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To cite this article: C. Mann, P. Staubach, S. Grabbe, J. Wegner, K. Hennig, G. Nikolakis, J. C. Szepietowski, L. Matusiak, E. von Stebut, U. Kirschner, M. Podda, S. Garcovich & M. Schultheis (2023) Self-management-competency as a new target in Hidradenitis suppurativa care, Journal of Dermatological Treatment, 34:1, 2245082, DOI: [10.1080/09546634.2023.2245082](https://doi.org/10.1080/09546634.2023.2245082)

To link to this article: <https://doi.org/10.1080/09546634.2023.2245082>



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Published online: 14 Aug 2023.



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RESEARCH ARTICLE



Self-management-competency as a new target in Hidradenitis suppurativa care

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ABSTRACT

Background: Hidradenitis suppurativa affects approximately 1% of the population.

Objective: Highlighting the relevance of self-management-competency as a new therapeutic target.

Method: 258 patients from the 'Epidemiology and Care in Acne inversa (EpiCAi)' project were included in the study. Disease burden was measured by patient-rated questionnaires in terms of disease activity, pain, quality of life, depression and insomnia and correlated with the domains of the health education impact questionnaire (heiQ) measuring self-management-competency.

Results: 66 male (25.6%) and 192 female (74.4%) patients, with a mean age of 40.3±10.24 years were included. Mean scores of pain on the numeric rating scale (NRS), Dermatology Life Quality Index (DLQI) and Hospital Anxiety and Depression Scale (HADS) were 5.11±2.68, 11.35±7.79 and 13.71±7.57, respectively. The Insomnia severity index (ISI) showed a mean of 9.58±5.76. The HADS has the highest increased total risk across all heiQ domains. With respect to the heiQ domains, the highest exposure can be attributed to improving constructive attitudes and approaches as well as decreasing emotional distress.

Conclusion: There is a clear association of self-management-competency with overall disease burden, which underlines the need for psychoeducational support. This study provides ideas to develop new possible strategies of care.

ARTICLE HISTORY

Received 19 July 2023

Accepted 31 July 2023

KEYWORDS

Hidradenitis suppurativa; psychoeducation; quality of life; care; self-management

1. Introduction

Hidradenitis suppurativa (HS) is a chronic inflammatory skin condition characterized by recurrent episodes of the formation of inflammatory nodules, abscesses, fistulas, pain, and drainage in the inverse skin regions (1). HS is an immense burden of disease (2).

When establishing treatment plans, disease status and impact must be evaluated. There are numerous validated scores as e.g., Hurley-stage (3) or the International Hidradenitis Suppurativa Severity Score System (IHSS) (4) as well as quality of life (e.g., Dermatology Life Quality Index (DLQI)) (5) and treatment guidelines building on these scores to initiate physical, medicinal and surgical therapies (6). In contrast, dealing with the disease burden by means of improving mental wellbeing has been addressed in HS only sparsely.



To treat the disease holistically and to implement successful disease management, it is necessary to identify key targets in self-management and education that can be addressed. Possible topics include information on the reduction of triggers and risk factors, as well as techniques to reduce symptoms, overcome distress and improve coping with the disease. There is a validated instrument, the health education impact questionnaire (heiQ), for adults with chronic diseases which proved to be effective in evaluating self-management-competency in various publications (7). The heiQ consists of eight independent core domains in relation

to living and coping with the illness: Positive and active life engagement (active), health-focused activities (health), skill acquisition (skill), constructive attitudes and approaches (const), self-observation (self), navigating health care (coop), social integration and support (social), and emotional distress (emo).

The aim of this study was to explore whether the heiQ is a sensitive tool to identify relevant target points in self-management-competency of HS-patients to influence disease activity and burden.

