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Looking Beyond the Skin: Examining the Patient and Clinician Reported Outcomes and Effects of Acne Vulgaris and Sarecycline Treatment

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Journal of Drugs in Dermatology

Looking Beyond the Skin: Examining the Patient and Clinician Reported Outcomes and Effects of Acne Vulgaris and Sarecycline Treatment

INTRODUCTION

ORIGINAL ARTICLE

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Journal of Drugs in Dermatology

Assessing the Impact of Acne and Its Treatment on Disease Burden and Quality of Life

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It is well established that acne vulgaris (AV) is associated with high patient burden and an associated adverse impact on quality of life (QoL), and it is also recommended that patient-reported outcome measures (PROs) be employed for assessment of health-related QoL in both clinical studies and routine practice. Quality of life assessment is frequently included in registration studies of new acne treatments, but less often in real-world studies. Thus, there is an important unmet need to address the burden of acne and the effects of treatment in the real-world using well-designed PROs.

The Patient-reported Outcomes for Sarecycline Effectiveness and Safety (PROSES) study was a real-world, single-arm, prospective cohort study that included 300 patients with moderate-to-severe non-nodular acne patients >9 years who were prescribed sarecycline in real-world community practices in the United States. Two measures were employed to assess the burden of acne at baseline and treatment effects. The first was the Acne Symptom and Impact Scale (ASIS), a validated 17-item PRO measure, with 9 items assessing signs and 8 items assessing impacts of AV designed for use in both adolescents and adults.[1,2] The second PRO was the Expert Panel Questionnaire (EPQ). It was developed using a modified Delphi approach that involved 8 dermatologists with expertise in treating acne, including pediatric and skin of color focused expertise, one dermatologist /clinical psychologist, and one dermatologist/ psychiatrist. This 11-item PRO aimed to address how acne impacts the patient's emotional functioning, social functioning, and activities of daily living.[3]

Results from PROSES indicated a high disease burden. Baseline results for the ASIS indicated that patients experienced moderate AV disease burden in the signs, symptoms, and impact domains as well as the emotional impact subdomain. At baseline, results obtained with the EPQ indicated that patients had moderate-to-severe anger; worries about AV worsening; and adverse impacts on both social media activity and real-life plans. Most patients also made efforts to hide their acne. ASIS mean scores significantly decreased at week 12 for signs, impact, emotional impact, and social impact. There were also significant reductions from baseline on the EPQ in the proportion of patients who felt angry, worried about AV worsening, had thoughts or worries about AV, altered their activity on social media, felt that AV had an impact on real-life plans, felt picked on/judged due to AV, or were concerned about their ability to reach future goals due to AV. These results for impacts of AV were associated with a significant increase from baseline in the percentage of patients reporting clear/almost clear on the Investigator's Global Assessment of Activity Severity.

The baseline data from the two PROSES papers provide very detailed information about the impacts of AV in both pediatric and adult patients. They also demonstrate that both ASIS and EPQ responses were significantly improved by the inclusion of oral sarecycline in the AV treatment regimen in routine clinical practice. These results are an important addition to those from controlled clinical trials. This is important since the effect of treatment for a disease on QoL evaluated in a clinical trial may differ substantially from those of the same intervention employed in routine clinical practice.[4] There are also well-described limitations of the single-arm design used in the PROSES studies that should be acknowledged. In such a study, responses could result from the efficacy of the treatment under evaluation, a placebo effect in patients receiving an ineffective intervention, or improvement that is spontaneous or perhaps predicted by the natural history of the disease.[5] Such concerns are, of course, ameliorated by prior demonstration of the efficacy of sarecycline on facial AV in controlled clinical trials. In addition, results from the phase 3 clinical program for sarecycline showed that it had significant positive effects on patients' symptoms, emotions, and functioning as measured by the Skindex-16, a PRO developed for use across dermatologic diseases.

In conclusion, the results from ASIS and EPQ provide new and important information about the impacts of facial AV in a wide range of patients assessed in the real world. They also support the view that sarecycline is effective in routine clinical practice and substantially decreases the burden of AV in both children and adults.

DISCLOSURE

Neal Bhatia MD has served as an advisor, consultant, and investigator for Almirall.

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ORIGINAL ARTICLE

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Impact of Acne Vulgaris and Sarecycline on Social/Emotional Functioning and Daily Activities: PROSES Study

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ABSTRACT

Background: Concise patient-reported outcome (PRO) instruments addressing the consequences of facial acne vulgaris (AV) on patients' functioning and activities of daily living (ADL) are needed.

Methods: A 12-week, single-arm, prospective cohort study was conducted in patients ≥9 years old with moderate/severe non-nodular facial AV prescribed sarecycline as part of usual care. The primary endpoint included AV-specific patient- and caregiver-reported outcomes assessed with the expert panel questionnaire (EPQ, developed by 10 experts using a Delphi method) in patients (>12 years) and caregivers (for patients 9-11 years). Additional assessments included parental/caregiver perspectives on children's AV.

Results: A total of 253 patients completed the study. Following 12-weeks of treatment, there were significant ($P \leq .0001$) changes from baseline in the proportion of patients responding that they never or rarely: felt angry (31.6%), worried about AV worsening (28.9%), had thoughts about AV (20.9%), had a certain level of worries about AV (38.7%), altered their social media/selfie activity (23.7%), had an impact on real-life plans due to AV (22.9%), made efforts to hide AV (21.3%), felt picked-on/judged due to AV (15.0%), were concerned about their ability to reach future goals due to AV (13.8%), or had sleep impacted due to AV (18.2%). No significant change from baseline was observed for parent/caregiver's understanding of the child's AV concerns, from both patient and parent/caregiver perspectives.

Conclusions: Over 12 weeks of AV management with oral sarecycline, patients reported significant reductions in AV-related effects on emotional/social functioning and ADL as measured by the EPQ, a simple PRO with potential for use in clinical practice.

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INTRODUCTION

Acne vulgaris (AV) is a multifactorial inflammatory dermatosis of the pilosebaceous unit triggered by androgen-driven hyperseborrhea, follicular hyperkeratinization, hypercolonization of *Cutibacterium acnes*, and inflammation.[1-3] It is the most common cutaneous disorder in the United States (US) and has an estimated global prevalence of 9.4%.[4-8] Acne has significant morbidity associated with persistent scarring and psychosocial concerns that negatively affect quality of life (QoL), leading to low self-esteem and increased social and emotional anxiety.[9-12] The psychosocial impact of AV is reported to be profound compared to other dermatologic diseases such as psoriasis and eczema.[13] Patient-reported outcome (PRO) measures have become increasingly emphasized in clinical practice for determination of disease effects and its impact on patients' and caregivers' health-related QoL (HRQoL).[14] Studies focused on these issues have shown that AV can adversely affect a patient's mood, social/emotional functioning, activities of daily living (ADL), and general thoughts/worries about AV and their future goals.[9,15,16] Patients and caregivers may also be concerned about side effects of treatment, particularly those associated with systemic therapies, such as broad-spectrum antibiotics.[17-23] While several PROs have been developed for patients with acne, there remains a need for a targeted and concise list of questions for assessing the burden of AV.[24] This study incorporated a new PRO, the expert panel questionnaire (EPQ), in a 12-week study of sarecycline, a narrow-spectrum tetracycline antibiotic, in patients with AV.

MATERIALS AND METHODS

Study Design

A 12-week single-arm prospective observational cohort study was carried out between March 2021 and May 2022 and enrolled 300 patients with AV who were administered sarecycline as part of usual care at one of 30 community US dermatology practices.

The study protocol was approved by the Advarra Institutional Review Board (SSU00149823 and SSU00150552). All participants provided written informed consent (assent, in the case of pediatric patients) prior to study initiation.

Participants

Patients were ≥9 years of age with a confirmed clinical diagnosis of facial non-nodular AV, had an Investigator's Global Assessment (IGA) of score 3 (moderate) or 4 (severe), were deemed a potential candidate for sarecycline treatment per the clinician's judgment, and capable of adhering to study procedures. Adult primary caregivers for patients aged <12 years were included. Patients were excluded if they had any facial dermatologic or physical condition that could interfere with AV clinical evaluations; had a history of allergy to tetracycline-class antibiotics or antibiotic-associated or pseudomembranous colitis; had a known resistance to tetracyclines; were receiving concurrent treatment with oral retinoids or penicillin; or were pregnant, lactating, or planning a pregnancy during the study period.

