Real-world effectiveness of guselkumab in patients with psoriasis: Health-related quality of life and efficacy data from the noninterventional, prospective, German multicenter PERSIST trial

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Abstract
Psoriasis is a common, chronic inflammatory skin disorder negatively impacting health-related quality of life (HRQoL). Guselkumab, targeting interleukin-23 (IL-23), is an approved biologic therapy for psoriasis. PERSIST is an ongoing prospective, noninterventional, long-term, German multicenter study evaluating the effect of guselkumab on HRQoL, and its efficacy and safety in patients with moderate-to-severe psoriasis in a real-world setting. The primary endpoint is the proportion of patients with a Dermatology Life Quality Index (DLQI) score ≤ 1 at week 28. Of 303 patients enrolled and treated with guselkumab, mean age and disease duration were 49.7 and 21.0 years, respectively, and 51.2% (n = 155) of patients had received ≥1 prior biologic therapy. Mean baseline DLQI score was 13.7, and mean symptom and sign scores in the Psoriasis Symptoms and Signs Diary (PSSD) were 51.9 and 60.8, respectively. Baseline Psoriasis Area Severity Index (PASI) and body surface area (%) scores were 16.4 and 27.5. Following 28 weeks of guselkumab treatment, the mean DLQI score decreased to 2.8, and 56.8% of patients (n = 150) achieved DLQI ≤ 1. Mean PSSD symptom and sign scores also improved, decreasing to 12.5 and 15.9, respectively. At week 28, PASI 90 response was 55.3%; significant improvement was observed in patients with psoriasis in difficult-to-treat areas. Overall, analyses demonstrated that guselkumab was effective in the real-world setting, as measured by HRQoL and skin improvements, even in patients with a high burden of disease and those who have received multiple biologic therapies. No new safety signals were observed.

KEYWORDS
anogenital, guselkumab, palmoplantar, psoriasis, quality of life, RWE, scalp
1  |  INTRODUCTION

Psoriasis is a chronic inflammatory skin disease with a prevalence of 2%–4% in Europe, and 2.5% in Germany. Plaque psoriasis is the most frequent type, comprising more than 80% of all cases. Patients with moderate-to-severe psoriasis have an increased risk of developing comorbidities; as such, they usually require continuous therapy to limit the impact of the disease on health-related quality of life (HRQoL), including anxiety and depression. However, severity of psoriasis is not a reliable predictor of the severity of psychological distress, disability, or impact on HRQoL. Therefore, patient-reported outcomes (PROs) play a critical role during treatment evaluation. The Dermatology Life Quality Index (DLQI), which evaluates patient perception of the impact of skin disease on HRQoL, and the Psoriasis Symptoms and Signs Diary (PSSD) are key tools for conducting patient-centric evaluations.

With increased understanding of the pathophysiology of psoriasis, several biologic therapies have been developed. Guselkumab, a fully human monoclonal antibody that binds to the p19 subunit of interleukin-23 (IL-23), was approved in Europe in November 2017 for the treatment of moderate-to-severe psoriasis based on its significant superior efficacy versus placebo in the phase 3 double-blind VOYAGE 1 and VOYAGE 2 studies. Long-term efficacy and safety with guselkumab treatment have since been demonstrated in these studies, as well as in the phase 3 double-blind, head-to-head ECLIPSE study versus secukinumab. However, patients treated in randomized controlled trials (RCTs) have often received fewer previous therapies and have fewer comorbidities than patients in the real-world setting. Therefore, PROs and real-world data from post-marketing studies and international or local registries are of great interest to the scientific community, providing crucial data in patients typically excluded from RCTs.
PERSIST is a noninterventional study investigating the effect of guselkumab and ustekinumab treatment on HRQoL, and their long-term efficacy and safety in patients with moderate-to-severe psoriasis, in routine clinical practice. This publication focuses on patients treated with guselkumab, at week 28.

