

CLINICAL REPORT

Treatment Satisfaction of Patients with Psoriasis

Marthe-Lisa SCHAARSCHMIDT¹, Christian KROMER¹, Raphael HERR², Astrid SCHMIEDER¹, Sergij GOERDT¹ and Wiebke K. PEITSCH¹

¹Department of Dermatology, University Medical Center Mannheim, Heidelberg University, and ²Mannheim Institute of Public Health, Social and Preventive Medicine, Medical Faculty Mannheim, Heidelberg University, Mannheim, Germany

Treatment satisfaction of patients with psoriasis largely depends on the treatment modality, but evidence on preferences for specific medications is scarce. Here we assessed treatment satisfaction of 200 participants with moderate-to-severe psoriasis from a German University hospital with a 5-point scale and the Treatment Satisfaction Questionnaire for Medication (TSQM) and determined sociodemographic and disease-related influence factors. Participants obtaining biologicals and traditional systemic medications were significantly more satisfied than those receiving phototherapy or topical agents (TSQM=323.3, 288.0, 260.6 or 266.8; $p<0.001$). The highest TSQM score was calculated for ustekinumab (350.1), followed by acitretin (338.1), adalimumab (323.0), fumaric acid esters (304.7), infliximab (300.2), etanercept (298.8), and methotrexate (272.3; $p<0.001$). High disease-related quality of life impairment ($\beta=-0.437$, $p<0.001$) and psoriatic arthritis ($\beta=-0.185$, $p=0.005$) were associated with decreased satisfaction. Optimising satisfaction is essential to improve adherence and outcome. We show high preferences for biologicals, particularly ustekinumab, but also good satisfaction with certain traditional medications. **Key words: psoriasis; systemic therapy; biologicals; ustekinumab; treatment satisfaction; preferences.**

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Prof. Dr. Wiebke K. Ludwig-Peitsch, Department of Dermatology, University Medical Center Mannheim, Heidelberg University, Theodor-Kutzer-Ufer 1–3, DE-68135 Mannheim, Germany. E-mail: wiebke.ludwig@umm.de

Psoriasis has substantial negative impact on the life course of affected patients (1, 2). However, their quality of life is also considerably influenced by the treatment prescribed. To identify a suitable treatment with acceptable costs, physicians often take a stepwise approach, starting with topical agents and phototherapy and escalating first to traditional antipsoriatic medications, then to biologicals (3–5). This often results in a process of trial and error, which may be frustrating from the patients' perspective. In the last years, the idea of patient-centred care in psoriasis has gained increasing importance, and

patient-reported outcomes are increasingly integrated into treatment decisions (6, 7).

Treatment dissatisfaction (8) and non-adherence (9) are common among patients with psoriasis. However, several recent studies showed higher satisfaction rates for biologicals than for other treatment modalities (10–14). Patients' satisfaction with and preferences for specific systemic antipsoriatic medications have only been compared in a few studies, sometimes with conflicting findings (8, 11, 15, 16).

The aim of our study was to compare satisfaction of patients with moderate-to-severe psoriasis with all systemic antipsoriatic medications currently approved for treatment of psoriasis in Germany, using the Treatment Satisfaction Questionnaire for Medication (TSQM) as validated score, and to assess the association of sociodemographic and disease-related characteristics with treatment satisfaction.

METHODS

Study participants

Patients visiting the outpatient Department of Dermatology of the University Medical Center Mannheim, Germany were asked to participate. Inclusion criteria were age ≥ 18 years and moderate-to-severe psoriasis according to the criteria of the Committee for Medicinal Products for Human Use (CHMP) [for details see (17)]. Participants unable to complete the survey because of difficulties with German language were excluded. The study was performed according to the principles of the Declaration of Helsinki and approved by the Ethics Committee of the Medical Faculty Mannheim.