2. Materials and methods

The data for this publication stem from the EpiCAi-project. EpiCAi (Epidemiology and Care in Acne inversa) is a project of an international consortium of experts led by the Department of Dermatology of the University Medical Center Mainz in cooperation with LENICURA GmbH. The aim is to combine data from the everyday care of a large number of HS patients with additional digital surveys. All HS-diagnosed patients, who have agreed to the documentation of their LAight therapy (physical treatment option in Germany performed in outpatient offices) in the manufacturer's software (LENICURA GmbH, Germany), were invited to participate in EpiCAi. Invitation was performed by mailing to the address provided by patients for research purposes and on the other hand by

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displaying flyers at the treatment sites of the LAight therapy as well as an announcement on the project website (www.epicai.de). After logging into their own account, patients were shown questionnaires on different topics. It was not mandatory to fill out all questionnaires, but once a questionnaire was started, it automatically closed after 7 days, saving the most recent status. All available data was analyzed. The present study focuses on the self-management-competency of patients and includes a subset of validated endpoints derived from EpiCAI-questionnaires.

Self-management-competency was measured by the heiQ. Each domain of the heiQ consists of four to six questions and a total of 40 questions on a 4-point scale ('strongly disagree' to 'strongly agree'). By calculating the mean value of the respective items, the domain values are formed (on a scale from 1–4). The higher the score, the stronger the ability to cope with the chronic disease in the respective domain. The domain 'emo' is an exception, as it is rated negatively.

Disease severity was measured by Hurley-staging which was assessed by the physician in the outpatient centers. Moreover, patients were asked to rate their disease activity as a sum of inflammatory nodules + 2 x abscesses + 4 x draining fistulas (PRDA). For this purpose, patients were provided with a description of each lesion typical of HS (8). For measuring the disease burden, the current pain on the Numeric Rating Scale (Pain-NRS: no pain = 0 to worst pain imaginable = 10), the DLQI with 10 items (0 to 3 points allocated per question) as well as the Hospital Anxiety and Depression Scale (HADS), an instrument to measure psychological distress in patients consisting of 14 items, 7 for each subscale anxiety and depression (0 to 3 points allocated per question) (9) were derived. Sleep quality was assessed by the Insomnia Severity Index (ISI), a 7-item patient-rated questionnaire (scoring from 0–28) depicting the quality of sleep in the past 14 days (10). Moreover, patients were also asked about their wishes for information to be displayed if a digital application/app for patients with HS was available.

2.1. Statistical methods

The study follows an explorative design to identify target points for the education of HS-patients. All available data of patients was used for the statistical analysis. To show the impact of the different domains of the heiQ on disease activity, disease burden and sleep impairment, odds-ratios were calculated. For the heiQ, patients with a score in the lower third (L3) received a binary value of 1, while patients in the upper third (U3) received a 0 (Table 1).

The following cut-of criteria were used for the allocation of a binary value of 1 in the disease related endpoints: PRDA severe

Table 1. Criteria on heiQ for patients with HS, compared to other diseases.

	Mean	SD	Lower third (L3)	Upper third (U3)	Cohen's d ^a to bowles disease	Cohen's d ⁽¹⁾ to rheuma	Cohen's d ⁽¹⁾ to oncology
heiQ_Activ	2.87	0.61	≤ 2.40	≥ 3.20	0.21	0.05	0.41
heiQ_Health	2.49	0.73	≤ 2.00	≥ 2.75	0.36	0.52	0.97
heiQ_Skill	2.73	0.55	≤ 2.25	≥ 3.00	0.01	0.07	0.71
heiQ_Const	3.06	0.61	≤ 2.40	≥ 3.20	0.16	0.08	0.44
heiQ_Self	2.91	0.47	≤ 2.67	≥ 3.17	0.46	0.33	0.67
heiQ_Coop	2.93	0.60	≤ 2.60	≥ 3.20	0.39	0.22	0.92
heiQ_Social	2.80	0.66	≤ 2.40	≥ 3.00	0.19	0.02	0.93
heiQ_Emo	2.65	0.73	≤ 2.17	≥ 3.00	-0.42	0.06	-0.55

^aCalculated as difference between mean of other disease ¹ and HS-mean divided by SD of HS-value.

Schwarze M. Übersetzung, Adaption und Validierung des HeiQ – eines generischen Instruments zur Bewertung von Patientenschulungen (PS) und Selbstmanagementprogrammen (SM). In: Abschlussbericht. Hannover. 2011.

