Original Investigation

FREE

Using the Physician Global Assessment in a Clinical Setting to Measure and Track Patient Outcomes

Vanessa L. Pascoe, BA[1,2]; Monica Enamandram, MD[3]; Kristen C. Corey, MD[4] ; et al

Author Affiliations | Article Information

Cite Permissions Metrics

JAMA Dermatol
Published Online: April 2015
2015;151;(4):375-381.
doi:10.1001/jamadermatol.2014.3513

RELATED ARTICLES FIGURES SUPPLEMENTAL CONTENT

Abstract

Importance In dermatology, the development of objective, standardized quality measures that can be used in a clinical setting is important to be able to respond to the needs of payers and credentialing and licensure bodies and to demonstrate dermatologic value.

Objective To examine the feasibility of using Physician Global Assessment (PGA) scores to collect and track patient acne and psoriasis outcomes over time.

Design, Setting, and Participants The PGA severity scores were included on physicians' billing sheets for patients with acne and psoriasis seen at a tertiary care center outpatient dermatology clinic from June 2011 through October 2012. A subset of patients from 5 clinics completed Patient Global Assessments

(PtGAs) between November 2011 and May 2012. Thirty dermatology clinicians saw a total of 2770 patients with acne and 1516 patients with psoriasis in clinic, recording PGA scores for each patient. The PtGA scores were collected from 52 and 103 patients with acne and psoriasis, respectively, within the larger sample.

Main Outcomes and Measures Longitudinal PGA severity scores were collected for acne and psoriasis. The PGA severity scores were analyzed over time, with the hypothesis that patient scores for both acne and psoriasis would improve between the initial and follow-up visits. The PtGA scores from a subset of clinics and dates were compared with PGA scores to assess within-clinic reliability, with the hypothesis that there would be good agreement between clinician and patient assessments.

Results New patient PGA outcomes showed considerable improvement over time. At 3-month follow-up, 14.6% of the acne cohort was graded as effectively clear, compared with 2.1% at baseline ($P < .001$). Similarly, at 3-month follow-up, 22.3% of the psoriasis cohort was graded as effectively clear, compared with 3.1% at baseline ($P < .001$). Additionally, interobserver agreement between PGA and PtGA scores was good (acne, $\kappa = 0.68$; psoriasis, $\kappa = 0.70$).

Conclusions and Relevance The PGA can be readily incorporated into practice to track patient acne and psoriasis outcomes over time, representing an opportunity for dermatologists to evaluate performance and validate practice guidelines.

Introduction

As pay-for-performance metrics and clinical outcomes measures are increasingly used to guide clinical practice, quality-improvement initiatives have become a major force in shaping health care. Several medical specialties have developed standardized patient outcomes measurement methods.[1-3] To date, dermatology lacks a comprehensive, specific set of such measures, which may be due in part to the subjective nature of the physical examination and/or the lack of laboratory tests.[4,5] From a policy perspective, this renders it challenging to demonstrate to stakeholders that the field of dermatology is systematically working to improve patient care.

In this evolving climate of outcome-based practice, dermatologists have identified a need to develop quality measures.[5,6] One such potential measure is the Physician Global Assessment (PGA), a 5- or 6-point scoring system used to assess disease severity. The PGA has previously been proposed as a simple, intuitive mechanism to collect clinical outcomes data, but investigation of its use has been limited primarily to clinical trials.[6] For this analysis, we chose to study acne and psoriasis, both common chronic dermatolo[illegible]on-ditions for which standardized outcomes measurements would be clinically and epidemiologically valuable. Furthermore, for both diseases, PGA scoring is one of the standard measurements used in clinical trials, with a primary treatment success end point most often defined as PGA clear or almost clear.[7,8]

In acne, clinical trials typically use global assessment and/or lesion counting to evaluate disease severity and treatment outcomes. Global assessments have demonstrated reliability: Tan et al[9] found that a global system accurately distinguished clear or almost clear from mild acne categories. Trends in PGA also consistently mirrored results using other disease severity metrics, including study participants' global assessment and both facial and truncal lesion counts.[10-13]

