity in discrete choice experiments: need we worry? *Health Econ.* 2006;15(11):1217-1228.
26. Ashcroft DM, Seston E, Griffiths CE. Trade-offs between the benefits and risks of drug treatment for psoriasis: a discrete choice experiment with UK dermatologists. *Br J Dermatol.* 2006;155(6):1236-1241.
27. Seston EM, Ashcroft DM, Griffiths CE. Balancing the benefits and risks of drug treatment: a stated-preference, discrete choice experiment with patients with psoriasis. *Arch Dermatol.* 2007;143(9):1175-1179.
28. Ryan M, Farrar S. Using conjoint analysis to elicit preferences for health care. *BMJ.* 2000;320(7248):1530-1533.
29. Claes C, Kulp W, Greiner W, Graf von der Schulenberg J, Werfel T. Therapie der mittelschweren und schweren Psoriasis. In: *Deutsche Agentur für Health Technology Assessment des Dutschen Instituts für Medizinische Dokumentation und Information.* Vol 34. Köln, Germany: German Institute for Medical Documentation and Information; 2006:15-46, 91-94.
30. Puzenat E, Bronsard V, Prey S, et al. What are the best outcome measures for assessing plaque psoriasis severity? a systematic review of the literature. *J Eur Acad Dermatol Venereol.* 2010;24(suppl 2):10-16.
31. Taylor W, Gladman D, Helliwell P, Marchesoni A, Mease P, Mielants H; CASPAR Study Group. Classification criteria for psoriatic arthritis: development of new criteria from a large international study. *Arthritis Rheum.* 2006;54(8):2665-2673.
32. Green P, Srinivasan V. Conjoint analysis in marketing: new developments with implications for research and practice. *J Mark.* 1990;54(4):3-19.
33. Finlay AY, Khan GK. Dermatology Life Quality Index (DLQI)—a simple practical measure for routine clinical use. *Clin Exp Dermatol.* 1994;19(3):210-216.
34. Backhaus K, Erichson B, Plinke W, Weiber R, eds. *Multivariate Analysemethoden.* Vol 11. Berlin, Germany: Springer; 2006.
35. Hahn M, Schulz T. Health economic aspects of psoriasis therapy: is inpatient topical treatment of plaque-type psoriasis in this age of biologics still appropriate from both medical and economic viewpoints? *Hautarzt.* 2005;56(6):576-580.
36. Sminkels OQ, Prins M, Veeniiuis RT, et al. Effectiveness and side effects of UVB-phototherapy, dithranol inpatient therapy and a care instruction programme of short contact dithranol in moderate to severe psoriasis. *Eur J Dermatol.* 2004;14(3):159-165.
37. Schmitt J, Zhang Z, Wozel G, Meurer M, Kirch W. Efficacy and tolerability of biologic and nonbiologic systemic treatments for moderate-to-severe psoriasis: meta-analysis of randomized controlled trials. *Br J Dermatol.* 2008;159(3):513-526.
38. Jones-Caballero M, Unaeze J, Peñas PF, Stern RS. Use of biological agents in patients with moderate to severe psoriasis: a cohort-based perspective. *Arch Dermatol.* 2007;143(7):846-850.
39. Lecluse LL, Tutein Nolthenius JL, Bos JD, Spuls PI. Patient preferences and satisfaction with systemic therapies for psoriasis: an area to be explored. *Br J Dermatol.* 2009;160(6):1340-1343.
40. Zachariae R, Zachariae H, Blomqvist K, et al. Quality of life in 6497 Nordic patients with psoriasis. *Br J Dermatol.* 2002;146(6):1006-1016.
41. de Korte J, Sprangers MA, Mombers FM, Bos JD. Quality of life in patients with psoriasis: a systematic literature review. *J Investig Dermatol Symp Proc.* 2004;9(2):140-147.
42. Meyer N, Paul C, Feneron D, et al. Psoriasis: an epidemiological evaluation of disease burden in 590 patients. *J Eur Acad Dermatol Venereol.* 2010;24(9):1075-1082.
43. Kirby B, Richards HL, Woo P, Hindle E, Main CJ, Griffiths CE. Physical and psychologic measures are necessary to assess overall psoriasis severity. *J Am Acad Dermatol.* 2001;45(1):72-76.