Treatment

Clinicians prescribed oral sarecycline (60 mg, 100 mg, or 150 mg) to all eligible patients prior to their selection into the study, as part of usual care. Appropriate dosages were determined based on clinician judgment and as per US Food and Drug Administration prescribing guidelines.[25]

Assessments

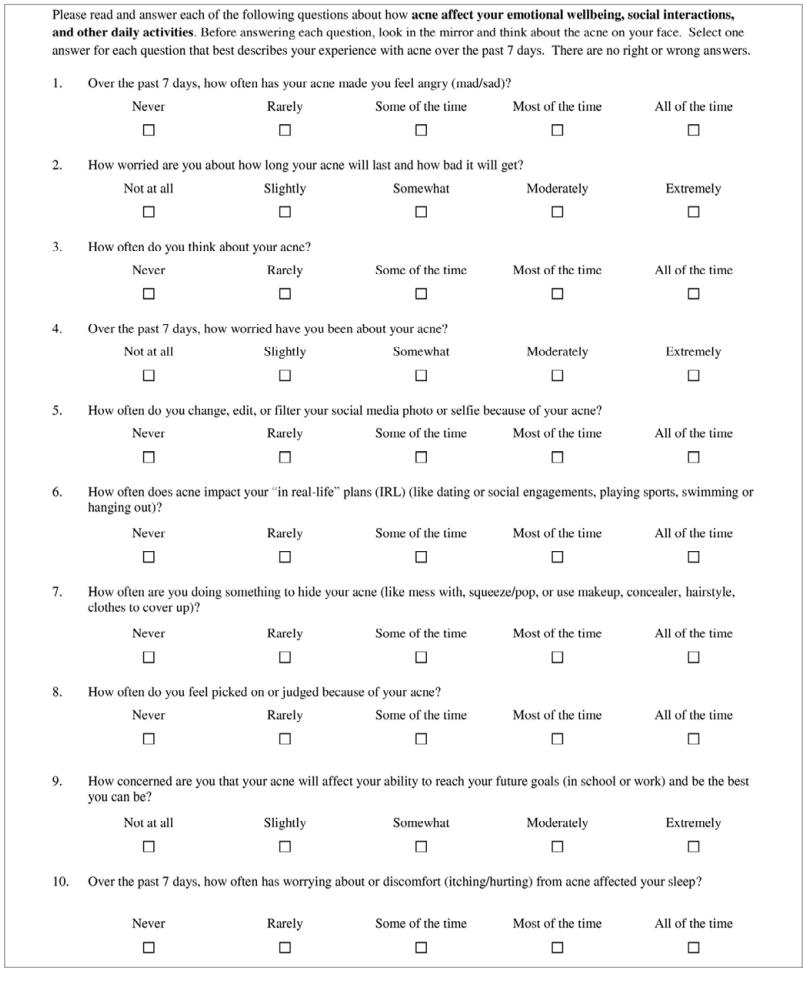
The primary assessment and endpoint was the EPQ reported at baseline and week 12 by patients ≥12 years and with the assistance of caregivers for those 9-11 years old.

Additional assessments included parental/caregiver concerns about the child's AV, understanding of the child's AV-related concerns, and the child's ability to accomplish future goals.

EPQ

The EPQ was developed for use in research studies to monitor and fully capture patient disease burden and treatment experiences, including the physical and psychosocial impact of AV. A 10-person consensus panel of dermatologists with expertise in the treatment of AV convened virtually and used a 3-step modified Delphi method to establish the questionnaire items; the panel included pediatric and skin of color specialists as well as 2 members with backgrounds in clinical psychology or psychiatry. Initially, a subgroup of panelists constructed items following a targeted literature review to identify over 50 PRO topics/items. This was reduced to 11 items considered most relevant for the assessment of AV burden.

FIGURE 1. Final version of the EPQ.



Please read and answer each of the following questions about how **acne affect your emotional wellbeing, social interactions, and other daily activities**. Before answering each question, look in the mirror and think about the acne on your face. Select one answer for each question that best describes your experience with acne over the past 7 days. There are no right or wrong answers.

1. Over the past 7 days, how often has your acne made you feel angry (mad/sad)?
   Never ☐ Rarely ☐ Some of the time ☐ Most of the time ☐ All of the time ☐
2. How worried are you about how long your acne will last and how bad it will get?
   Not at all ☐ Slightly ☐ Somewhat ☐ Moderately ☐ Extremely ☐
3. How often do you think about your acne?
   Never ☐ Rarely ☐ Some of the time ☐ Most of the time ☐ All of the time ☐
4. Over the past 7 days, how worried have you been about your acne?
   Not at all ☐ Slightly ☐ Somewhat ☐ Moderately ☐ Extremely ☐
5. How often do you change, edit, or filter your social media photo or selfie because of your acne?
   Never ☐ Rarely ☐ Some of the time ☐ Most of the time ☐ All of the time ☐
6. How often does acne impact your "in real-life" plans (IRL) (like dating or social engagements, playing sports, swimming or hanging out)?
   Never ☐ Rarely ☐ Some of the time ☐ Most of the time ☐ All of the time ☐
7. How often are you doing something to hide your acne (like mess with, squeeze/pop, or use makeup, concealer, hairstyle, clothes to cover up)?
   Never ☐ Rarely ☐ Some of the time ☐ Most of the time ☐ All of the time ☐
8. How often do you feel picked on or judged because of your acne?
   Never ☐ Rarely ☐ Some of the time ☐ Most of the time ☐ All of the time ☐
9. How concerned are you that your acne will affect your ability to reach your future goals (in school or work) and be the best you can be?
   Not at all ☐ Slightly ☐ Somewhat ☐ Moderately ☐ Extremely ☐
10. Over the past 7 days, how often has worrying about or discomfort (itching/hurting) from acne affected your sleep?
    Never ☐ Rarely ☐ Some of the time ☐ Most of the time ☐ All of the time ☐

The items were clustered into 3 domains for AV impact: emotional functioning (4-items), social functioning (3-items), and ADL (4-items). These items were complementary to the validated Acne Symptom and Impact Scale (ASIS) that the panel had chosen for use in the PROSES study.[26,27] The panelists proposed 6 additional questions for caregivers, including 3 questions (items 4, 9, and 10) from the main instrument, 1 question adapted from the ASIS questionnaire on current AV status, and 2 questions regarding concerns about antibiotics and antibiotic resistance. The total set of questions was reviewed and modified by the expert panel to provide a final questionnaire on which there was 100% agreement among experts for all items (Figure 1). In the main 11-item EPQ, items 1-9 and 11 were scored on a 5-point adjectival response scale (score: 0 [no burden/impact] – 4 [most burden/impact]); item-10 was scored on a 5-point scale (score: 0 [not at all] – 4 [very much]). The 6 additional questions were also scored on a 5-point scale (score 0-4). The EPQ was aligned with prior research evaluating issues impacting patients with AV.[15,16] The panel formulated the questions to be more relevant to the current social environment and addressed issues including bullying, embarrassment, social media manipulation, and perception of physical imperfection due to AV.

Statistical Analysis

All patients who received ≥1 dose of sarecycline and had ≥1 question answered at week 12 were included in the analyses. All continuous variables are presented as mean, standard deviation (SD), and number of patients; categorical variables are presented as counts and percentages. Discrete variables were analyzed using Chi-square tests. Statistical differences in continuous measures were assessed using paired t-tests. Items from the EPQ were analyzed individually. All statistical analyses were conducted using SAS statistical software and $P \leq .05$ was considered statistically significant.

RESULTS

Patients and Caregivers

A total of 253 patients received sarecycline throughout the study as part of usual care and had valid non-missing data at week 12. The baseline demographic characteristics for adult patients, pediatric patients, and caregivers are summarized in Table 1. The mean age was 26.6 years for adult patients (60.1%) and 14.8 years for pediatric patients (39.9%). The final cohort was predominantly female (66.4%) and White/Caucasian (68.4%). At baseline, most patients had moderate AV (86.6%) and the rest had severe AV (13.4%).

Concerns about Antibiotic Use and Resistance

The majority of adults were not at all/slightly concerned about antibiotic use for AV (79.6%) and antibiotic resistance (72.4%). Similarly, most caregivers were not at all or slightly concerned about antibiotic use for AV (68.3%) and antibiotic resistance (65.3%) (Figure 2).

Disease Burden at Baseline

Most of the patients with AV experienced high disease burden at baseline, with the emotional/social impact of AV more affected, as evidenced by the proportion of patients reporting "all/most/some of the time" on individual issues measured by EPQ items: 56.1% reported mood/anger issues, 79.4% worried about AV worsening, 84.2% were thinking about AV, 72.7% had some level of AV worries, 51.4% of patients often edited social media photo/selfie, 44.7% reported impact on real-life plans, 72.7% made efforts to hide AV, 26.9% reported being picked-on/

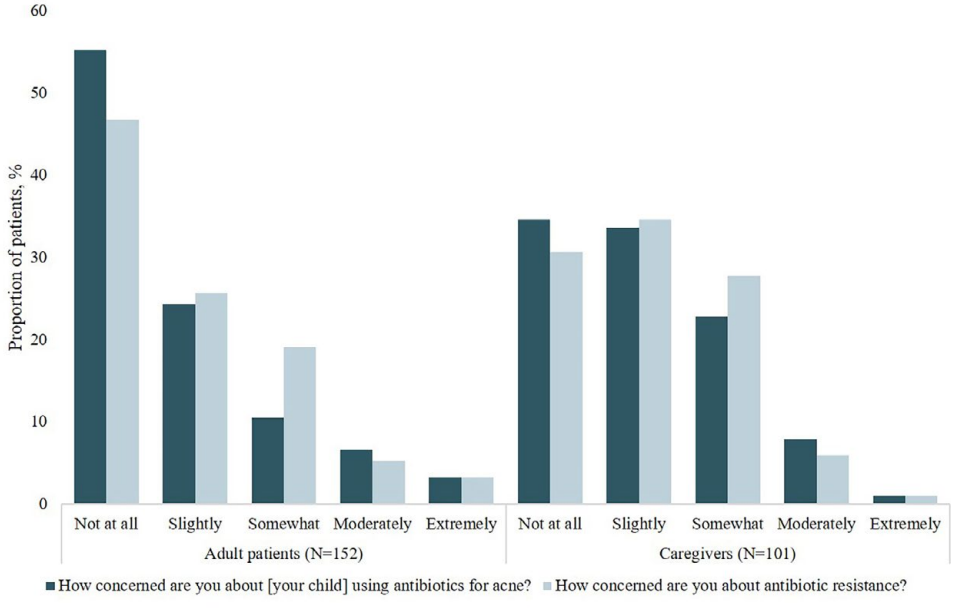
TABLE 1.