The US Food and Drug Administration (FDA) currently recommends that PGAs be used to evaluate treatment success in clinical trials of acne vulgaris, with a score of clear or almost clear or a 2-point scale reduction considered a successful treatment response.[8] In the present study, we used the FDA's suggested 5-point scale. A recent study of 18 acne global grading scales demonstrated that the FDA scale was able to accurately categorize disease severity and also possessed strong clinimetric properties such as validity, reproducibility, discriminatory capacity, and responsivity.[14]

In psoriasis, the PGA scoring system is based on response to treatment as measured by lesion erythema, induration, and scale, with score assignments that range from clear, almost clear, mild, moderate, to severe.[15] When compared with the most widely used psoriasis assessment tool, the Psoriasis Area and Severity Index, as well as health-related quality of life psoriasis assessments, the PGA system demonstrates both reliability and substantial correlation.[7,16] In the present study, we used a common psoriasis PGA scale that has undergone psychometric validation and been found to have strong test-retest reliability, internal consistency, reliability, and validity as well as significant longitudinal correlation to the Patient Global Assessment (PtGA).[17]

In the present study, we examined the feasibility of using the PGA scoring system for acne and psoriasis outcomes. We sought to quantitatively demonstrate that the PGA scores can be used to track the positive impact of clinical treatment over time.

Methods

This study was approved by the institutional review board (IRB) at the Massachusetts General Hospital (MGH). Written informed consent was implied by patients' completion of the PtGA questionnaire, consistent with IRB approval.

Physicians' billing sheets from patient encounters were modified to include PGA category subheadings (clear, almost clear, mild, moderate, or severe) under the acne and psoriasis *International Classification of Diseases, Ninth Revision (ICD-9)* diagnosis sections in the medical dermatology clinic at the MGH. All 30 attending dermatologists were trained and instructed to complete the PGA scale after each relevant patient visit (**Table 1**). A clinic coordinator followed up on any missing data.

Table 1. Physician's Global Assessment (PGA) of Acne and Psoriasis

Evaluation and enrollment proceeded in the sequence illustrated in **Figure 1**. Demographic data and PGA scores were collected for acne and psoriasis from patients evaluated from June 2011 through October 2012. For new patients with acne or psoriasis presenting for care during the study period, PGA data was compared between initial evaluation and subsequent follow-up visits to examine clinical progress with treatment over time. To compare PGA scores at baseline and follow-up, χ^2 statistical analyses were used, with a level of significance set at $P < .05$. Physician compliance with PGA completion was calculated using clinic billing data for patients treated for acne or psoriasis between June 2011 and October 2012.

View Large Download

Figure 1. Enrollment of Patients and Clinicians

This diagram demonstrates the number of patients and clinicians participating in Physician Global Assessment (PGA) scoring for acne and psoriasis from June 2011 through October 2012. One of the 30 clinicians discontinued participation after 10 months, but the 10 months of data were included in our analysis.

To assess the within-clinic reliability of PGA scores and minimize subconscious inflation of patient scores, patients from 5 clinicians' clinics were approached by clinic personnel (nurses, medical assistants) and asked if they would like to complete a Patient Global Assessment (PtGA) questionnaire. All clinicians were informed that they might be assessed, but they were unaware of whether or when these assessments occurred. The PtGA questionnaires were administered to patients from the 5 chosen clinics from November 2011 through May 2012. Willing participants gave verbal consent, then selected the PtGA category that best described their current disease severity. Nontreating medical personnel collected PtGA forms to prevent treating clinician access to patient responses and ensure integrity of physician-derived assessments.