(PRDA > 10); at least moderate pain (pain-NRS > 3) (11); very strong influence on quality of life (DLQI > 19 points); alarming values of HADS (HADS total score > 14) and at least moderate sleep problems (ISI > 14). The significance level was set at 5%. All analyses were performed using SPSS (IBM, New-York, United States).

3. Results

3.1. Study population

Patients were recruited for EpiCAI from 3rd December 2021 until 3rd June 2022. In total 3,513 patients had a valid HS-diagnosis and thus were eligible to fill out the digital questionnaires. Of those 277 filled out the informed consent.

A total of 258 patients, 66 male (25%) and 192 female (74.4%), with a mean age of 40.3 ± 10.24 years answered the questionnaire for self-management at baseline and thus were included in this study. Most patients suffered from HS with Hurley stage II (60.5%), while 16.3% showed Hurley stage I and 23.2% were evaluated as Hurley stage III (Table 2). PRDA scores were available for 182 patients, showing a mean score of 16.96 ± 16.45 points. Overall, the disease burden was high with mean values of pain-NRS, DLQI and HADS of 5.11 ± 2.68 points, 11.35 ± 7.79 points and 13.71 ± 7.57 points, respectively. Moreover, the ISI was completed by 179 patients, showing a mean of 9.58 ± 5.76 points.

3.2. heiQ domains

Table 1 shows the mean values for the heiQ domains as well as the cutoffs for the L3 and U3. To gain an idea about the initial level of self-management competency in HS, the mean values were compared to those reported for other diseases like

Table 2. Baseline characteristics.

Characteristics	mean ± SD or absolute/relative numbers are shown
Age in years	40.30 ± 10.24
Gender	
Male	66 (25.6%)
Female	192 (74.4%)
Hurley Stage	
Hurley I	42 (16.3%)
Hurley II	156 (60.5%)
Hurley III	60 (23.3%)
PRDA (n = 182)	16.96 ± 16.45
Pain NRS (n = 198)	5.11 ± 2.68
DLQI (n = 194)	11.35 ± 7.79
HADS (n = 194)	13.71 ± 7.57
ISI (n = 179)	9.58 ± 5.76
Smoking behavior (n = 181)	
Non-smoker	48 (26.5%)
Former smoker	52 (28.7%)
Smoker	68 (37.6%)
Vaping with nicotine	13 (0.7%)
Cigarettes/day (n = 68)	14.01 ± 7.66
BMI	32.47 ± 7.40
Living site (n = 181)	
Rural	95 (52.5%)
City	86 (47.5%)
Work status (n = 182)	
Employed	144 (79.12%)
Not employed*	51 (20.88%)
SHG activity	
No	130 (50.4%)
Yes	128 (49.6%)

*Including student, retired, 'erwerbsunfähig', 'arbeitsunfähig', unemployed, other.

inflammatory bowel disease, rheumatologic and oncologic diseases using Cohens' d (12) (a measurement for effect size mean difference divided by standard deviation). Especially in comparison to oncologic disease, the mean difference almost consistently shows a medium (> 0.5) to strong (> 0.8) effect in difference toward lower values for HS-patients.

3.3. Association of heiQ domains with disease activity and burden

Table 3 shows the odds-ratio of high values in relevant HS-endpoints with L3 performers in heiQ domains as well as risk factors 'smoking' and 'obesity'. It can be obtained that the heiQ domains show many significant associations with a higher risk in disease activity and burden (e.g., a 9 times higher risk for a critical HADS value if patients belong to the L3 of heiQ_Coop and thus are under the impression to not be able to communicate properly with their caregivers). The different magnitudes of effects are highlighted in different colors and received different index points (e.g., 4 points for an odds-ratio bigger than 6 or smaller than 0.167, see Table 3).

From the magnitude of the odds-ratios, an index score was calculated for each endpoint as well as for each heiQ domain by summing up the respective index points to illustrate which endpoint has the highest overall association to self-management-competency and which heiQ domain has the highest impact across all endpoints.