Data collection

After providing written informed consent, participants completed a computerised survey with questions on age (in years), gender, disease duration (years since onset of the first symptoms of psoriasis), currently and previously prescribed antipsoriatic treatments, and most preferred treatment ever received. Current, previous and most preferred treatment options were subdivided into topical treatments, phototherapy, traditional systemic antipsoriatic medications and biologicals. Options for topical treatments included urea, salicylic acid, topical steroids, vitamin D agonists, combinations of topical steroids and vitamin D agonists, dithranol, vitamin A agonists, calcineurin inhibitors and tar. Options for phototherapy were systemic PUVA, topical PUVA (cream, bath or shower PUVA), narrow-band UVB 311 nm, broad-band UVB/SUP and excimer laser. The list of traditional systemic treatments comprised acitretin, cyclosporine,

fumaric acid esters, methotrexate and leflunomide and the list of biologicals adalimumab, etanercept, golimumab, infliximab and ustekinumab. In addition, respondents could always tick the option "other" and indicate a medication which was not listed as free text, or chose the option "yes, unknown which". For all medications both generic and brand names were presented, and multiple answers were allowed. Furthermore, participants were asked to choose the best treatment that they had ever obtained for their psoriasis from an identical list of options. For this question, only one answer was possible. Medical records were reviewed by 2 of the investigators (M.-L.S. and C.K.) to elicit unknown treatments and validate answers.

Treatment satisfaction was documented on a 5-point Likert scale (1 = very dissatisfied, 2 = dissatisfied, 3 = undecided, 4 = satisfied, 5 = very satisfied) and with the TSQM, a validated score assessing satisfaction on 4 subscales (efficacy, adverse events, convenience, and overall satisfaction) with values ranging between 0 and 100 on each subscale (0 = complete dissatisfaction, 100 = maximum satisfaction) (18). TSQM scores were calculated separately for each subscale and added to a total score with a maximum of 400 points. The Dermatology Life Quality Index (DLQI) was also part of the survey.

In addition, information was gathered on psoriatic arthritis (arthralgia: yes/no, suspected psoriatic arthritis: yes/no, prior physician-based diagnosis of psoriatic arthritis: yes/no). If participants reported arthralgia or suspected psoriatic arthritis, Classification of Psoriatic Arthritis criteria were applied to verify the diagnosis (19). The Psoriasis Area and Severity Index (PASI) was assessed by 2 of the investigators (M.-L.S. and C.K.).

Statistical analyses

Subgroup analyses investigating the association of the current treatment modality with satisfaction on a 5-point scale or on the TSQM score and its subscales were performed with ANOVA (analysis of variance) followed by Fisher's Least Significant Difference (LSD) *post hoc* tests, using SPSS software. To achieve normal distribution the satisfaction score and TSQM were squared transformed. Participants treated with a combination of modalities were only included in the category of the "more intense" treatment. The category "topical therapy" only comprised respondents on mere topical treatment.

Multivariate linear regression analysis was performed to estimate association of gender, age, PASI, DLQI, disease duration, psoriatic arthritis, number of systemic therapies and the current treatment modality with TSQM. The TSQM was defined as dependent variable; age (in years), gender, PASI, DLQI, disease duration (in years), psoriatic arthritis (yes/no), treatment modalities (topical treatment, phototherapy, traditional systemic therapy, biologicals) and the number of different systemic antipsoriatic medications ever obtained were independent variables. A standardised regression coefficient β was calculated for each independent variable, indicating the amount of change in TSQM when varying the respective variable while holding the others constant.

Two-factorial ANOVAs were performed to verify effects of gender, age, PASI, DLQI, disease duration, psoriatic arthritis and the type of current treatment on satisfaction i.e., 2 (characteristics of each binary variable) \times 4 (topical, phototherapy, traditional systemic, or biological therapy). For bivariate analyses, participants were grouped according to gender, age (<50 or \geq 50 years), PASI (0–5 or >5), DLQI (0–5 or >5), disease duration (0–10 or >10 years) and presence or absence of psoriatic arthritis.

Subgroup analyses regarding satisfaction with specific systemic medications were conducted with ANOVA followed by

LSD *post hoc* tests. For these analyses, participants with combinations of traditional systemic therapies and/or biologicals and/or phototherapy were grouped into the category "combination therapy". Details on the combinations prescribed are shown in Table S1¹. Respondents on infliximab-methotrexate combinations were grouped into the category "infliximab", because infliximab was routinely prescribed together with low dose methotrexate to prevent antibody formation. Combinations with topical treatment were not considered, because the majority of participants (76.5%) applied topical agents including moisturising skin care products with urea. Satisfaction with alitretinoin and golimumab was not assessed separately, since too few participants currently received these medications ($n=4$ or $n=3$).

Subgroup analyses comparing the best treatment ever obtained by participants with and without psoriatic arthritis were performed with χ^2 test or with Fisher's Exact Test for small numbers of participants within subgroups.