2  |  METHODS

2.1  |  Study design

PERSIST is an ongoing, prospective, noninterventional, multicenter study investigating the impact of guselkumab and ustekinumab on HRQoL, and the long-term efficacy and safety of these treatments in a real-world setting, in patients with moderate-to-severe plaque psoriasis. First planned and started in 2016 with ustekinumab-treated patients, a study amendment was approved in January 2018 to also evaluate patients treated with guselkumab. The 2-year study is being conducted at 56 German sites, in accordance with the International Conference on Harmonisation Good Clinical Practice (ICH-GCP) guidelines and with approval from the respective Research Ethics Committees. All patients provided written informed consent.

2.2  |  Patients

Patients enrolled in PERSIST were ≥18 years old and had a diagnosis of moderate-to-severe plaque psoriasis for ≥2 years. All patients included in this analysis were prescribed guselkumab based on the treating physician’s decision as per routine clinical practice, and according to the approved label. See Supporting Information for exclusion criteria.

2.3  |  Endpoints and assessments

The primary endpoint was the proportion of patients with a DLQI score ≤ 1 at week 28. The DLQI comprises 10 questions that evaluate the impact of skin disease on the patient’s life during the previous week, providing a score ranging from 0 to 30, where 0–1 indicates no effect on quality of life. Secondary endpoints included PSSD, Psoriasis Area Severity Index (PASI) and body area-specific Physician’s Global Assessment (PGA) outcomes at week 28. The PSSD allows patient self-evaluation of symptoms and signs of psoriasis on a scale of 0–10, with higher scores indicating greater severity (see Supporting Information for additional assessment details).

Patients will be evaluated for 2 years, until consent withdrawal, or until beginning another systemic treatment for psoriasis. Concomitant medications for psoriasis (excluding biologic therapy) were permitted. Safety was assessed at data cut-off (28 January 2020) by evaluating adverse events (AEs) using terms as defined by Medical Dictionary for Regulatory Activities (MedDRA v20.0). Assessments were conducted on the full analysis population, comprising all patients treated with guselkumab, using available data without imputing missing values.

2.4  |  Statistical analysis

A study sample size of ≥300 patients was selected for the group receiving guselkumab, consistent with the size of the ustekinumab study (see Supporting Information).

3  |  RESULTS

3.1  |  Patients

Between January 2018 and May 2019, 303 patients were enrolled into PERSIST following routine prescription of guselkumab. There were 24 (7.9%) patient withdrawals before week 28, six (2.0%) because of AEs. At week 0, 100.0% (n = 303/303) of planned patients (number of patients in the full analysis set – number of discontinuations before a given visit) received a dose of guselkumab; this was 97.7% (n = 292/299) at week 4, 96.2% (n = 278/289) at week 12, and 93.5% (n = 261/279) at week 28.

At baseline, patient mean age was 49.7 years and mean duration of disease was 21.0 years (Table 1). The mean DLQI score was...
13.7, and the mean (PSSD) symptom and sign scores were 51.9 and 60.8, respectively. Mean PASI score was 16.4 and mean body surface area (BSA) was 27.5%. Scalp psoriasis (PGA ≥ 1) was observed in 79.1%, palmoplantar psoriasis (PGA ≥ 1) in 34.4%, and anogenital psoriasis (PGA ≥ 1) in 51.0% of patients. Nail psoriasis (target Nail Psoriasis Severity Index [NAPSI] ≥ 1) was present in 51.0% of patients. Nail psoriasis served in 79.1%, palmoplantar psoriasis (PGA ≥ 1) in 34.4%, and

### 3.2 | Patient-reported outcomes

At week 28, 56.8% (n = 150) of patients receiving guselkumab achieved the primary endpoint of a DLQI score ≤ 1 (Figure 1a). Mean DLQI score decreased from 13.7 at baseline to 3.6 (95% confidence interval [CI] 3.0–4.2) by week 16 and to 2.8 (95% CI 2.3–3.2) by week 28 (Figure 1b). In analyses of patients who had baseline PGA scores ≥ 2 for area-specific psoriasis, similar improvements were observed in mean DLQI scores over time, with a score of ≤ 1 at week 28 achieved by 58.0% (n = 101) of patients with scalp psoriasis, 51.3% (n = 39) with palmoplantar psoriasis, 52.5% (n = 53) with anogenital psoriasis, and 56.4% (n = 66) with nail psoriasis (Figure 2).