Following this method, index scores for endpoints show that the HADS (26 index points) has the highest increased total risk for

L3 scorers across all heiQ domains, followed by the DLQI and ISI (each 15 index points), pain-NRS (13 index points) and finally PRDA (12 index points).

Index scores for heiQ domains show that patients performing in the L3 in the domains heiQ_Const and heiQ_Emo (15 index points) have the highest risk for a high disease impact. Those two domains are followed by heiQ_Activ and heiQ_Social (13 index points), heiQ_Coop (9 index points) and finally heiQ_Health and heiQ_Self (4 index points).

3.4. Categories of supportive recommendations and information

In the study, patients were asked about which kind of information and support they would mostly benefit from, once a specific digital application for HS would become available. Results are depicted in Table 4. Among the suggested information categories, tips for cleansing and skin care are the most frequently selected (47.0%) by respondents, followed by wound care (40.7%), treatment options and disease understanding (35.5%) as well as knowledge on trigger and risk factors (29.0%).

After that, the project team associated the different requests with heiQ domains. From all suggestions, 'stress reduction and personal time-outs spending on things you enjoy' achieved 47 summed index points. This can be assigned to heiQ_Const and heiQ_Emo with a referral to mental coping and self-aid groups as well as to heiQ_Activ with suggestions for different personalized

Table 3. Odds ratios between heiQ domains and HS-relevant endpoints.

heiQ domains		PRDA	Pain-NRS	DLQI	HADS	ISI	Derived index
		12	13	15	26	15	
heiQ_Activ	Odds-Ratio	2.689	3.197	3.158	32.727	4.714	13
	95% CI	[1.20 ; 6.02]	[1.38 ; 7.40]	[1.17 ; 8.54]	[11.74 ; 91.28]	[1.77 ; 12.56]	
	N _{U3} / N _{L3}	62 / 45	68 / 53	67 / 52	67 / 52	62 / 48	
heiQ_Health	Odds-Ratio	2.995	1.672	2.051	3.141	1.593	4
	95% CI	[1.38 ; 6.50]	[0.75 ; 3.73]	[0.76 ; 5.57]	[1.48 ; 6.65]	[0.63 ; 4.07]	
	N _{U3} / N _{L3}	54 / 58	61 / 62	60 / 61	60 / 61	52 / 56	
heiQ_Skill	Odds-Ratio	2.111	3.726	3.065	2.297	1.614	8
	95% CI	[1.06 ; 4.21]	[1.75 ; 7.93]	[1.23 ; 7.63]	[1.20 ; 4.42]	[0.76 ; 3.44]	
	N _{U3} / N _{L3}	78 / 61	85 / 70	83 / 69	83 / 69	76 / 63	
heiQ_Const	Odds-Ratio	2.256	2.748	8.164	45.600	3.947	15
	95% CI	[1.10 ; 4.63]	[1.33 ; 5.67]	[2.31 ; 28.84]	[15.56 ; 133.62]	[1.54 ; 10.11]	
	N _{U3} / N _{L3}	58 / 68	63 / 76	62 / 75	62 / 75	61 / 65	
heiQ_Self	Odds-Ratio	1.788	2.204	0.917	2.748	0.837	4
	95% CI	[0.87 ; 3.70]	[1.00 ; 4.85]	[0.39 ; 2.18]	[1.36 ; 5.56]	[0.36 ; 1.95]	
	N _{U3} / N _{L3}	72 / 52	76 / 60	75 / 59	75 / 59	68 / 55	
heiQ_Coop	Odds-Ratio	1.792	2.498	2.605	9.059	4.219	9
	95% CI	[0.82 ; 3.90]	[1.11 ; 5.60]	[0.98 ; 6.93]	[3.87 ; 21.22]	[1.60 ; 11.11]	
	N _{U3} / N _{L3}	53 / 52	58 / 59	56 / 59	56 / 59	52 / 53	
heiQ_Social	Odds-Ratio	2.780	2.096	5.385	29.597	7.453	13
	95% CI	[1.24 ; 6.22]	[0.94 ; 4.70]	[1.66 ; 17.46]	[10.57 ; 82.86]	[2.32 ; 23.99]	
	N _{U3} / N _{L3}	54 / 49	61 / 55	60 / 54	60 / 54	57 / 50	
heiQ_Emo	Odds-Ratio	0.276	0.212	0.074	0.040	0.266	15
	95% CI	[0.12 ; 0.62]	[0.09 ; 0.49]	[0.02 ; 0.26]	[0.015 ; 0.11]	[0.09 ; 0.80]	
	N _{U3} / N _{L3}	54 / 55	58 / 61	57 / 59	57 / 59	52 / 56	
Obesity	Odds-Ratio	0.907	0.779	1.000	1.043	0.947	
	95% CI	[0.50 ; 1.64]	[0.43 ; 1.42]	[0.48 ; 2.06]	[0.59 ; 1.84]	[0.46 ; 1.97]	
	N _{nad} / N _{ad}	87 / 91	98 / 97	96 / 96	96 / 96	85 / 84	
Smoker	Odds-Ratio	1.992	1.841	1.078	1.108	1.556	
	95% CI	[1.06 ; 3.75]	[0.97 ; 3.51]	[0.50 ; 2.33]	[0.61 ; 2.03]	[0.76 ; 3.17]	
	N _{NS} / N _S	86 / 76	95 / 79	94 / 78	94 / 78	98 / 81	