Significance was always assumed at $p \leq 0.05$.

RESULTS

Of the 239 patients who were asked to participate, 29 (12.1%) declined, and 10 were excluded because they did not meet study criteria. Two hundred participants with moderate-to-severe psoriasis completed the survey (Table I).

Since virtually all participants (99%) received antipsoriatic treatment at the time of study participation, the mean PASI was relatively low (3.4). The mean DLQI was 6.2, reflecting moderate disease-related quality of life impairment (see Table I).

Eighteen percent of the respondents currently received exclusively topical therapy, 10% phototherapy, 37.5% traditional systemic medications and 43.5% biologicals (Table II). Overall, satisfaction with the currently prescribed treatment was relatively high (mean TSQM = 298.2; see Table I).

Associations of the current treatment modality with satisfaction

Among participants currently obtaining biologicals, 51.7% stated very high treatment satisfaction (5 on the Likert scale), compared to 36.1% treated with traditional systemic medications, 7.7% with phototherapy and 8.1% with topical therapy ($p < 0.001$, $\chi^2 = 54.33$, Fig. 1A). Mean satisfaction was 4.34, 4.08, 3.62 and 3.14 for biologicals, traditional systemic medications, phototherapy and topical treatment ($p < 0.001$ in ANOVA; for pair-wise comparisons with *post hoc* tests, see Fig. 1B).

TSQM scores >300 were reported by 66.7% of the respondents currently treated with biologicals, 44.3% with traditional systemic medication, 30.8% with phototherapy and 27% with exclusive topical treatment

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Table I. Characteristics of the study cohort

Category	
Gender	
Female, n (%)	85 (42.5)
Male, n (%)	115 (57.5)
Age	
Mean (standard deviation)	50.8 (14.1)
Median (min–max; interquartile range)	51 (18–84; 17.8)
Psoriasis Area and Severity Index	
Mean (standard deviation)	3.4 (4.1)
Median (min–max; interquartile range)	2 (0–26.7; 4.4)
Dermatology Life Quality Index	
Mean (standard deviation)	6.2 (7.1)
Median (min–max; interquartile range)	4 (0–30; 9)
Disease duration	
Mean (standard deviation)	19.9 (13.1)
Median (min–max; interquartile range)	19.5 (1–60; 21)
Psoriatic arthritis	
Yes, n (%)	45 (22.5)
No, n (%)	155 (78.5)
Systemic therapies, n ^a	
Mean (standard deviation)	1.9 (1.5)
Median (min–max; interquartile range)	2 (0–8; 2)
Treatment satisfaction ^b	
Mean (standard deviation)	4 (1)
Median (min–max; interquartile range)	4 (1–5; 1)
Treatment Satisfaction Questionnaire for Medication score (range: 0–400)	
Mean (standard deviation)	298.2 (68.3)
Median (min–max; interquartile range)	300.8 (22.9–400; 98.9)

^aNo. of systemic therapies indicates the number of different systemic antipsoriatic therapies ever used. ^bTreatment satisfaction was assessed on a 5-point scale (1 = very dissatisfied, 2 = dissatisfied, 3 = indifferent, 4 = satisfied, 5 = very satisfied).

($p=0.001$, $\chi^2=28.08$, Fig. 1C). Mean TSQM scores were 323.3, 288.0, 260.6, and 266.8 for biologicals, traditional systemic treatments, phototherapy and topical treatments, respectively ($p<0.001$ in ANOVA, Fig. 1D). *Post hoc* tests indicated significantly higher TSQM scores in the subgroup treated with biologicals compared to all other subgroups ($p=0.002$, $p=0.001$ or $p<0.001$), and with traditional systemic therapy compared to topical treatment ($p=0.04$).