Demographic Characteristics of Patients and Caregivers

Demographic Data	Adult Patients, ≥18 years old (N=152)	Pediatric Patients, <18 years old (N=101)	Caregivers (N=101)
Age, years			
Mean (SD)	26.6 (7.6)	14.8 (1.7)	45.9 (7.9)
Median (min, max)	24.0 (18.0, 50.0)	15.0 (10.0, 17.0)	48.0 (18.0, 65.0)
Sex			
Male, n (%)	34 (22.4)	51 (50.5)	19 (18.8)
Female, n (%)	118 (77.6)	50 (49.5)	82 (81.2)
Race			
White/Caucasian, n (%)	94 (61.8)	79 (78.2)	75 (74.3)
Black or African American, n (%)	18 (11.8)	7 (6.9)	7 (6.9)
American Indian or Alaskan, n (%)	1 (0.7)	1 (1.0)	1 (1.0)
Asian, n (%)	12 (7.9)	6 (5.9)	3 (3.0)
Native Hawaiian or other Pacific Islander, n (%)	1 (0.7)	2 (2.0)	0 (0.0)
Other, n (%)	28 (18.4)	11 (10.9)	12 (11.9)
Prefer not to answer, n (%)	4 (2.6)	4 (4.0)	4 (4.0)
Hispanic, Latino, or of Spanish origin			
Yes	55 (36.2)	31 (30.7)	31 (30.7)
No	97 (63.8)	70 (69.3)	70 (69.3)

max, maximum; min, minimum; N, population size; n, sample size; SD, standard deviation

FIGURE 2. Patient and caregiver concerns about antibiotics and antibiotic resistance.



judged due to AV, 27.3% reported concerns about their ability to reach future goals, and 27.7% reported sleep impact. The majority reported adequate parental understanding of AV concerns (for patients <18 years old; Figure 3a and 3b).

Disease Burden After 12 Weeks of Treatment With Sarecycline

Following 12 weeks of treatment, there was a significant increase ($P \leq .0001$) in the proportions of patients responding that they never/rarely: felt angry (31.6%); worried about AV worsening (28.9%); had thoughts about AV (20.9%); had a certain level of worries about AV (38.7%); altered their social media/selfie activity (23.7%); had an impact on real-life plans due to AV (22.9%); made efforts to hide AV (21.3%); felt picked-on/judged due to AV (15.0%); were concerned about their ability to reach future goals due to AV (13.8%); or had their sleep impacted due to AV (18.2%) (Figure 3a and 3b).

FIGURE 3A. EPQ responses for items 1, 3, 5, 6, 7, 8, and 11 vs baseline: $^{*}P \leq .0001$; $^{**}P < .0001$; $^{\wedge}P = .0005$; $^{\wedge\wedge}P = .0009$; $^{\#}P = .0042$.

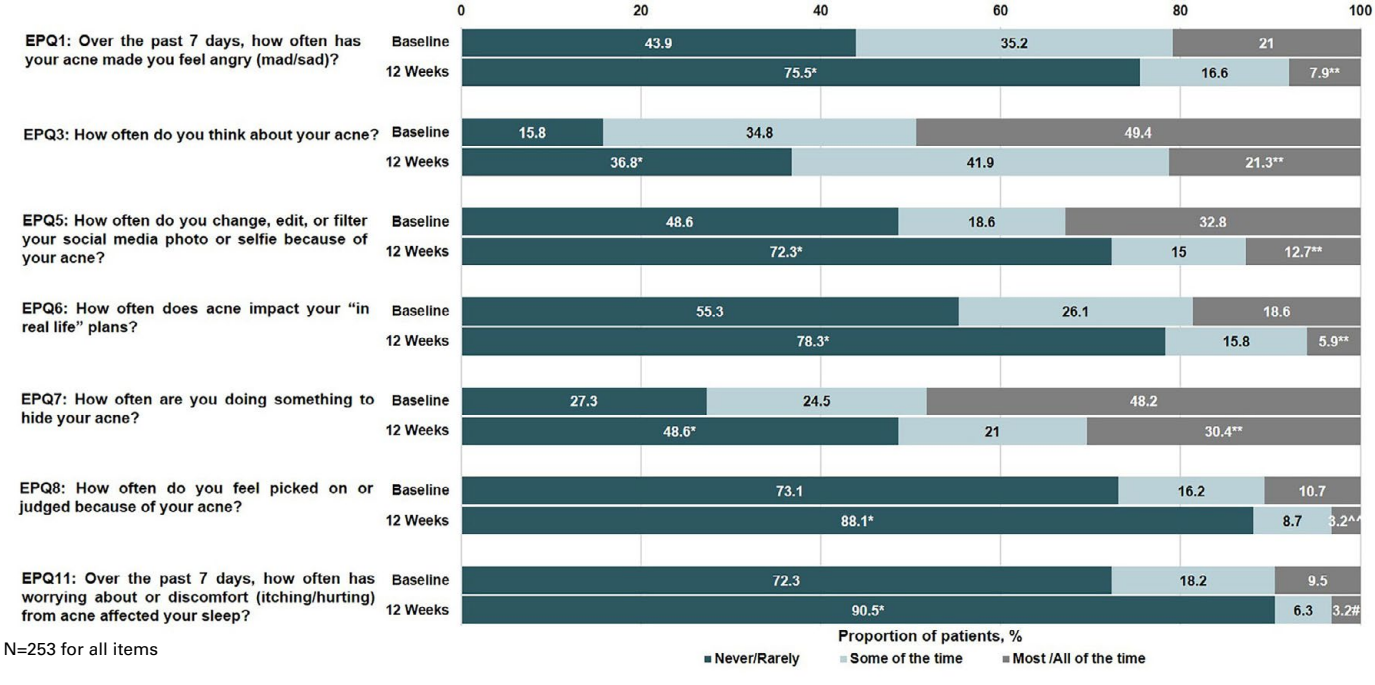
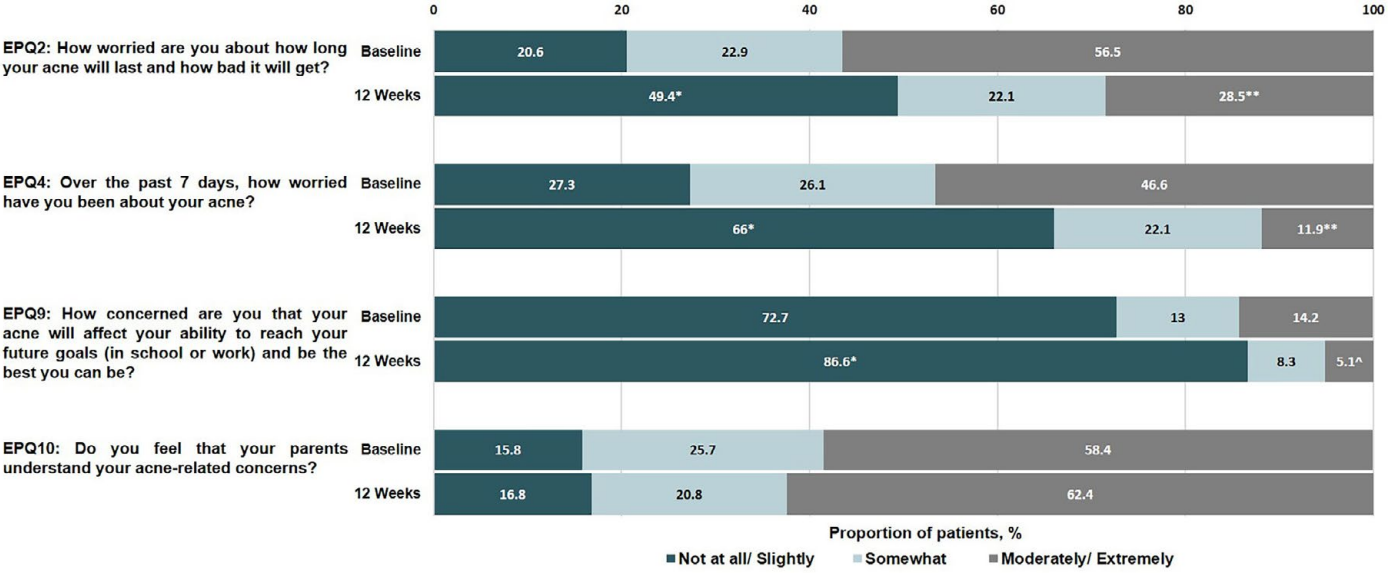


FIGURE 3B. Expert panel questionnaire responses for items 2, 4, 9, and 10 vs baseline: *$P \leq .0001$; **$P < .0001$; ^$P = .0005$; ^^$P = .0009$; #$P = .0042$.



N=253 for all items, except for EPQ question 10, which corresponded to only caregivers of pediatric patients, with N=101.