Coinciding with improvements in DLQI, the mean PSSD symptom score decreased from 51.9 at baseline to 12.5 (95% CI 10.3–14.7) at week 28, whereas the mean sign score decreased from 60.8 to 15.9 (95% CI 13.5–18.3; Figure S1a). Among patients who had PSSD scores ≥ 1 for itch, pain or scaling at baseline, the mean reductions in these item scores were −4.6 (n = 244), −4.4 (n = 210), and −5.1 (n = 242), respectively, each meeting the criteria for clinically meaningful improvement (≥4-point reduction).18 Within this group, the proportion of patients achieving a score of 0 was 35.7% (n = 87) for itch, 65.2% (n = 137) for pain, and 37.2% (n = 90) for scaling; patients who achieved a PSSD score of 0 for these individual items were more likely to have a DLQI score of ≤ 1 versus > 1 (Figure 3).

### 3.3 | Efficacy outcomes

Guselkumab treatment led to marked PASI responses, reducing mean PASI from 16.4 (n = 303) at baseline to 3.0 (n = 266, 95% CI 2.3–3.6) by week 28 (Supporting Information Table S1). The proportion of patients with a PASI score ≤ 5 increased over time, from 8.6% at baseline to 36.8% at week 4 and 83.1% by week 28. After

### Abbreviations: BMI, body mass index; BSA, body surface area; CI, confidence interval; DLQI, Dermatology Life Quality Index; NAPSI, Nail Psoriasis Severity Index; PGA, Physician’s Global Assessment; PASI, Psoriasis Area Severity Index; PGA, Phototherapy; PSSD, Psoriasis Symptoms and Signs Diary; SD, standard deviation.

### Table 1 Baseline characteristics of patients in PERSIST

| Characteristic | Total |
|----------------|-------|
| Mean age; years (SD), n = 303 | 49.7 (13.8) |
| Gender; n (%), n = 303 | |
| Male | 193 (63.7) |
| Female | 110 (36.3) |
| Mean age at first diagnosis; years (SD), n = 303 | 28.7 (14.6) |
| Mean duration of psoriasis; years (SD), n = 303 | 21.0 (14.0) |
| Mean BMI; kg/m² (SD), n = 252 | 29.7 (6.3) |
| Reason for switching to guselkumab; n (%), n = 303 | |
| Insufficient efficacy/loss of efficacy | 239 (78.9) |
| Intolerance | 47 (15.5) |
| Contraindication | 4 (1.3) |
| Other | 13 (4.3) |
| Mean PASI (95% CI), n = 303 | 16.4 (15.2–17.6) |
| Mean BSA; % (95% CI), n = 302 | 27.5 (25.2–29.8) |
| Mean DLQI (95% CI), n = 299 | 13.7 (12.8–14.5) |
| PSSD, n = 294 | |
| Symptom; mean (SD) | 51.9 (25.9) |
| Sign; mean (SD) | 60.8 (22.4) |
| Psoriatic arthritis; n (%), n = 303 | 84 (27.7) |
| Scalp PGA ≥ 1; n (%), n = 302 | 239 (79.1) |
| Palmoplantar PGA ≥ 1; n (%), n = 302 | 104 (34.4) |
| Anogenital PGA ≥ 1; n (%), n = 300 | 153 (51.0) |
| Target NAPSI ≥ 1; n (%), n = 297 | 136 (45.8) |
| Prior psoriasis therapy; n (%), n = 303 | |
| Conventional systemic | 234 (77.2) |
| Fumaric acid esters | 158 (52.1) |
| Methotrexate | 151 (49.8) |
| Cyclosporin | 39 (12.9) |
| Acitretin | 12 (4.0) |
| Other | 19 (6.3) |
| Biologic | 155 (51.2) |
| Secukinumab | 66 (21.8) |
| Adalimumab | 65 (21.5) |
| Ustekinumab | 48 (15.8) |
| Etanercept | 34 (11.2) |
| Ixekizumab | 16 (5.3) |
| Infliximab | 14 (4.6) |
| Brodalumab | 13 (4.3) |
| Other | 14 (4.6) |
| Topical | 93 (30.7) |
| Phototherapy | 73 (24.1) |
| Prior biologic therapies; n (%), n = 303 | |
| 0 | 148 (48.8) |
| 1 | 80 (26.4) |
| 2 | 43 (14.2) |
| ≥3 | 32 (10.6) |
28 weeks of treatment, 79.7% and 50.8% of patients had PASI scores of ≤ 3 and ≤ 1, respectively (Figure 4a). By week 28, 76.7%, 55.3%, and 28.9% of patients achieved a PASI 75, PASI 90, and PASI 100 response, respectively. Of note, a higher proportion of biologic-naïve patients (n = 133) achieved PASI 75 (89.5% vs 63.9%), PASI 90 (69.9% vs 40.6%), and PASI 100 responses (39.1% vs 18.8%), compared with patients previously treated with biologic therapy (n = 133; Figure 4b).