Table II. Treatment experience

	Current n (%)	Treatments ever used, n (%)	Maintenance % ^c
Topical therapy ^a	153 (76.5)	194 (97)	NA
Topicals exclusively	37 (18.5)	10 (5) ^a	
Phototherapy	20 (10)	160 (80)	NA
UVB 311	14 (7)	87 (43.5)	
Topical PUVA	6 (3)	77 (38.5)	
Systemic PUVA	0 (0)	28 (14)	
Broad band UVB/SUP	1 (0.5)	31 (15.5)	
Excimer laser	0 (0)	5 (2.5)	
Other/unknown ^b	0 (0)	7 (3.5)	
Traditional systemic therapy	75 (37.5)	153 (76.5)	
Acitretin	7 (3.5)	31 (15.5)	22.6
Fumaric acid esters	32 (16)	91 (45.5)	35.2
Methotrexate	32 (16)	93 (46.5)	34.4
Cyclosporine	0 (0)	13 (6.5)	0
Leflunomide	0 (0)	2 (1)	0
Alitretinoin	4 (2)	8 (4)	50
Other ^c	0 (0)	3 (1.5)	0
Biologicals	87 (43.5)	92 (46)	
Infliximab	14 (7)	19 (9.5)	73.7
Etanercept	8 (4)	23 (11.5)	34.8
Adalimumab	37 (18.5)	55 (27.5)	67.3
Golimumab	3 (1.5)	4 (2)	75
Ustekinumab	26 (13)	28 (14)	92.9
Other/unknown ^d	0 (0)	7 (3.5)	0

^aThis category also applies to moisturising products with urea. ^bThree participants stated prior phototherapy with light comb, 4 did not recall which kind of phototherapy they had received. ^cOne had previously obtained systemic corticosteroids, a second mycophenolate mofetil and a third could not remember the kind of systemic treatment. ^dSeven had previously been treated with another biological (alefacept: $n=1$, efalizumab: $n=5$, unknown: $n=1$). ^eThe maintenance rate was calculated as the proportion of participants still on treatment with a specific systemic medication. It was not assessed (NA) for topicals and phototherapy since these modalities are often applied intermittently.

PUVA: psoralen plus UVA; SUP: selective ultraviolet phototherapy.

TSQM subscores for efficacy, adverse events, convenience and global satisfaction are presented in Table SII¹. As expected, satisfaction with efficacy was highest for biologicals ($p<0.001$, $p=0.004$ or $p=0.006$ vs.

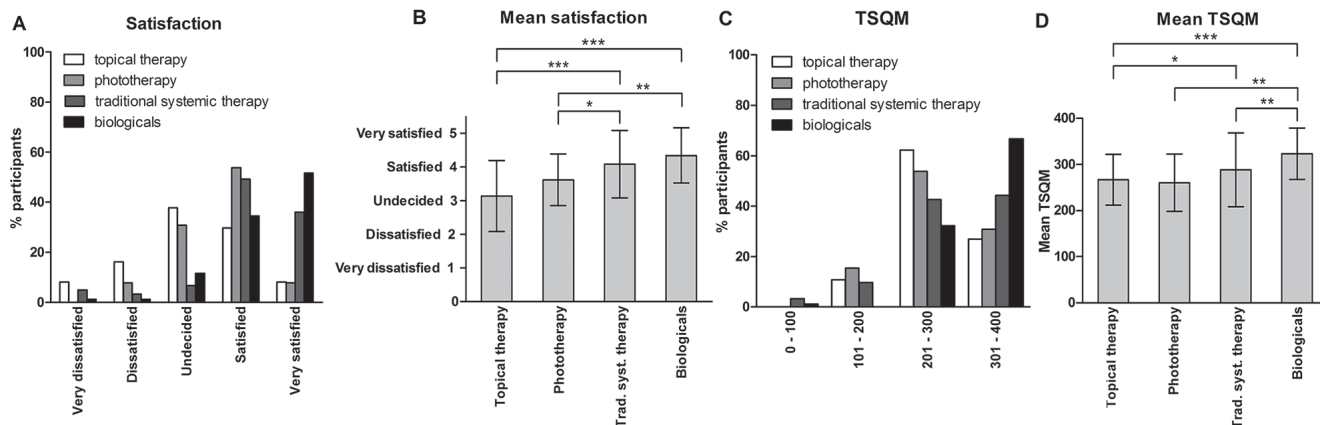


Fig. 1. Satisfaction with currently prescribed therapies. (A) Satisfaction assessed by choice between 5 categories from 'very dissatisfied' to 'very satisfied'. (B) Mean satisfaction levels indicated significantly lower satisfaction with topical therapy and phototherapy than with traditional systemic therapy or biologicals. (C) Treatment Satisfaction Questionnaire for Medication (TSQM) scores of participants on various therapy. (D) Mean TSQM scores for biologicals were significantly higher than for all other modalities. * $p\leq 0.05$, ** $p\leq 0.01$, *** $p\leq 0.001$. Bars: Means with standard deviations.