TABLE 2.

Patient and Caregiver Comparison	Baseline (N=101)	Week-12 (N=101)
Parent/Caregiver: Do you feel that you understand your child's acne-related concerns right now?		
Not at all/A little, n (%)	7 (6.9)	7 (6.9)
Somewhat, n (%)	18 (17.8)	22 (21.8)
Quite a bit/Very much, n (%)	76 (75.3)	72 (71.3)
Child: Do you feel that your parents understand your acne-related concerns?		
Not at all/A little, n (%)	16 (15.8)	17 (16.8)
Somewhat, n (%)	26 (25.7)	21 (20.8)
Quite a bit/Very much, n (%)	59 (68.4)	63 (62.4)
Parent/Caregiver: Over the past 7 days, how concerned have you been about your child's acne?		
Not at all/A little, n (%)	15 (14.9)	63 (62.4)
Somewhat, n (%)	29 (28.7)	17 (16.8)
Quite a bit/Very much, n (%)	57 (56.4)	21 (20.8)
Child: Over the past 7 days, how worried have you been about your acne?		
Not at all/A little, n (%)	36 (35.6)	68 (67.3)
Somewhat, n (%)	35 (34.7)	25 (24.8)
Quite a bit/Very much, n (%)	30 (29.7)	8 (7.9)
Parent/Caregiver: How concerned are you about your child's ability to accomplish future goals and reach full potential due to acne?		
Not at all/A little, n (%)	47 (46.5)	68 (67.3)
Somewhat, n (%)	28 (27.7)	16 (15.8)
Quite a bit/Very much, n (%)	26 (25.8)	17 (16.5)
Child: How concerned are you that your acne will affect your ability to reach your future goals (in school or work) and be the best you can be?		
Not at all/A little, n (%)	84 (83.2)	94 (93.1)
Somewhat, n (%)	9 (8.9)	5 (4.9)
Quite a bit/Very much, n (%)	8 (7.9)	2 (1.9)

N, population size; n, sample size

There were corresponding significant ($P<.005$) decreases in the proportions of patients responding that they moderately/extremely or most/all of the time: felt angry (–13.0%); worried about AV worsening (–28.1%); had thoughts about AV (–28.1%); had a certain level of worries about AV (–34.8%); altered their social media/selfie activity (–20.2%); had an impact on real-life plans due to AV (–12.6%); made efforts to hide AV (–17.8%); felt picked-on/judged due to AV (–7.5%); were concerned about their ability to reach future goals due to AV (–9.1%); or had their sleep impacted due to AV (–6.3%) (Figure 3a and 3b).

Responses to additional questions revealed that almost twice as many parents/caregivers (56.4%) vs their children (29.7%) reported being quite a bit/very much concerned about (child's) AV at baseline. These values decreased to 20.8% and 7.9%, respectively, by week 12. Similarly, 25.8% of parents/caregivers and 7.9% of children reported being quite a bit/very much concerned about (child's) ability to reach future goals due to AV. These values decreased to 16.5% and 1.9%, respectively, by week 12. Most pediatric patients (62.4%) and their parents/caregivers (71.3%) reported that parents understood the child's AV-related concerns quite a bit/very much. There was little change in these values at week 12 (Table 2).

DISCUSSION

AV and its sequelae have a profound influence on patients' physical, social, and psychological well-being, significantly reducing their social/emotional functioning.[28] This impaired QoL may be improved by successful treatment of AV.[29] An undesirable skin appearance may result in a body image that provokes anger, anxiety, humiliation, embarrassment, bullying, and stigmatization among peers. Identifying such concerns in patients with AV is pivotal to providing comprehensive care leading to clinical and overall psychosocial improvement.[30] It has been shown that AV can result in psychological disturbance,[31] interference with social/leisure activities, and social avoidance.[30] Careful assessment of the impact of AV on patient-reported social/emotional well-being, and overall effect on AV-related concerns may help characterize the overall disease burden, identify psychologically vulnerable patients, and support appropriate integrated treatment. It is also important for assessing the benefits of new AV therapies.[32-34]

Results from this real-world study employing the novel EPQ suggest that 12 weeks of oral antibiotic treatment significantly reduced the adverse effects of AV on emotional/social functioning and ADL. At the end of 12 weeks, high percentages of patients reported no/least impact of AV in each of the 3 domains assessed by the EPQ. Specifically, after 12-weeks of treatment, most patients responded that they never/rarely felt angry, altered their social media activity, felt an impact on their real-life plans due to AV, or had their sleep impacted due to AV. Treatment also positively affected patients' attitudes toward interactions via social media. At baseline, most patients chose to alter their appearance to hide their skin lesions, considering it to be personal imperfection and unattractive. At the conclusion of this study, patients seldom thought of altering their social media activities, indicating less concern about their appearance, and suggesting increased self-confidence. By the end of the study, most patients never/rarely felt picked on/judged due to AV and were positive regarding their ability to reach future goals, suggesting improved self-esteem and social functioning. At the study's conclusion, a minority of patients reported that they most/all of the time made efforts to hide their AV, worried about AV worsening, or had concerns about their ability to reach future goals due to AV.

Reducing psychosocial stress should be considered a guiding principle in AV management. Employment of safe and effective therapeutic options, and monitoring of both clinical responses and PRO have the potential to significantly decrease psychosocial burden associated with AV.[28] If systemic antibiotics are used, proper stewardship supports the use of narrow-spectrum agents to minimize disruption of the normal microflora and limit development of resistance.[22]

Various validated scoring systems are being used to determine patients' QoL and the effectiveness of clinical interventions on patients' psychosocial well-being.[32,35-37] However, most do not focus on patients' social/emotional functioning and ADL, which remain under-explored; do not address facial AV or issues that matter most to young patients; and/or take a long time to administer.[35,38] The EPQ fills the unmet need in AV-related PRO measurement. The EPQ is sensitive to therapy, as it demonstrated improvements in patients receiving an efficacious acne treatment.[25] The questionnaire could be helpful in routine clinical practice to improve AV patient management and document health outcomes, including patients' emotional/social functioning.

This study had significant limitations. Results may be subject to biases such as recall bias, reporting bias, selection bias, and other biases commonly seen in real-world and open-label studies. Approaches such as standardized study inclusion/exclusion criteria, consecutive sampling, and diverse dermatology clinics/investigators from across the US with varied prior experience with sarecycline were employed to minimize biases.

CONCLUSION

The novel EPQ appears to be a clinically relevant and responsive AV-related PRO instrument that effectively measures the impact of the disease and its treatment. Appropriate AV treatment with sarecycline was associated with a reduction in psychosocial impairment and supports the conclusion that the EPQ is a promising tool for supplementing clinical judgment in AV management.