1 – 1.99 / 1 – 0,499	1 index point
2 – 3.99 / 0,5 – 0,251	2 index points
4 – 5.99 / 0,25 – 0,167	3 index points
> 6 / < 0,167	4 index points

The upper third (U3) of respondents in heiQ serves as 0, the lower third (L3) as 1. For endpoints the following binary conditions are used to classify for 1: PRDS > 10, pain-NRS > 3, DLQI >19, HADS > 14, ISI > 14.

Table 4. Patients wishes for the content of an HS-App.

Patient wishes for possible functions in an HS-App	Proportion
Cleansing and skin care (e.g., tips for hair removal, soothe itching, suitable toiletries and soaps)	47.0%
→ Cleansing and skin care	
Wound care and scar care incl. adequate dressings (when to call a doctor?)	40.5%
→ Wound care	
Treatment options (ointments, drugs, surgery, alternative treatments, mode of action and side effects)	35.5%
→ Treatment options and disease understanding	
Trigger factors and preventive measures (e.g., food, smoking, alcohol, supplements, period, stress)	29.0%
→ Trigger and risk factors	
Expert contact (identification, consultation, information)	18.0%
→ Expert finder and suggestion	
Forum for affected persons / exchange of experiences (private chat function)	17.0%
→ Mental coping and self-aid groups	
Everyday tips (e.g., tips for clothing, 'household remedies', sleep improvement, self-care, hot weather and sweating)	14.5%
→ Treatment options and disease understanding	
→ Cleansing and skin care	
Diary (incl. treatments and pictures)	12.0%
→ Diary	
Comorbidities and their effect (e.g., depression or diabetes)	8.0%
→ Treatment options and disease understanding	
Pain management (acute inflammation and chronic pain)	7.0%
→ Pain management	
Explanation of pathogenesis of HS and explanation of lesion types and Hurley stages	7.0%
→ Treatment options and disease understanding	
Communication health insurance and regulatory authorities (apply for reimbursement of new therapies or disability status)	6.5%
→ Communication health insurance and regulatory authorities	
Types of sport (e.g., swimming, yoga)	4.0%
→ Treatment options and disease understanding	
How to talk to family and friends (suggestion for couple therapy and sex-life)	2.5%
→ Communication with family and friends	
Social Interaction with employer and colleagues concerning HS (info sheet on what HS is)	2.0%
→ Communication with employer and colleagues	
heiQ domains	Suggestions derived from patient wishes by the study team (added index*)
heiQ_Const (15 index points)	Stress reduction and personal time-outs spending on things you enjoy (47) Mental coping and self-aid groups (38)
heiQ_Emo (15 index points)	Stress reduction and personal time-outs spending on things you enjoy (47) Mental coping and self-aid groups (38)
heiQ_Activ (13 index points)	Stress reduction and personal time-outs spending on things you enjoy (47) Suggestions for sport (17)
heiQ_Social (13 index points)	Mental coping and self-aid groups (38) Communication with family and friends (13) Communication with employer and colleagues (13)
heiQ_Coop (9 index points)	Treatment options and disease understanding (21) Diary (13) Expert finder and suggestion (9) Communication health insurance and regulatory authorities (9)
heiQ_Skill (8 index points)	Treatment options and disease understanding (21) Cleansing and skin care (12) Wound care (8) Pain management (8)
heiQ_Self (4 index points)	Treatment options and disease understanding (21) Diary (13) Cleansing and skin care (12) Trigger and risk factors (4)
heiQ_Health (4 index points)	Stress reduction and personal time-outs spending on things you enjoy (47) Suggestions for sport (17)