The PtGA and PGA scores were compared for concordance between assessments graded effectively clear (clear or almost clear) and assessments indicating ongoing disease activity (mild, moderate, and severe). Interobserver agreement between PtGA and PGA scores was calculated using the weighted Cohen [illegible] efficient (STATA statistical software; StataCorp LP). Demographics and PGA severity levels for the acne and psoriasis in the study population were compared with the respective PtGA questionnaire responses using 2-sample *t* tests, Fisher exact tests, and χ^2 analyses using Excel, version 11 (Microsoft Corporation).

Results

Demographics and Baseline Disease Severity of Total Clinic Population

A total of 2770 patients with acne were evaluated at our institution from June 2011 through October 2012. As summarized in **Table 2**, patients with acne were predominantly female, with a mean age of 30.7 years. The majority of patients had mild (31%) or moderate (54%) acne. There were a total of 1516 patients with psoriasis, slightly more women than men, with a mean age of 51.3 years. Most patients with psoriasis were affected with mild (39%) or moderate (46%) disease.

View Large Download

Table 2. Demographic and PGA Characteristics of the Total Study Population and New Patients[a]

Demographics and Baseline Disease Severity of New Patients

Acne

During the study period, 336 patients with a new acne diagnosis returned for at least 1 follow-up visit; 31.5% were male, and 68.5% female; mean age, 25.5 years (**Table 2**). Within this cohort, the majority (67%) of new patients had a total of 2 visits during the study period; 20.7% had 3 visits. From baseline PGA scores, as would be expected at an academic medical center, the majority (67.1%) of new patients with acne were graded with moderate to severe disease.

Psoriasis

Within this same timeframe, 130 patients had a new diagnosis of psoriasis and at least 1 follow-up visit; 46% of new patients were men, and 54% were women; mean age, 46.5 years. The majority of new patients (59%) had a total of 2 visits during the study period; 17% had 3 visits. Like patients with acne, new patients with psoriasis were predominantly (57.7%) affected with moderate to severe disease (**Table 2**).

New Patients' Follow-up Disease Severity by PGA Scoring

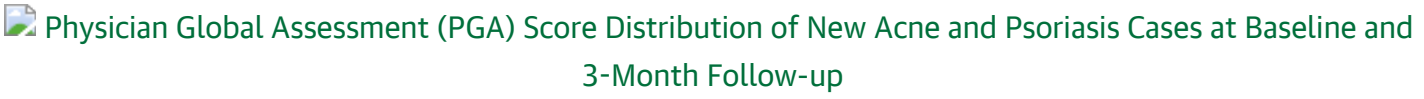
Acne

For follow-up evaluation, 40.6% of new patients with acne (n = 212) returned within an approximately 3-month interval (45-119 days; mean, 99 days) after their initial visit. The majority of returning patients were affected by mild (35.4%) or moderate (40.1%) acne (**Table 2**, **Figure 2**). Among the cohort of new patients, 8% of those with acne (n = 27) demonstrated an improvement in disease severity by 2 or more PGA categories at their 3-month follow-up visit. Similarly, 19% of new patients with acne (n = 63) improved by 2 or

more PGA disease severity categories over the 16-month study period. When stratified by PGA score, 14.6% of the cohort was graded as effectively clear of acne (PGA rating of clear or almost clear) at 3 months compared with 2.1% at baseline ($P < .001$). Throughout the 16-month study period, 22% of new patients achieved a PGA score indicating that they were clear of acne.

View Large Download

Figure 2. Physician Global Assessment (PGA) Score Distribution of New Acne and Psoriasis Cases at Baseline and 3-Month Follow-up



A, Acne. B, Psoriasis. A and B, For both acne and psoriasis, there was significant disease severity improvement between baseline and 3-month follow-up visits. A, For acne at baseline, 2.1% of the cohort was graded as effectively clear (PGA score of clear or almost clear) compared with 14.6% at 3-month follow-up ($P < .001$). B, For psoriasis at baseline, 3.1% were graded as effectively clear compared with 22.3% at 3-month follow-up ($P < .001$).