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DISCLOSURES

Dr Graber reported receiving royalties from Wolters Kluwer Health and served as a consultant/advisor, research investigator, and/or speaker for Almirall SA, Cutera, Digital Diagnostics, Hovione, Keratin Biosciences, La Roche Posay, Lipidor AB, L'Oreal, Ortho Dermatologics, Sebacia, SolGel, Verrica, and WebMD. Dr Fried served as a research investigator and/or scientific advisor for AbbVie, BI, BMS, Dermavant, Dermira, EPI, Incyte, Janssen, LEO, Lilly, Novartis, Ortho Dermatologics, Pfizer, Regeneron, Sanofi Sun, and UCB. Dr Hebert reported receiving grants and/or honoraria from Almirall SA, Amryt, Arcutis, Dermavant, GSK, Incyte, Leo, Lilly, Novan, Pfizer, and Sun Pharma; and served as a member of Data and Safety Monitoring Board for GSK, Ortho Dermatologics, and Regeneron-Sanofi. Dr Del Rosso served as a research investigator, consultant/advisor, and/or speaker for AbbVie, Aclaris, Almirall, Amgen (Celgene), AnaptysBio, Arcutis, Athenex, Bausch (Ortho Dermatologics), Biofrontera, BioPharmX, Biorasi, Blue Creek, Botanix, Brickell, Bristol Myers Squibb, Cara Therapeutics, Cassiopea, Dermata, Dermavant, Encore, EPI Health, Ferndale, Galderma, Genentech, Incyte, Jem Health, LEO Pharma, La Roche-Posay, Lilly (Dermira), MC2, NOVAN, Pfizer, Ralexar, Regeneron, Sanofi-Genzyme, Sente, Solgel, Sonoma (Intraderm), Sun Pharma, UCB, Verrica, and VYNE (Foamix/Menlo). Dr Kircik served as an investigator, speaker, advisory board member, and/or consultant for Abbott Laboratories, Aclaris, Inc, Allergan, Inc, Almirall, Anacor Pharmaceuticals, Inc, Assos Pharma, Astellas Pharma US, Inc, Asubio Pharma Co, Ltd, Berlex Laboratories (Bayer Healthcare Pharmaceuticals), Biogen-Idec, Inc, Biolife, Biopelle, Boehringer Ingelheim, Breckinridge Pharma, Celgene Corporation, Centocor, Inc, Colbar, CollaGenex, Combinatrix, Connetics Corporation, Coria, Dermik Laboratories, Dermira, Inc, Dow Pharmaceutical Sciences, Inc, Dusa Pharmaceuticals, Inc, Eli Lilly & Co, Embil Pharmaceutical Co, Ltd, EOS, Ferndale Laboratories, Inc, Galderma Laboratories, LP, Genentech, Inc, GlaxoSmithKline, PLC, Health Point Ltd, Idera, Inc, Innocutis Medical, LLC, Innovail, Intendis, Inc, Johnson & Johnson, Laboratory Skin Care, Inc, Leo Pharmaceuticals, Inc, L'Oreal SA, 3M, Maruho Co, Ltd, Medical International Technologies, Medicis Pharmaceutical Corp, Merck & Co, Inc, Merz, Nano Bio Corporation, Novartis Pharmaceutical Corporation, Noven Pharmaceuticals, Inc, Nucryst Pharmaceuticals Corporation, Obagi Medical Products, Inc, Onset, Ortho Dermatologics, OrthoNeutrogena, PediaPharma, Inc, Promius Pharma, LLC, PharmaDerm, Pfizer, Inc, PuraCap, QLT, Inc, Quatrix, Quinnova, Serono (Merck-Serono International SA), SkinMedica, Inc, Stiefel Laboratories, Inc, Sun Pharmaceutical Industries, Ltd, Taro, TolerRx, Inc, Triax, UCB, Inc, Valeant Pharmaceuticals North America LLC, Warner-Chilcott, XenoPort, Inc, and ZAGE. Dr Stein Gold served as an investigator, advisor and/or speaker for Almirall SA, Galderma, Ortho Derm, and Sun. Dr Harper reported receiving honoraria for serving as a consultant, speaker, and/or investigator for Almirall, Cassiopeia, Cutera, EPI, Galderma, Journey, L'oreal, Ortho, Sol Gel, Sun, and Vyne and received honoraria for holding stocks in Cutera. Dr Alexis reported receiving grants and/or royalties from Abbvie, Almirall SA, Amgen, Arcutis, Bristol-Myers-Squibb, Cara, Castle, Dermavant, Galderma, Leo, Novartis, Springer, Wiley-Blackwell, Wolters Kluwer Health, Valeant (Bausch Health), and Vyne; and served as a consultant/advisor and/or speaker for Abbvie, Allergan, Almirall SA, Amgen, Arcutis,Bausch health, Beiersdorf, BMS, Cara, Castle, Cutera, Dermavant, Eli Lilly, EPI, Galderma, Incyte, Janssen, Leo, L'Oreal, Ortho, Pfizer, Sanofi-Genzyme, Sanofi-Regeneron, Swiss American, Regeneron, UCB, VisualDx, and Vyne. Dr Narayanan reported receiving consulting honoraria or research funding from Almirall, Biogen, Johnson and Johnson, Sarepta Therapeutics, SeaGen, and Takeda. Dr Koscielny and Dr Kasujee are employees of Almirall, SA. No other conflicts were reported.

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ORIGINAL ARTICLE

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Sarecycline Improves Acne Severity, Symptoms, and Psychosocial Burden in Non-nodular Acne Vulgaris: PROSES Study

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ABSTRACT

Background: Patient-reported outcomes (PROs) are emerging as a fundamental component of disease impact assessment in acne vulgaris (AV), complementing clinician-reported outcomes. No data are available on PROs for patients with AV using sarecycline in real-world settings.
Methods: A single-arm, prospective cohort study that included patients ≥9 years old diagnosed with moderate or severe non-nodular AV was implemented as part of routine care in clinical practices (N=30). Patients received oral sarecycline (60 mg, 100 mg, or 150 mg) for 12 weeks, as part of usual care. The primary endpoint was Acne Symptom and Impact Scale (ASIS) responses from patients (≥12 years) and caregivers (for patients 9-11 years) at week 12 and change from baseline (CFB). Investigator's Global Assessment (IGA) of AV severity and adverse events (AEs) were also recorded.
Results: A total of 253 patients with AV completed the study (adults: 60.1%, females: 77.6%). ASIS mean scores significantly decreased (P <.0001) at week 12 for: signs (mean CFB ± standard deviation [SD]: –0.8 ± 0.7), impact (–1.0 ± 1.0), emotional impact (–1.2 ± 1.1), and social impact (0.6 ± 1.1). Significant reductions in AV severity (P <.0001) were reported by patients and caregivers. The IGA success rate was 58.9% and physician satisfaction with treatment outcomes was 88.1%. A total of 31 (10.3%) patients reported ≥1 AE during the study.
Conclusions: Patients with moderate-to-severe AV receiving acne management with an oral antibiotic for 12 weeks experienced a significant improvement in AV-related symptoms and psychosocial burden.

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INTRODUCTION

Acne vulgaris (AV) is a complex, inflammatory, cutaneous disorder of the pilosebaceous unit that affects 9.4% of the global population,[1,2] ranking it as the eighth most prevalent disease in the world.[3] AV can persist into adulthood with 85% of impacted individuals being adolescents and young adults,[4] and it has a higher prevalence among adult women than their male counterparts.[5] More than 5.1 million Americans sought medical treatment for AV in 2013 with direct costs estimated to exceed 3 billion dollars.[6] The condition is chronic, has a high potential for relapse and long-term sequelae, and its physical appearance contributes to the emotional and psychosocial burden of disease, impaired quality of life (QoL), low self-image,[7] poor self-esteem, and increased social and emotional anxiety.[8,9] Psychosocial impact on patients with AV is reported to be greater than that attributed to other dermatologic conditions (psoriasis and eczema)[10] and equivalent to that for other debilitating conditions such as asthma, epilepsy, diabetes, or arthritis.[11,12]

Antibiotics have been a standard of care in treating AV for >5 decades.[13,14] Oral antibiotics are recommended by the American Academy of Dermatology for the treatment of moderate and severe AV, and oral tetracyclines are used frequently for this condition. However, prolonged and repetitive use of broad-spectrum antibiotics, such as doxycycline and minocycline, have been associated with the development of antimicrobial resistance.[15-19]

Sarecycline is the first narrow-spectrum tetracycline-derived antibiotic approved by the US Food and Drug Administration (US FDA) for the treatment of inflammatory lesions of non-nodular moderate-to-severe AV, and it has a low potential to induce bacterial resistance.[20-23] Two identically designed, pivotal, double-blind, randomized, placebo-controlled clinical trials demonstrated sarecycline to be efficacious and well-tolerated with a favorable safety profile.[20] These studies assessed patient-reported outcomes (PROs) with the Skindex-16, and demon-

strated a positive impact of sarecycline. However, there have been no studies evaluating the effectiveness of sarecycline or any other oral antibiotics in AV through PROs in a real-world setting. PROs may be ideal for capturing the experience of patients with AV that is not adequately reflected by traditional clinical outcomes. Assessment of PROs is recommended in studies of patients with AV to complement standard outcomes reported and for use in routine clinical practice.[24,25] Clinical trials in AV have employed a wide range of PROs, hampering the interpretation of research findings and comparisons across studies.[26-28] PRO assessments in routine practice could complement clinical assessment and provide patients' perspectives on treatment, including with oral antibiotics, as well as the impact of therapy on their physical, emotional, and psychosocial well-being. This prospective study evaluated PROs using a validated tool – the Acne Symptom and Impact Scale (ASIS) – and assessed the clinical effectiveness and safety of sarecycline in community practice settings across the US.

METHODS

Study Design and Participants

This single-arm, prospective, observational cohort study evaluated the use of sarecycline in patients with moderate-to-severe non-nodular AV (N=300) in the US. Data were collected from 30 community dermatology practices between March 2021 and May 2022. The study was approved by the Advarra Institutional Review Board (SSU00149823 and SSU00150552). Study patients were followed for up to 12 weeks with evaluations at weeks 4, 8, and 12.

Patients ≥9 years old with a confirmed diagnosis of facial non-nodular moderate-to-severe AV (Investigator Global Assessment [IGA] score of 3 or 4) were included and received oral sarecycline (60 mg, 100 mg, or 150 mg). Appropriate sarecycline dosages were determined by the clinicians based on clinical judgment per US FDA prescribing guidelines.[21] Patients ≥18 years old provided informed written consent and those <18 years of age were consented to participate by their adult primary caregivers.

Patients were excluded if they had any facial conditions that interfered with AV clinical evaluations; had a history of allergy to tetracycline-class antibiotics or pseudomembranous or antibiotic-associated colitis; known resistance to other tetracyclines; were on concurrent treatment with penicillin or oral retinoids; were pregnant, lactating, or planning a pregnancy during the study period; or had inaccessible medical records.

FIGURE 1. ASIS questionnaire.

Please read and answer each of the following questions about **acne signs and symptoms**. Before answering each question, **look in the mirror and think about the acne on your face**. Select one answer for each question that best describes your experience with acne **right now**. There are no right or wrong answers.