Of patients who reported PsA at baseline, PASI 90 was achieved by 65.3% (n = 47) and PASI 100 by 34.7% (n = 25) at week 28. By comparison, PASI 90 was achieved by 51.5% (n = 100) and PASI 100 by 26.8% (n = 52) of patients without PsA at baseline at week 28. PASI response was also evaluated according to baseline body mass index (BMI); at week 16, PASI 90 was achieved by 57.4% (n = 31) of patients with a BMI < 25, but only by 29.1% (n = 30) with a BMI > 30. PASI 90 response rates increased to 63.3% (n = 31) and 44.4% (n = 44), respectively, at week 28 (Figure S2).

In line with PASI responses, progressive improvement was observed in patients with difficult-to-treat psoriasis. Among those with an area-specific PGA score ≥ 2 at baseline, severe involvement of the scalp, palmoplantar, and anogenital regions was observed in 23.5% (n = 47/200), 18.5% (n = 15/81), and 9.3% (n = 11/118) of patients, respectively (Figure 5). By week 28, the proportions of patients with severe scalp, palmoplantar, and anogenital psoriasis had decreased to 1.1% (n = 2/177), 1.3% (n = 1/76), and 0%, respectively. Moreover, complete or almost complete clearance (PGA ≤ 1) was achieved at week 28 by 87.0% (n = 154), 85.6% (n = 65), and 84.3% (n = 86) of patients with scalp, palmoplantar, and anogenital psoriasis, respectively, among those with a baseline PGA score ≥ 2 (Figure 5). Improvement in target NAPSI was also observed, with a reduction in mean score from 4.2 (95% CI 3.8–4.6) at baseline to 1.7 (95% CI 1.3–2.1) at week 28, a relative mean change of −58.8% (95% CI −67.7, −49.9).

### 3.4 Safety outcomes

Thirty-nine patients (12.9%) experienced at least one treatment-related AE. Most AEs were mild or moderate (Table 2). The most common treatment-related AEs were viral upper respiratory tract infection (2.6%), diarrhea (1.3%), and pruritus (1.3%). AEs leading to treatment discontinuation were reported for six patients (2.0%; Supporting Information Table S2). Treatment-related serious AEs occurred in three patients (1.0%) and included one case (0.3%) each of Epstein–Barr virus infection, malignant neoplasm, and pemphigoid.

No patients died during the study and no myocardial infarctions were observed. One patient (0.3%) experienced a cerebrovascular accident and one patient (0.3%) experienced a transient ischemic attack.

### 4 DISCUSSION

PERSIST provides a comprehensive real-world assessment of guselkumab treatment in Germany from a patient-centric perspective. Most patient baseline characteristics, including mean age, gender ratio, BMI, disease duration, DLQI, and PASI, were similar to those reported by the German psoriasis registry PsoBest, indicating that PERSIST is representative of the psoriasis population receiving systemic treatment in Germany.