*Sum of all index points of the domains, where the suggestion is associated.

activities or workout plans as a possible method to address patient's needs (Table 4).

4. Discussion

HS is a progressive, life-defining disease that can lead to physical limitations, inability to work, and social isolation. Due to the

relatively low awareness and understanding for HS, educational opportunities and support structures for patients are scarce. A recent study by Kirby et al. (13) on the real-world patient journey found that people with HS remain frustrated with their disease management (13).

Our explorative study is the first to evaluate whether relevant target points in self-management-competency of HS-patients could be identified with a validated tool, the heiQ-questionnaire.

The instrument has been successfully used in various studies on dermatological diseases (e.g., psoriasis, atopic dermatitis) to evaluate the self-management-competency of patients as well as the effect of educational programs (14–16).

The results of our explorative study show that there is a clear association of self-management-competency, measured by the heiQ, with overall disease burden; including diseases activity, pain level, mental condition and insomnia. There are other conditions, especially in the oncological field, for which social and psychological support programmes have been established (17). Studies find that this improves the handling and acceptance of the disease by those affected. So far, these structures are often missing in HS, which is clearly reflected in the results of the heiQ, where HS patients score consistently lower in self-management-competency (Table 1).

Patient empowerment embodies the idea of shifting the therapy focus toward a higher patient-autonomy to achieve better disease outcomes. When looking at inflammatory skin diseases like atopic dermatitis and psoriasis, the positive effect of empowering heliotherapy has been shown and psychotherapy in patients has been long recognized as helpful to reduce triggers (18–20).

The odds-ratios between the domains of the heiQ and HS-relevant endpoints shown in Table 3 can be used to identify priorities when creating support structures and educational programs for patients. They can also be used to determine specific target points to positively influence disease activity and burden.

Our results suggest that patients performing in the L3 in the domains heiQ_Const and heiQ_Emo have the highest risk (15 index points) for a high disease impact and thus the implementation of constructive attitudes and suggestions toward approaches in disease management should be aimed for. Considering the gathered patient feedback, this can be achieved by recommending stress reduction and personal time-outs, providing information on mental coping or referral to self-aid groups (Table 4). According to odds-ratios in Table 3 a higher self-management competency in these domains is highly associated with better life quality and less depression and anxiety.

When looking at sleep impairment a positive effect is expected with increased social integration (heiQ_Social) and empowerment of patients to communicate confidently with their caregivers (heiQ_Coop). This could be achieved by providing them with knowledge about treatment options thus increasing their disease understanding. An association between insomnia and poor social integration was also seen in the Covid-19 pandemic (21). Furthermore, physical activity has shown to be of relevant importance to improve sleep quality (22). Vice versa improving sleep quality should also help decrease disease burden.

HS requires a high level of self-management from those affected, however according to our data, this is exactly what most patients struggle with, seemingly thereby influencing their disease outcome. Our ultimate goal for patients should be to help them gain competency by making them experts in their own disease and thus positively influence their daily life. We consider the heiQ a valuable, sensitive tool to detect weaknesses and monitor patients' capabilities.