1. How oily is your face right now?
   Not at all ☐ | A little ☐ | Somewhat ☐ | Quite a bit ☐ | Very ☐
2. How many pimples do you have on your face right now?
   None ☐ | A few ☐ | Some ☐ | Quite a bit ☐ | A lot ☐
3. How many acne scars (holes or indents) do you have on your face right now?
   None ☐ | A few ☐ | Some ☐ | Quite a bit ☐ | A lot ☐
4. How many scabs from acne do you have on your face right now?
   None ☐ | A few ☐ | Some ☐ | Quite a bit ☐ | A lot ☐
5. How many dark marks from acne do you have on your face right now?
   None ☐ | A few ☐ | Some ☐ | Quite a bit ☐ | A lot ☐
6. How many blackheads do you have on your face right now?
   None ☐ | A few ☐ | Some ☐ | Quite a bit ☐ | A lot ☐
7. How many whiteheads do you have on your face right now?
   None ☐ | A few ☐ | Some ☐ | Quite a bit ☐ | A lot ☐
8. How much redness do you have on your face right now?
   None ☐ | A few ☐ | Some ☐ | Quite a bit ☐ | A lot ☐

Please read and answer each of the following questions about how **acne impact your quality of life**. Before answering each question, look in the mirror and think about the acne on your face. Select one answer for each question that best describes your experience with acne in the past 7 days. There are no right or wrong answers.

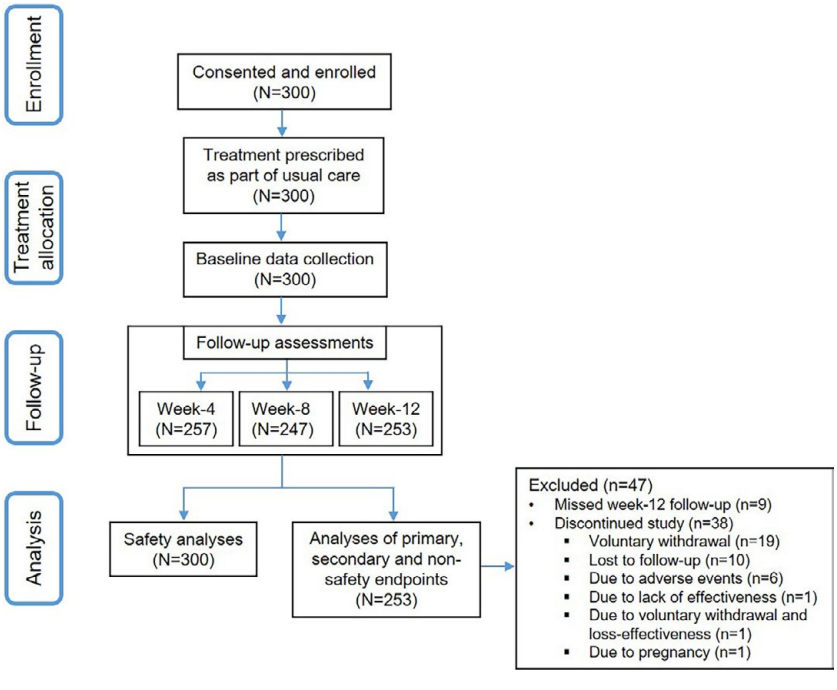
10. Over the past 7 days, rate how your face looked because of your acne.
    Excellent ☐ | Very good ☐ | Good ☐ | Fair ☐ | Bad ☐
11. Over the past 7 days, how often did you feel sad because of the acne on your face?
    Never ☐ | Rarely ☐ | Some of the time ☐ | Most of the time ☐ | All of the time ☐
12. Over the past 7 days, how often did you feel embarrassed because of the acne on your face?
    Never ☐ | Rarely ☐ | Some of the time ☐ | Most of the time ☐ | All of the time ☐
13. Over the past 7 days, how often did you feel self-conscious because of the acne on your face?
    Never ☐ | Rarely ☐ | Some of the time ☐ | Most of the time ☐ | All of the time ☐
14. Over the past 7 days, how often did you feel annoyed because of the acne on your face?
    Never ☐ | Rarely ☐ | Some of the time ☐ | Most of the time ☐ | All of the time ☐
15. Over the past 7 days, how often did you feel not confident because of the acne on your face?
    Never ☐ | Rarely ☐ | Some of the time ☐ | Most of the time ☐ | All of the time ☐
16. Over the past 7 days, how often did you choose not to be around other people because of the acne on your face?
    Never ☐ | Rarely ☐ | Some of the time ☐ | Most of the time ☐ | All of the time ☐
17. Over the past 7 days, how often did someone make bad comments about the acne on your face?
    Never ☐ | Rarely ☐ | Some of the time ☐ | Most of the time ☐ | All of the time ☐

TABLE 1.

Demographic Characteristics of Adult Patients and Caregivers (Safety Population)			
Demographic Data	**Adult Patient, ≥18 years old (N=184)**	**Pediatric Patient, <18 years old (N=116)**	**Caregiver (N=116)**
Age, years			
Mean (SD)	26.5 (7.6)	14.8 (1.7)	45.9 (7.7)
Median (min, max)	24.0 (18.0, 50.0)	15.0 (10.0, 17.0)	48.0 (18.0, 65.0)
Sex			
Male	42 (22.8)	57 (49.2)	22 (19.0)
Female	142 (77.2)	59 (50.9)	94 (81.0)
Race			
White/Caucasian	113 (61.4)	92 (79.3)	87 (75.0)
Black or African American	25 (13.6)	8 (6.9)	8 (6.9)
American Indian or Alaskan	1 (0.5)	2 (1.7)	1 (0.9)
Asian	13 (7.1)	6 (5.2)	3 (2.6)
Native Hawaiian or other Pacific Islander	1 (0.5)	2 (1.7)	3 (2.6)
Other	33 (17.9)	13 (11.2)	14 (12.1)
Prefer not to answer	5 (2.7)	4 (3.5)	4 (3.5)
Ethnicity: Hispanic, Latino, or of Spanish Ancestry			
Yes	65 (35.3)	36 (31.0)	36 (31.0)
No	119 (64.7)	80 (68.9)	80 (68.9)

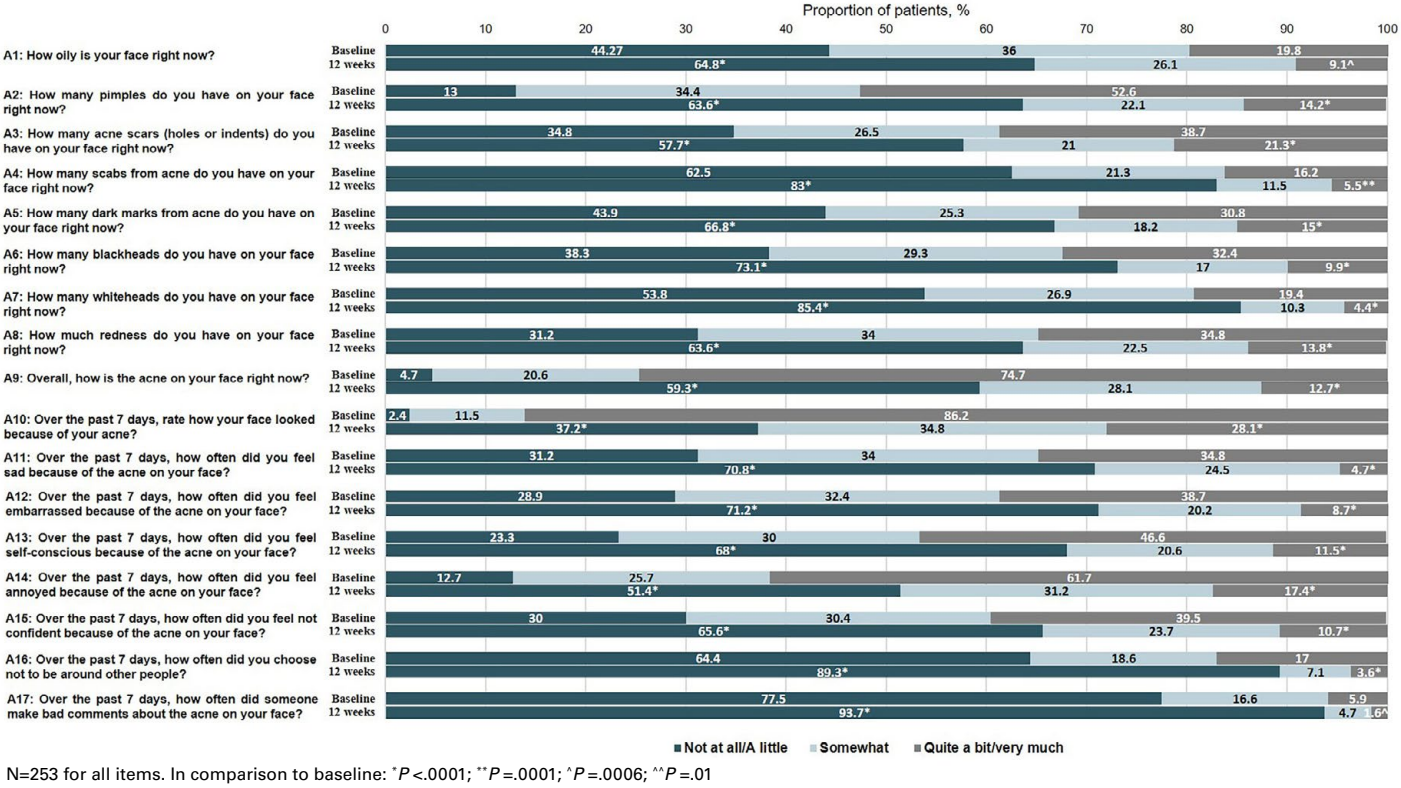
max, maximum; min, minimum; N, population size; n, sample size; SD, standard deviation

FIGURE 2. CONSORT flow diagram of study.