However, some differences in baseline characteristics were noted between patients in PERSIST and those in VOYAGE 1 and 2 and ECLIPSE (Supporting Information Table S3). These
differences are likely related to the different study types, i.e. real-world evidence (RWE) versus RCTs. In RWE studies such as PERSIST, elderly patients and those previously treated with multiple therapies are more likely to be included than in RCTs. VOYAGE 1 and 2 included three study arms (guselkumab, placebo, and adalimumab), whereas ECLIPSE was a head-to-head comparison of guselkumab versus secukinumab. The VOYAGE studies excluded patients previously treated with adalimumab or guselkumab, and ECLIPSE excluded patients who had received secukinumab or guselkumab. In addition, patients in PERSIST were older than those in the guselkumab groups of VOYAGE 1 and 2 and ECLIPSE (mean age 49.7 vs 43.9, 43.7, and 46.3 years, respectively), and also had a slightly longer duration of disease (mean 21.0 vs 17.9, 17.9, and 18.5 years, respectively).11,12,15 In addition, more patients in PERSIST had previously received conventional systemic (77.2% of patients vs 63.8%, 66.7%, and 52.0%, respectively) or biologic therapies (51.2% vs 21.6%, 20.4%, and 29.0%, respectively), compared with patients in VOYAGE 1 and 2 and ECLIPSE. Consequently, many patients in PERSIST were treated with guselkumab as a later treatment line for psoriasis, and enrolled into PERSIST following guselkumab approval in 2017.

In PERSIST, a clinically meaningful improvement in DLQI score was observed following guselkumab treatment, which aligns with findings from other RWE studies of guselkumab.20,21 In a study by

**FIGURE 2** Percentage of patients achieving given thresholds of mean DLQI scores at baseline, week 16, and week 28 following guselkumab treatment in patients with scalp, palmoplantar, anogenital or nail psoriasis. Patients with scalp, palmoplantar or anogenital psoriasis had a baseline PGA score ≥ 2. A DLQI score of 0–1 represents no effect of psoriasis on quality of life; 2–5, small effect; 6–10, moderate effect; 11–20, very large effect; 21–30, extremely large effect. Patient numbers at each time point are approximate values, as visits were adapted to routine clinical practice. DLQI, Dermatology Life Quality Index; PGA, Physician’s Global Assessment; W, week. [Color figure can be viewed at wileyonlinelibrary.com]

**FIGURE 3** Percentage of guselkumab-treated patients achieving DLQI ≤ 1 or > 1 at week 28 who have PSSD scores of 0 for itch, scaling or pain. Data for itch, scaling, and pain are all significant (**p < 0.001, Fisher’s exact test). DLQI, Dermatology Life Quality Index; PSSD, Psoriasis Symptoms and Signs Diary.
Fougerousse et al., mean DLQI score decreased from 11.4 at baseline to 2.3 at week 16. In addition, a similar proportion of patients in PERSIST achieved a DLQI score of 0–1 (56.8% by week 28) as in VOYAGE 1 (60.9%) and 2 (57.6%) at week 24. In PERSIST, improvements in DLQI score were also observed over time in patients with psoriasis in difficult-to-treat areas, which can profoundly impact on HRQoL. PERSIST is the first real-world study to report on the effectiveness of guselkumab on HRQoL in patients with anogenital psoriasis, an indication that is particularly debilitating because sexual functioning is impacted in up to 90% of patients with genital psoriasis. Moreover, psoriasis patients with anogenital involvement have significantly greater treatment needs than those without. Findings from PERSIST may further support the effectiveness of guselkumab in patients who have a high burden of disease and impaired quality of life caused by psoriasis in difficult-to-treat areas. Improvement in PSSD scores was also observed in PERSIST, with mean changes consistent with both VOYAGE studies. However, although baseline single-item scores in PERSIST and VOYAGE 1 were similar, the proportions of patients achieving a PSSD score of 0 (among those with a baseline score ≥ 1) differed (35.7% vs 40.9% for itch, 65.2% vs 56.9% for pain, and 37.2% vs 47.3% for scaling in PERSIST [week 28] and VOYAGE 1 [week 24], respectively). Overall, guselkumab-treated patients reported improvements in symptoms and signs, as well as HRQoL, demonstrating its effectiveness even in a population that has received previous biologic therapies.