topical, photo- or traditional systemic therapy in *post hoc* tests). Satisfaction with adverse events was best for topical therapy ($p=0.008$ vs. traditional systemic therapy), followed by biologicals ($p=0.009$ vs. traditional systemic therapy) and phototherapy ($p=0.009$ vs. traditional systemic therapy). Scores for convenience were highest for biologicals ($p<0.001$ or $p=0.004$ vs. topical or phototherapy) and traditional systemic medications ($p=0.004$ or $p=0.017$ vs. topical or phototherapy). Global satisfaction was greatest with biologicals ($p<0.001$ vs. topical and phototherapy, $p=0.003$ vs. traditional systemic therapy), followed by traditional systemic medication ($p<0.001$ vs. topical therapy).

Multivariate regression analysis controlling for age, gender, disease severity, disease duration and number of previous systemic therapies confirmed greater satisfaction with biologicals compared to mere topical therapy, phototherapy, or traditional systemic therapy (Table SIII¹). Higher disease-related life quality impairment was significantly associated with lower TSQM, and respondents with psoriatic arthritis were less satisfied with their current treatment than others.

Subgroup analyses within treatment modalities

For bivariate analyses, participants were grouped according to gender, age, PASI, DLQI, disease duration and presence or absence of psoriatic arthritis. Two-factorial ANOVAs demonstrated a main effect of the type of current therapy on TSQM (all p -values <0.001). Additional significant main effect revealed higher TSQM values for the lower DLQI group ($p<0.001$), and for the absence of psoriatic arthritis ($p=0.009$).

Post hoc tests comparing TSQM scores of the different treatment modalities revealed that participants aged ≥ 50 years were significantly more satisfied with topical treatment than younger ones and respondents with PASI ≤ 5 were more satisfied with traditional systemic treatment than those with higher PASI (Table SIV¹). Participants with psoriatic arthritis were less satisfied with traditional systemic medications and biologicals than others.

Satisfaction with specific systemic medications

When satisfaction with specific systemic medications currently taken was measured on a 5-point scale, respondents indicated greatest satisfaction with ustekinumab (4.80), followed by acitretin (4.50), adalimumab (4.33), fumaric acid esters (4.17), infliximab and etanercept (both 4.0), combination therapy (3.91) and methotrexate (3.88; $p=0.005$ in ANOVA; for pair-wise *post hoc* tests, see Fig. S1A¹). Correspondingly, the highest mean TSQM score was documented for ustekinumab (350.1), followed by acitretin (338.1), adalimumab (323.0), fumaric acid esters (304.7), infliximab (300.2), etanercept (298.8), methotrexate (272.3), and combination therapy

(252.2; $p<0.001$ in ANOVA; for pair-wise *post hoc* tests see Fig. S1B¹). Satisfaction scores for ustekinumab and acitretin did not differ significantly.

Satisfaction with ustekinumab assessed on a 5-point scale was significantly higher in participants without arthritis compared to those with arthritis (Fig. S1C¹). By contrast, infliximab was rated significantly better by participants suffering from arthritis. Comparison of TSQM scores confirmed higher satisfaction with ustekinumab in the absence of arthritis, although differences between participants with and without arthritis were not significant (Fig. S1D¹). TSQM scores for the specific systemic medications in the subscales efficacy, adverse events, convenience and global satisfaction are shown in Table SII¹.

Most preferred treatment ever received

When asked for the best treatment ever prescribed, only 11.8% of the participants experienced with topical medications indicated topical treatment as most preferred option. Of the participants who ever treated with phototherapy, 15.4% were most satisfied with this modality, and 39.9% of the respondents experienced with traditional systemic treatment preferred this option over all others (Table SV¹). Remarkably, 93.5% of the participants experienced with biologicals considered these medications as their best treatment ever. Again, ustekinumab was ranked best, followed by golimumab, infliximab and adalimumab.

Preferences were somewhat different in respondents with and without psoriatic arthritis (Table SV¹). Merely 22.5% with arthritis compared to 46.3% without arthritis rated traditional systemic medication best. Regarding biologicals, 91.7% of the participants with mere cutaneous psoriasis ranked ustekinumab best and 69.7% preferred adalimumab whereas only 57.1% favoured infliximab. However, infliximab was rated particularly well by participants with psoriatic arthritis (Table SV¹).