4.1. Limitations and biases

It must be pointed out that the study-cohort was already under treatment in an outpatient center. So participants were most likely well informed about HS at the time of the survey. This implies that we expect an even more substantial burden of disease and lower self-management-competency in the general HS-population.

Patients collected the PRDA-score based on the validated lesion identification scheme (LISAI). Although it has been shown that patients can correctly classify their lesions in the anatomical region with the help of the LISAI, a validation of the quantitative measurement by patients has not yet been performed (8).

4.2. Outlook

Although the implementation of basic educational programs and support groups seems obvious, our study reveals that the importance for HS-care might be underestimated. Implementing supportive measures like e.g., a specific HS-App designed to analyze specific patient's needs to come up with an individualized plan is one way to improve self-management-competency.

Further studies are needed to evaluate whether individual performance of patients in heiQ domains can be used to give associated suggestions (Table 4) and whether these suggestions eventually lead to improved disease activity and burden.

Authors' contributions

C.M., M.S. drafted the manuscript and designed the figures with K.H. K.H. performed the analysis. PS and SG were involved in planning and supervised the work. All coauthors participated in the study, helped interpreting the results and worked on the manuscript. All authors discussed the results, commented and agreed on the final version of the manuscript.

Ethics statement

The research complied with the guidelines for human studies and was conducted according to the ethical principles of the Declaration of Helsinki and in line with the principles of Good Clinical Practice (ICH-GCP) and was registered at the German Clinical Trials Registry (DRKS00025315) before recruitment of the first patient. The study protocol was approved by the independent ethics committees and informed consent was obtained from each patient before any study specific procedures.

Disclosure statement

Caroline Mann: Grants or contracts from any entity: Novartis; Allmirall | Consulting fees: Almirall-Hermal, Payment or honoraria for lectures, presentations, speakers bureaus, manuscript writing or educational events: PER, UNEV, AbbVie, Pfizer, Novartis, L'Oreal | Support for attending meetings and/or travel: AbbVie, Pfizer, Lilly, Almirall, L'Oreal, Takeda, Novartis– funding of travel, congress, and hotel fees. Petra Staubach: Grants or contracts from any entity: Novartis; Allmirall | Consulting fees: AbbVie, Allergika, Almirall-Hermal, Amgen, Beiersdorf, Biocryst, BMS, Boehringer-Ingelheim, Celgene, CSL-Behring, Eli-Lilly, Falk, Galderma, Hexal, Janssen, Klinge, Klosterfrau, LEO-Pharma, LETI-Pharma, L'Oreal, Novartis, Octapharma, Pfizer, Pflüger, Pharming, Regeneron, Shire, Takeda, Sanofi-Genzyme, UCB Pharma | Leadership or fiduciary role in other board, society, committee or advocacy group, paid or unpaid unrelated to current work presented here: Society of dermatopharmazie. Georgios Nikolakis: Consulting fees - Dessau Medical Center received a consulting fee from Mölnlycke Health Care GmbH, for which I served as a consulting physician | Payment or honoraria for lectures, presentations, speakers bureaus, manuscript writing or educational events: Speaker for the EADV HS Course 28–30.11.2022,