Although the PASI 90 response rate in PERSIST (55.3% at week 28) was not as high as that observed in two smaller RWE studies, where PASI 90 was achieved by 72.5% (N = 5227 and approximately 70.0% (N = 55)21 of patients at week 28, it was similar to three other guselkumab RWE studies, where PASI 90 was achieved by 50.6% (N = 180)20 and 55.4% (N = 112)28 of patients at week 16, and 62.0% (N = 29)29 of patients at week 24. However, the PASI 90 response rate was greater in VOYAGE 1 and 2 (at week 24) and ECLIPSE (at week 48), in which 80.2%, 75.2%, and 84.0% of patients achieved PASI 90, respectively.11,12,15

As previously discussed, baseline patient characteristics could account for differences in response between PERSIST and RCTs. In particular, a greater proportion of patients had received conventional systemic and biologic therapies; notably, such patients were less likely to achieve PASI 90 response (Figure 4b), a finding also observed in the RWE study by Galluzzo et al.27 Other patient characteristics could account for the lower PASI response in PERSIST compared with other studies, including lower baseline PASI score (16.4 vs 20.0–22.1, respectively).11,12,15,27 Analyses of data from the PsO-Reg registry determined that a high absolute PASI score before biologic treatment is associated with a higher PASI response. A higher baseline value increases the likelihood of achieving relative endpoints, even if the absolute value remains high after treatment. PERSIST also had a greater proportion of patients with ≥1 comorbidity compared with RCTs (e.g. 27.7% vs 17.9%–19.5% patients with PsA, respectively),11,12,15 and this can negatively impact PASI response and drug survival. The PSO-BIO-REAL study – a large multinational RWE study that examined the impact of biologic therapies (excluding IL-23 inhibitors) on skin clearance – demonstrated that 46.0% of patients without comorbidities achieved at least a PASI 90 response following biologic therapy versus 31.0% of patients with just one comorbidity. Nevertheless, the presence of PsA in patients in PERSIST did not appear to hinder the ability to achieve a PASI 90 or 100 response. Lastly, an association between PASI response and BMI was observed in PERSIST; patients with a BMI < 25 were more likely to achieve a PASI 90 response than patients with a BMI > 30. Indeed, obesity is reported to be a negative prognostic factor for
achieving a clinical response with treatment of psoriasis.\textsuperscript{33,34} Factors not related to patient baseline characteristics may also contribute to the lower PASI response observed in PERSIST compared with RCTs. For example, patient adherence to treatment in real-world practice may be reduced when compared with a clinical trial setting.

Following guselkumab treatment, high levels of improvement in PGA score were observed in difficult-to-treat anatomical regions, consistent with improvements in DLQI score. Although not directly comparable because of the different assessments used, improvement in scalp psoriasis among patients in PERSIST was similar to that observed in the VOYAGE studies; 85.6% and 85.3% of patients who had a baseline Investigator’s Global Assessment (IGA) score ≥ 2 in VOYAGE 1 and 2, respectively, achieved scalp IGA 0–1 (at week 24),\textsuperscript{11,12} whereas 87.0% of patients who had a baseline PGA score ≥ 2 in PERSIST achieved scalp PGA 0–1 (week 28). Similarly, the proportion of patients with palmoplantar psoriasis (PGA ≥ 2 at baseline) who achieved a PGA ≤ 1 in PERSIST was similar to that observed for patients with hand and foot involvement of psoriasis in the VOYAGE studies (85.6% at week 28 vs 78.9% and 81.6% [hand-foot (hf)-PGA 0–1] at week 24 in VOYAGE 1 and 2, respectively), although differences in these assessments limit interpretation of this comparison.\textsuperscript{11,12} The mean percent improvement in NAPSI score in PERSIST at week 28 was greater than in VOYAGE 1 and 2 at week 24 (58.8 vs 49.8 and 55.0, respectively).

Overall, guselkumab was well tolerated and had a favorable safety profile among patients with moderate-to-severe plaque psoriasis treated during routine clinical practice in a real-world setting; no new safety signals were detected. Most of the treatment-related
AEs were mild or moderate in severity, were consistent with those observed in the VOYAGE 1, VOYAGE 2, and ECLIPSE studies, and occurred at a similar or lower rate.13,15,35

The limitations of PERSIST include the lack of a comparator study arm. A comparison between outcomes for guselkumab and ustekinumab, noting limitations pertaining to differences in time periods when patients were treated, may be considered in future analyses of PERSIST data. In addition, as PERSIST is a German registry, the results may not be generalizable to patients in other countries.