DISCUSSION

Comparing satisfaction of patients with moderate-to-severe psoriasis under routine clinical conditions in a German tertiary care centre, we show greatest satisfaction for biologicals, followed by traditional systemic medications. High impact of the treatment modality on satisfaction scores and greatest satisfaction with biologicals were confirmed in regression models controlling for several confounding factors. These results are well in line with several other studies (2, 11, 12, 14, 20–22) and may be attributed to the high efficacy, favourable risk-benefit profile and convenient application mode of biologicals.

Our bivariate analyses suggested that older participants were more satisfied with topical therapy than

younger ones. Older patients may be more reluctant to use systemic antipsoriatic medications because they are more likely to suffer from comorbidities and to take comedication, factors increasing the risk of adverse events (23).

Participants with psoriatic arthritis were less satisfied with traditional systemic medications and biologicals than others. Psoriatic arthritis has a severe incremental impact on physical functions and daily activities (24) and identification of an effective and sustainable medication is particularly difficult for patients with psoriasis and concomitant arthritis. Complete clearance of arthritis is rare even with highly efficient medications such as TNF antagonists (25, 26).

Data on patients' preferences for specific systemic medications are scarce and sometimes conflicting (16). In 2 studies comparing preferences for methotrexate, cyclosporine, acitretin and systemic PUVA (psoralen plus ultraviolet A phototherapy), PUVA was preferred over the other medications (8, 15). However, in another trial based on a hypothetical treatment scenario PUVA scored lowest (27). Only 2 studies compared satisfaction with specific traditional systemic medications and biologicals (11, 28). In the first study, 31% of the patients experienced with biologicals identified methotrexate as their best treatment ever, whereas 50%, 48%, 46% or 29% chose alefacept, etanercept, infliximab or efalizumab (28). In the second larger study multivariate models showed higher satisfaction for adalimumab, etanercept, ustekinumab, narrowband UVB phototherapy or a adalimumab-methotrexate combination than for methotrexate monotherapy (11).

According to our data, satisfaction was highest for ustekinumab, followed by acitretin, adalimumab, fumaric acid esters, infliximab and etanercept, while methotrexate and combination therapy obtained comparably lower scores. Ustekinumab and infliximab are more efficient than adalimumab and etanercept (29, 30), and onset of action is fastest for infliximab, followed by ustekinumab and adalimumab (31). Another major advantage of ustekinumab is its convenient application mode with subcutaneous injections only once every 12 weeks.

Among other biologicals, adalimumab had the second highest TSQM score, followed by infliximab and etanercept. However, when asked for their best treatment ever, 73.5% of the respondents chose infliximab and only 65.5% adalimumab. Taken together, preferences for adalimumab and infliximab appear to be comparable in our cohort. Preferences for etanercept were lower, most likely because it is somewhat less efficient and slower in reducing psoriasis than other biologicals (29, 31). Conflicting with our findings, Callis Duffin et al. (11) reported lower adjusted overall satisfaction with infliximab than with ustekinumab, adalimumab and etanercept.

Clearly, it has to be kept in mind when comparing satisfaction with different biologicals that ustekinumab

was approved for treatment of psoriasis some years after the TNF antagonists. It is therefore conceivable that more patients developed secondary non-response to TNF antagonists than to ustekinumab and that rates of secondary treatment failure of ustekinumab will increase during the next years. However, according to a recent study ustekinumab showed better one-year drug survival compared to etanercept and a trend towards better drug survival compared to adalimumab (32). In our cohort ustekinumab had the highest number of patients still on treatment (92.9%) whereas maintenance rates of infliximab and adalimumab were only 73.7% and 67.3%, respectively. High maintenance of ustekinumab is likely to correlate with and account for high satisfaction.

Participants with mere skin involvement were more satisfied with ustekinumab than those with arthritis whereas satisfaction with infliximab was greater in participants with arthritis. However, the number of participants with psoriatic arthritis receiving ustekinumab was very small ($n=3$), because ustekinumab has only been recently approved for psoriatic arthritis and TNF antagonists are still considered as the first choice of biologicals for this indication (25, 33–35).

Treatment satisfaction with methotrexate was relatively low in our cohort, conflicting with 2 other reports. In a study from the pre-biological era methotrexate was preferred over cyclosporine and acitretin (8). According to a EUROPSO membership survey, high satisfaction was documented more frequently for methotrexate (30%) than for cyclosporine (28%) and fumaric acid (26%) (15). Methotrexate may have PASI 75 response rates of up to 60% (5), but bears a significant risk of adverse events which are the most common reason for treatment discontinuation (36).