Porto, Portugal | Support for attending meetings and/or travel: Eli Lilly Scholarship for attending EADV 2021 | Participation in a data protection monitoring board or advisory board - Dessau Medical Center received a consulting fee from Mölnlycke Health Care GmbH, for which I served as a consulting physician. Joanna Wegner: Payment or honoraria for lectures, presentations, speakers bureaus, manuscript writing or educational events: AbbVie, Janssen, Novartis - Honoraria for lectures | Support for attending meetings and/or travel: Lilly, Pfizer - Assumption of travel- congress- and hotel fees. Esther Stebut: Consulting fees: Janssen, Novartis | Payment or honoraria for lectures, presentations, speakers bureaus, manuscript writing or educational events: Janssen, Novartis, Infectopharm, Leo | Leadership or fiduciary role in other board, society, committee or advocacy group, paid or unpaid: Deutsche Dermatologische Gesellschaft, Deutsche Forschungsgemeinschaft, Mediziner Fakultätentag). Jacek C Szepletowski: Advisory Board/Consultant for AbbVie, Leo Pharma, Novartis, Pfizer, Sanofi-Genzyme, Trevi, UCB and Vifor; Speaker for AbbVie, Ammirall, Janssen-Cilag, Eli-Lilly, Leo Pharma, Novartis, Pfizer, Sanofi-Genzyme; Investigator for for AbbVie, Ammirall, Amgen, AnaptysBio, BMS, Boehringer Ingelheim, Celtrion, Galderma, Galapagos, Helm AG, Kliniksa, Incyte, InfraRX, Janssen-Cilag, Leo Pharma, Medimmune, Menlo Therapeutics, Merck, Novartis, Pfizer, Regeneron, UCB, Teva, Trevi. Lukasz Matusiak: Advisory Board/Consultant for AbbVie, Novartis; Speaker for AbbVie, Aristo, Leo Pharma, Medac; Investigator for for AbbVie, Ammirall, Amgen, AnaptysBio, BMS, Boehringer Ingelheim, Celtrion, Galderma, Galapagos, Helm AG, Kliniksa, Incyte, InfraRX, Janssen-Cilag, Leo Pharma, Medimmune, Menlo Therapeutics, Merck, Novartis, Pfizer, Regeneron, UCB, Teva, Trevi. Uwe Kirschner: Grants or contracts from any entity: UCB Pharma Congress fees; Payment or honoraria for lectures, presentations, speakers bureaus, manuscript writing or educational events: Novartis | Support for attending meetings and/or travel: UCB Pharma; Novartis; Participation on a data protection monitoring board or advisory board: Novartis. Katharina Hennig: Patents planned, issued or pending: DE102015000150B4 | Stocks or stock options LENICURA GmbH – CEO and stockholder of the company. Stephan Grabbe: Grants or contracts from any entity: Novartis, Pierre Fabre | Consulting fees: AbbVie, BMS, MSD, Genzyme, Klinge Pharma, Sun Pharma, Kyowa-Kirin, Novartis, Pierre Fabre | Participation on a Data Safety Monitoring Board or Advisory Board: Alcedis | Leadership or fiduciary role in other board, society, committee or advocacy group, paid or unpaid unrelated to current work presented here: DeCOG, German dermatological cooperative oncology group - unrelated to current work presented here. Maurizio Podda: Maurizio Podda: Consulting fees: AbbVie, CSL, Galderma, Novartis, Janssen Cilag, UCB | Payment or honoraria for lectures, presentations, speakers bureaus, manuscript writing or educational events: AbbVie, Beiersdorf, BMS, Eli Lilly, Galderma, Janssen Cilag, Leo Pharma, L'Oreal, Novartis, MSD, UCB | Support for attending meetings and/or travel: AbbVie, Beiersdorf, BMS, Eli Lilly, Galderma, Janssen-Cilag, Leo Pharma, L'Oreal, Novartis, MSD, UCB | Participation on a Data Safety Monitoring Board or Advisory Board: AbbVie, Boehringer Ingelheim, CSL, Galderma, Janssen-Cilag, MoonLake, Novartis, L'Oreal, UCB | Leadership or fiduciary role in other board, society, committee or advocacy group, paid or unpaid: HiSNet Rhein Main e.V., President. Dr. Simone Garcovich: nothing to declare. Michael Schultheis: Grants or contracts from any entity: LENICURA GmbH - auditor activity on the implementation of the contract 'AOK-Priomed Acne inversa' | Participation on a Data Safety Monitoring Board or Advisory Board: Novartis | Payment or honoraria for lectures, presentations, speakers bureaus, manuscript writing or educational events: AbbVie - honoraria for lectures |

Support for attending meetings and/or travel: AbbVie, Pfizer – funding of travel, congress, and hotel fees.

Funding

The LENICURA software provided the digital questionnaires free of charge.

Data availability statement

All data is available from the authors upon reasonable request.

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