N, population size; n, sample size

FIGURE 3. ASIS Individual Item responses (analytic population).



N=253 for all items. In comparison to baseline: $^{*}P<.0001$; $^{**}P=.0001$; $^{\wedge}P=.0006$; $^{\wedge\wedge}P=.01$

Assessments

The primary endpoint was ASIS questionnaire responses at week 12 and change from baseline (CFB) from patients ≥12 years old and with the assistance of caregivers for patients aged 9-11 years. ASIS is a validated 17-item questionnaire that contains a signs domain (items A1-A9) and an impact domain (emotional impact [items A10-A15] and social impact [items A16-A17]) (Figure 1).[29,30] All items in the questionnaire are scored on a 5-point adjectival response scale (score 0-4). Higher scores indicate severe symptoms or a negative impact of AV on appearance, emotions, or social activities, and a score of 0 indicates lack of negative impact from AV or positive impact on psychosocial well-being and QoL. Data were scored according to developer guidelines, reporting domain (signs and impact), and subdomain (emotional impact and social impact) scores.[29,30] The secondary endpoint was the IGA of AV severity at week 12. This measure uses a 5-point adjectival response scale (score 0 [clear] – 4 [severe]) and IGA success was defined as a 2-point decrease in IGA score and a score of 0 (clear) or 1 (almost clear) at week 12. Additional outcomes included clinician satisfaction with AV treatment for individual patients as well as safety.

Data Analysis

All patients who received ≥1 dose of sarecycline during the study comprised the *safety population* and were included in the safety data analyses. All patients in the safety population who had ≥1 question answered pertaining to the study's primary endpoint at week 12 comprised the *analytic population*, which was included in analyses of all non-safety endpoints.

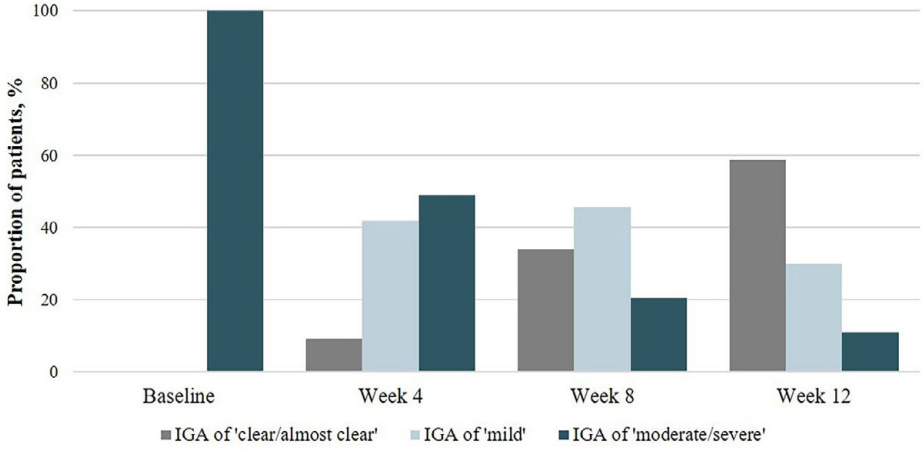
Continuous variables are presented as mean, median, standard deviation (SD), and number of patients. Categorical variables are presented as counts and percentages. Discrete variables were analyzed using Chi-square tests. Statistical differences in continuous measures were assessed using paired-sample t-tests. Missing values for IGA at weeks 4 and 8 were imputed using the last observation carried forward (LOCF). All statistical analyses were conducted using SAS statistical software, and $P \leq .05$ was considered significant.

RESULTS

Patient and Caregiver Characteristics

The disposition of patients is summarized in Figure 2. A diverse population of 300 patients (N=253 in the analytic population at week 12) with AV were recruited, comprising 61.3% adults (N=184; mean age ± SD: 26.5 ± 7.6 years; 77.2% female) and 38.7% pediatric patients (N=116; 14.8 ± 1.7 years; 50.9% female). The majority of adult (61.4%) and pediatric (79.3%) patients were White/Caucasian (Table 1). The demographics of the analytic population were comparable to the safety population with 86.6% having moderate and 13.4% having severe facial AV. Many patients reported previous use of medications for AV, including topical retinoids (47.8%), benzoyl peroxide (39.5%), topical antibiotics (36.4%), and tetracycline or macrolide oral antibiotics (24.5%). Sarecycline monotherapy was used by 49.8% of patients. The most frequently used concomitant medications were topical retinoids (24.5%), topical antibiotics (13.4%), and adapalene/benzoyl peroxide combination (11.1%).

FIGURE 4. IGA for facial AV severity during the 12-week study (analytic population).



*Change from baseline statistically significant at $P < .0001$

Healthcare Professional Use and Attitudes Regarding Oral Antibiotics

Treaters included 29 board-certified dermatologists and one nurse practitioner from private community dermatology practices; 60% of the clinicians reported frequently prescribing broad-spectrum antibiotics; 66.7% were moderately/extremely concerned about antibiotic resistance; and 63.3% were moderately/extremely concerned about disruption of the microbiome associated with long-term antibiotic use. Most clinicians (90%) recognized the importance of antibiotic stewardship.

PROs and Clinician-Reported Outcomes

Significant improvements in AV-related signs domain scores (mean CFB ± SD: –0.8 ± 0.7; $P < .0001$), impact domain scores (–1.0 ± 1.0; $P < .0001$), emotional impact subdomain scores (–1.2 ± 1.1; $P < .0001$), and social impact subdomain scores (–0.6 ± 1.1; $P < .0001$) measured by ASIS were observed by week 12. For individual ASIS items, most patients reported significant decreases from baseline to week 12 in AV-related signs (items 1-8; $P \leq .0006$) including oily face, pimples, scars, scabs, dark marks, blackheads, whiteheads, and redness. In addition, 59.3% of patients responded clear/almost clear to the question "How is your acne on your face right now?" at week 12 ($P < .0001$); and 37.2% responded excellent/very good to the question "Rate how your face looks because of acne" ($P < .0001$). Most patients reported a significant decrease in AV-related emotional impact at week 12 (ASIS items 11-15; $P < .0001$). This included feeling sad, embarrassed, self-conscious, annoyed, and being less confident. Most also reported a significant decrease in AV-related social impact at week 12, with fewer patients choosing not to be around other people ($P < .0001$), and fewer patients receiving criticism about acne ($P = .0101$; Figure 3).

Clinicians reported a significant increase in the proportion of patients with IGA of 0 or 1 (IGA success) from baseline (0%) to week 12 (58.9%; $P < .0001$; Figure 4). The proportion of patients with IGA of 3 or 4 significantly declined from 100% at baseline to 11.1% at week 12 ($P < .0001$). Clinicians were *very satisfied* or *satisfied* with treatment outcomes at week 12 for 88.1% of patients.

Safety

The safety population included 184 adults (61.3%) and 116 pediatric patients (38.7%). The mean treatment duration among all patients was 53.2 days with an overall compliance rate of 89.7%. Thirty-eight (12.7%) patients discontinued before week 12 with the most frequent cause being patient voluntary withdrawal or loss to follow-up (n=30; 10.0%; Figure 1). Thirty-one (10.3%) patients reported ≥1 adverse events (AEs) during the study. The majority were mild AEs (n=27; 9.0%). One patient (0.3%) had a serious AE of intracranial hypertension that resolved upon drug withdrawal. Two patients (0.7%) and 4 patients (1.3%) discontinued/withdrew from the study due to AEs not related to oral antibiotic use and related AEs, respectively (Table 2). Among non-related AEs, the most frequently noted groups were skin and subcutaneous tissue disorders (2.0%), nervous system disorders (1.7%), and infections (1.3%). The most frequently reported related AEs were gastrointestinal (2.3%) and nervous system disorders (1.7%). No individual non-related or related-AEs were reported for ≥2% of patients.

DISCUSSION

AV has a peak prevalence at puberty, impairs multiple aspects of QoL including self-perception, socialization, emotional health, and is often associated with anxiety, depression, and even suicidal intentions.[2] More than 40% of patients with AV are anxious regarding their skin condition[31] and nearly 70% suffer from depression, more often in females than in males.[32] A recent meta-analysis indicated a positive correlation between AV and suicidal ideation[33] with 9-12% of suicidal patients indicating acne as the primary cause.[31,34,35] Younger patients are more prone to such tendencies than older individuals.[34] Better understanding of the psychosocial ramifications of AV and how they might influence treatment selection and outcomes has the potential to improve outcomes and decrease patient burden. Patient-centered research is recognized as valuable in skin conditions as they substantially impact patients' health-related QoL.[36] PROs are useful for evaluating new or existing medications,[37] and the validated ASIS questionnaire is considered a high-quality tool for real-world assessment of patient-reported QoL and AV impact of acne.

TABLE 2.