Contrary to other studies, we noted relatively high satisfaction with acitretin. As non-immunosuppressive drug acitretin has a favourable safety profile, but it leads to dose-dependent, sometimes disturbing adverse events (4, 5, 37). As monotherapy for plaque-type psoriasis acitretin is less efficient than other systemic medications, but it is suitable for treating palmoplantar psoriasis and palmoplantar pustulosis (37). Patients of our cohort treated with acitretin had psoriasis with severe palmoplantar involvement. Our results suggest that given the appropriate indication and patient selection, acitretin therapy may be associated with high treatment satisfaction. Notably, however, among all participants ever treated with acitretin the maintenance rate was very low (22.6%).

The retinoid alitretinoin is approved for chronic refractory hand eczema but was prescribed off label for psoriasis with palmoplantar involvement in 8 participants, half of which rated it as their best treatment ever. Palmoplantar psoriasis and palmoplantar pustulosis are often extremely refractory to treatment (38) and improvement with alitretinoin was described in

a small case series (39). Our findings suggest that in refractory patients with predominantly palmoplantar psoriasis this medication might be a worthy option. Clearly, randomised controlled trials are warranted to assess its efficacy for this indication.

Fumaric acids are the most commonly prescribed systemic antipsoriatic medication in Germany. They are approximately equally effective as methotrexate (40). Adverse events including lymphopenia, abdominal pain, diarrhoea and flush are common (41) but can often be managed with individualised dosage adjustment. Our participants reported higher satisfaction with fumarates than with methotrexate. None of the respondents currently obtained cyclosporine or systemic PUVA which are nowadays increasingly replaced by therapies with a more favourable risk-benefit profile and better suitability for long-term treatment, and only very few rated these treatments best.

Major limitations of our study are the monocentric design and the limited number of participants treated with each medication. Participants often suffered from high need psoriasis with long disease duration and a refractory course. More than three quarters were experienced with systemic treatments and almost half with biologicals. Clearly, satisfaction with topical, photo- and traditional systemic therapy may be higher among patients with milder and less refractory psoriasis. On the other hand, treatment in a specialised centre might explain the relatively high overall satisfaction.

A further limitation is that the cohort was somewhat heterogeneous. All participants suffered from moderate-to-severe psoriasis according to CHMP criteria and the vast majority had plaque psoriasis, but some presented with predominantly palmoplantar involvement. Moreover, we did not document the duration of the currently prescribed treatment, which is likely to influence satisfaction. Patient-reported satisfaction and preferences might also have been affected by recall bias, in particular, when participants were asked to indicate their most preferred treatment.

Major advantages are that satisfaction was examined under real-life clinical conditions with validated scores, and that preferences were assessed for specific systemic medications. Taken together, we show high satisfaction with biologicals, among which ustekinumab was rated best for mere cutaneous psoriasis. However, given an appropriate patient selection, satisfaction may also be good with traditional systemic medications.

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Conflict of interest: M.-L.S. conducted clinical trials for Abbvie, Merck and Eli Lilly and received financial support for participation in conferences from Abbvie, ALK-Abello, Biogen Inc., Janssen-Cilag and MSD. A.S. conducted clinical trials for Abbvie and Pfizer and obtained support for conferences from Abbvie, Janssen-Cilag and Pfizer. S.G. obtained honoraria as Editor-

in-Chief of the Journal of the German Dermatological Society (JDDG) and support for conferences from Abbvie, ALK-Abello, Alma Lasers, ARC Lasers, Asclepion, BMS, GSK, Janssen-Cilag, L'Oreal, LEO Pharma, Medac, Merck, MSD, Novartis, P&M Cosmetics, Pfizer, Roche and Stiefel. W.K.P served as investigator for Abbvie, Eli Lilly, Janssen-Cilag, Merck, Novartis and Pfizer; was member of an advisory board of MSD and Novartis; obtained honoraria from ALK-Abello, Abbvie, Janssen-Cilag, MSD and Novartis; and received support for conferences from Abbvie, ALK-Abello, Alma Lasers, ARC Lasers, Asclepion, BMS, GSK, Janssen-Cilag, L'Oreal, LEO Pharma, Medac, Merck, MSD, Novartis, P&M Cosmetics, Pfizer, Roche and Stiefel.

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