In conclusion, guselkumab has a positive impact on both physician-assessed and patient-reported outcomes in real-world use. Guselkumab is efficacious and well tolerated, even for patients who have received several previous biologic therapies or have psoriasis in difficult-to-treat areas. While the data presented here provide important insights, longer-term data from PERSIST and other sources will expand understanding of the real-world performance profile of guselkumab for treatment of psoriasis.

CONFLICTS OF INTEREST

S.G. was an advisor and/or received speakers’ honoraria and/or received grants and/or participated in clinical trials of the following companies: AbbVie, Affibility AB, Akari Therapeutics Plc, Almirall-Hermal, Amgen, AnaptysBio, AstraZeneca AB, Baxalta, Bayer Health Care, Biogen Idec, Bioskin, BMS, Boehringer Ingelheim, Celgene, Centocor, Dermira, Eli Lilly, Foamix, Forward Pharma, Galderma, Hexal AG, Incyte Inc., Isoteknika, Janssen-Cilag, Johnson & Johnson, Kymab, LEO Pharma, Medac, Merck Serono, Mitsubishi Tanabe, Mölnlycke Health Care, MSD, Neubourg Skin Care GmbH, Novartis, Pfizer, Polchem SA, Principia Biopharma, Regeneron Pharmaceutical, Sandoz Biopharmaceuticals, Sanofi-Aventis, Schering-Plough, Sienna Biopharmaceuticals, Takeda, Teva, Trevi Therapeutics, UCB Pharma, and Vascular Biogenics. B.B. was an advisor and/or received speakers’ honoraria and/or received grants and/or participated in clinical trials of the following companies: AbbVie, Almirall, Amgen, Boehringer Ingelheim, Eli Lilly, Galderma, GSK, Janssen, LEO Pharma, Medac, MSD, Novartis, Pfizer, and UCB Pharma. B.K. was an advisor and/or received speakers’ honoraria and/or received grants and/or participated in clinical trials of the following companies: AbbVie, Amgen, Beiersdorf, LEO Pharma, and Janssen-Cilag. M.H. was an advisor and/or received speakers’ honoraria and/or received grants and/or participated in clinical trials of the following companies: AbbVie, Almirall, Amgen, Boehringer Ingelheim, Eli Lilly, Galderma, GSK, Janssen, LEO Pharma, Medac, MSD, Novartis, Pfizer, and UCB Pharma. B.K. was an advisor and/or received speakers’ honoraria and/or received grants and/or participated in clinical trials of the following companies: AbbVie, Almirall, Amgen, Beiersdorf, Biogen, Celgene, Dr. Pfleger, Eli Lilly, Galderma, Janssen, LEO Pharma, Medac, Novartis, Sanofi, and UCB Pharma. D.M. was an advisor and/or received speakers’ honoraria and/or received grants and/or participated in clinical trials of the following companies: AbbVie, Almirall, Amgen, Celgene, Eli Lilly, Janssen-Cilag, LEO Pharma, Moberg Pharma, Novartis, Sandoz, Sanofi Genzyme, and UCB Pharma. F.W. was an advisor and/or received speakers’ honoraria and/or received grants and/or participated in clinical trials of the following companies: AbbVie, Janssen-Cilag, and Novartis. S.W, Y.P, and M.G are employees of Janssen-Cilag GmbH. M.S. was an advisor and/or received speakers’ honoraria and/or received grants and/or participated in clinical trials of the following companies: AbbVie, Actelion, Amgen, Celgene, Eli Lilly, Galderma, GSK, Janssen-Cilag, LEO Pharma, MSD, Mundipharma, Novartis, Pfizer, Regeneron, Sanofi, and UCB Pharma.

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SUPPORTING INFORMATION
Additional supporting information may be found online in the Supporting Information section.

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