AEs (Safety Population)			
	N (%)		
	Non-related AE	Related AE	Any AE[a]
Patients with ≥1 AE	18 (6.0)	14 (4.7)	31 (10.3)
Intensity of AE (patients with ≥1 AE)[b,c]			
Mild	16 (5.3)	11 (3.7)	27 (9.0)
Moderate	3 (1.0)	3 (1.0)	6 (2.0)
Severe	0 (0.0)	1 (0.3)	1 (0.3)
Action taken with sarecycline (patients with ≥1 AE)			
Drug withdrawal/Study discontinuation	2 (0.7)	4 (1.3)	6 (2.0)
Other actions: dose not changed	16 (5.3)	10 (3.3)	25 (8.3)
Patients with ≥1 serious AE	0 (0.0)	1 (0.3)[d]	1 (0.3)[d]
Patients with ≥1 serious AE resulting in death	0 (0.0)	0 (0.0)	0 (0.0)

AE, adverse event, N, sample size
[a]Includes non-related and related AEs
[b]Among non-related AEs: 1 patient had 2 AEs each that were of different intensities (1 AE was mild and 1 AE was moderate); 1 patient had 2 mild AEs; 1 patient had 3 mild AEs
[c]Among related AEs: 1 patient had 2 mild AEs, 1 patient had 2 moderate AEs, and 1 patient had 2 AEs that were of different intensities (1 AE was moderate and 1 AE was severe)
[d]Idiopathic intracranial hypertension was noted at week 8, which resolved upon drug withdrawal

The findings of this study confirmed the substantial disease burden and psychological distress of AV and indicated a significant effect of sarecycline in relieving them. Twelve weeks of sarecycline treatment not only improved patients' acne signs but also significantly reduced psychological comorbidities by increasing patient confidence, self-acceptance, and self-appreciation. Patients' self-assessments revealed improved appearance and clear/almost clear skin, implying treatment satisfaction. Clinicians reported a significant decrease in AV severity as measured by IGA success at week 12 and were satisfied with the treatment outcomes for the majority of patients.

Study results also showed that a treatment regimen including sarecycline in real-world clinical practice resulted in a two-fold higher IGA success rate than those reported in Phase III clinical trials.[26] There also was close agreement between the clinician-reported IGA success (58.9%) and patients' global assessment of AV severity as clear/almost clear (59.3%). The safety profile for sarecycline reported here was consistent with previous studies,[20] and no AE was reported in ≥2% of patients. The high compliance rate further supports the efficacy and tolerability of sarecycline.

To our knowledge, this is the first real-world study that evaluated an oral antibiotic in pediatric and adult patients with moderate-to-severe non-nodular AV in routine clinical practice using a PRO along with conventional efficacy and safety assessments. Study results also showed that administering a validated PRO instrument, the ASIS questionnaire, accurately assessed the severity of AV signs and impacts in both pediatric and adult patients. All of these assessments support the use of sarecycline in this broad patient population. Additional multi-center real-world studies that incorporate PROs in routine clinical practice may further enhance understanding of how other acne treatments influence patients' psychological well-being.

Study Limitations

Sarecycline was administered as a part of real-world clinical practice and investigators could add other AV medications, as per usual care. This could have influenced all study outcomes. In addition, results were potentially subject to recall bias, reporting bias, selection bias, and other biases commonly seen in real-world and open-label studies. Approaches such as standardized study inclusion/exclusion criteria, consecutive sampling, and geographically diverse dermatology clinics, having varied experience with oral antibiotics were employed to minimize these biases. An LOCF imputation method was employed for missing data at weeks 4 and 8, but there were no missing data for the analysis population at week 12.

CONCLUSIONS

AV patient management involving sarecycline was effective and well-tolerated, with low rates of AEs in patients with moderate-to-severe AV over a 12-week study period. In addition, treatment with this oral antibiotic demonstrated significant improvements in emotional and psychosocial impacts of AV at week 12 compared to baseline, as measured using the validated ASIS questionnaire. Patient self-reported ASIS responses correlated with physician assessments and the tool proved useful in demonstrating both disease burden and treatment effectiveness. Most of the patients experienced IGA success and clinicians expressed treatment satisfaction with the outcomes for the majority of their patients. PROSES study results reinforce that oral antibiotics, such as sarecycline, are an effective and safe treatment option for AV patients.

DISCLOSURES

Dr Graber reported receiving royalties from Wolters Kluwer Health and served as a consultant/advisor, research investigator and/or speaker for Almirall SA, Cutera, Digital Diagnostics, Hovione, Keratin Biosciences,

La Roche Posay, Lipidor AB, L'Oreal, Ortho Dermatologics, Sebacia, SolGel, Verrica, and WebMD. Dr Harper reported receiving honoraria for serving as a consultant, speaker, and/or investigator for Almirall, Cassiopeia, Cutera, EPI, Galderma, Journey, L'oreal, Ortho, Sol Gel, Sun, and Vyne and received honoraria for holding stocks in Cutera. Dr Alexis reported receiving grants and/or royalties from Abbvie, Almirall SA, Amgen, Arcutis, Bristol-Myers-Squibb, Cara, Castle, Dermavant, Galderma, Leo, Novartis, Springer, Wiley-Blackwell, Wolters Kluwer Health, Valeant (Bausch Health), and Vyne; and served as a consultant/advisor and/or speaker for Abbvie, Allergan, Almirall SA, Amgen, Arcutis, Bausch health, Beiersdorf, BMS, Cara, Castle, Cutera, Dermavant, Eli Lilly, EPI, Galderma, Incyte, Janssen, Leo, L'Oreal, Ortho, Pfizer, Sanofi-Genzyme, Sanofi-Regeneron, Swiss American, Regeneron, UCB, VisualDx, and Vyne. Dr Stein Gold served as an investigator, advisor and/or speaker for Almirall SA, Galderma, Ortho Derm, and Sun. Dr Kircik served as an investigator, speaker, advisory board member, and/or consultant for Abbott Laboratories, Aclaris, Inc, Allergan, Inc, Almirall, Anacor Pharmaceuticals, Inc, Assos Pharma, Astellas Pharma US, Inc, Asubio Pharma Co, Ltd, Berlex Laboratories (Bayer Healthcare Pharmaceuticals), Biogen-Idec, Inc, Biolife, Biopelle, Boehringer Ingelheim, Breckinridge Pharma, Celgene Corporation, Centocor, Inc, Colbar, CollaGenex, Combinatrix, Connetics Corporation, Coria, Dermik Laboratories, Dermira, Inc, Dow Pharmaceutical Sciences, Inc, Dusa Pharmaceuticals, Inc, Eli Lilly & Co, Embil Pharmaceutical Co, Ltd, EOS, Ferndale Laboratories, Inc, Galderma Laboratories, LP, Genentech, Inc, GlaxoSmithKline, PLC, Health Point Ltd, Idera, Inc, Innocutis Medical, LLC, Innovail, Intendis, Inc, Johnson & Johnson, Laboratory Skin Care, Inc, Leo Pharmaceuticals, Inc, L'Oreal SA, 3M, Maruho Co, Ltd, Medical International Technologies, Medicis Pharmaceutical Corp, Merck & Co, Inc, Merz, Nano Bio Corporation, Novartis Pharmaceutical Corporation, Noven Pharmaceuticals, Inc, Nucryst Pharmaceuticals Corporation, Obagi Medical Products, Inc, Onset, Ortho Dermatologics, Ortho Neutrogena, PediaPharma, Inc, Promius Pharma, LLC, PharmaDerm, Pfizer, Inc, PuraCap, QLT, Inc, Quatrix, Quinnova, Serono (Merck-Serono International SA), SkinMedica, Inc, Stiefel Laboratories, Inc, Sun Pharmaceutical Industries, Ltd, Taro, TolerRx, Inc, Triax, UCB, Inc, Valeant Pharmaceuticals North America LLC, Warner-Chilcott, XenoPort, Inc, and ZAGE. Dr Del Rosso served as a research investigator, consultant/advisor, and/or speaker for AbbVie, Aclaris, Almirall, Amgen (Celgene), AnaptysBio, Arcutis, Athenex, Bausch (Ortho Dermatologics), Biofrontera, BioPharmX, Biorasi, Blue Creek, Botanix, Brickell, Bristol Myers Squibb, Cara Therapeutics, Cassiopea, Dermata, Dermavant, Encore, EPI Health, Ferndale, Galderma, Genentech, Incyte, Jem Health, LEO Pharma, La Roche-Posay, Lilly (Dermira), MC2, NOVAN, Pfizer, Ralexar, Regeneron, Sanofi-Genzyme, Sente, Solgel, Sonoma (Intraderm), Sun Pharma, UCB, Verrica, and VYNE (Foamix/Menlo). Dr Hebert reported receiving grants and/or honoraria from Almirall SA, Amryt, Arcutis, Dermavant, GSK, Incyte, Leo, Lilly, Novan, Pfizer, and Sun Pharma; and served as a member of Data and Safety Monitoring Board for GSK, Ortho Dermatologics, and Regeneron-Sanofi. Dr Fried served as a research investigator and/or scientific advisor for AbbVie, BI, BMS, Dermavant, Dermira, EPI, Incyte, Janssen, LEO, Lilly, Novartis, Ortho Dermatologics, Pfizer, Regeneron, Sanofi Sun, and UCB. Dr Siva Narayanan reported receiving consulting honoraria or research funding from Almirall, Biogen, Johnson and Johnson, Sarepta Therapeutics, SeaGen, and Takeda. Dr Koscielny and Dr Kasujee are employees of Almirall, SA. Dr Hilary E. Baldwin has served as an advisor, speaker, consultant and/or investigator for: Almirall, Arcutis, Bausch, Cutera, EPI, Galderma, Journey, La Roche-Posay, L'Oreal, Novan, Sol-Gel, and SUN.

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