Psoriasis

Among new patients with psoriasis, 72.3% (n = 94) returned for follow-up within an approximately 3-month interval (450-119 days; mean, 104 days) after their initial visit. The majority of returning patients were affected by mild (35.1%) or moderate (34.0%) disease (Table 2, Figure 2). The proportion of patients affected by moderate disease was substantially reduced at 3-month follow-up (34.0%) compared with baseline (46.1%). Furthermore, 8% (n = 11) of new patients demonstrated a reduction in disease severity by 2 or more PGA categories at their 3-month follow-up visit. Similarly, 18% (n = 23) of new patients with psoriasis improved by 2 or more PGA disease severity categories over the 16-month study period. When stratified by PGA score, 22.3% of the cohort was graded as effectively cleared of psoriasis (PGA rating of clear or almost clear) at 3 months compared with 3.1% at baseline ($P < .001$). Throughout the 16-month study period, 31.5% of new patients achieved a PGA score indicating that they were clear of psoriasis.

Demographics and Disease Severity of Population Completing the PtGA Questionnaire

Fifty-two patients with acne of 61 possible patients seen by 4 clinicians in 30 clinic sessions completed PtGA questionnaires, for a response rate of 85%. Study patients with acne completing the PtGA were similar to the total acne population in mean age (28.4 vs 30.7 years; $P = .18$), sex (23% male vs 27% ma = .64), and PGA score proportions (Table 3).

View Large Download

Table 3. Demographic and PGA Characteristics of the Total Study Population and PtGA Patients[a]

A total of 103 patients with psoriasis of 114 possible patients seen by 4 clinicians in 45 clinic sessions completed PtGA questionnaires, for a response rate of 90%. Mean age (48.3 vs 51.3 years; $P = .10$) and sex (59% vs 49% male; $P = .05$) did not significantly differ from the total psoriasis population, but the PtGA population consisted of a significantly higher proportion of moderate (38% vs 27%; $P = .02$) and severe (16% vs 6%; $P < .001$) psoriasis, and a lower proportion (27% vs 52%; $P < .001$) of mild disease (**Table 3**).

Physician and Patient Assessment of Acne and Psoriasis Disease Severity: PGA vs PtGA

The interobserver agreement between physician (PGA) and patient (PtGA) global assessment for acne and psoriasis was good, reflected by the weighted Cohen κ (acne, $\kappa = 0.68$; psoriasis, $\kappa = 0.70$) (eTable in the **Supplement**). On stratifying the results by individual clinician, κ values ranged from 0.61 to 0.90, except for those reported by clinician E, who was an outlier. Data were collected only for patients with psoriasis in clinician E's clinics, and slight agreement was reached between physician and patient assessment scores in this setting ($\kappa = 0.15$) (eTable in the **Supplement**).

Feasibility of Incorporating PGA Scoring Into Clinical Practice

The PGA is a practical method to collect dermatology outcomes data. Initial physician compliance was high and reached 100% for both patients with acne and patients with psoriasis after coordinator follow-up. One clinician discontinued participation after 10 months. Overall, the inclusion of PGA categories on billing sheets allowed scoring to be easily and methodically incorporated into routine practice. Moreover, PGA scoring proved to be feasible for clinicians, requiring little additional time and yielding rich information about the disease severity of a large cohort of patients over time. The overall distribution of PGA scores obtained was similar to established epidemiological patterns of acne and psoriasis, with the exception that the patients seen at our tertiary care center were more likely to have moderate to severe disease, particularly those with psoriasis.[18,19] This was likely because 2 of our participating clinicians (A and E) maintain a clinical interest in psoriasis and tend to treat more patients requiring phototherapy and/or systemic treatment than would occur in general practice.

Discussion

PGA as a Reliable Tool to Assess and Track Outcomes

Our results support use of the PGA as a standardized outcome measure in dermatology in the clinical setting. Our 100% physician compliance rate demonstrates that it is feasible and straightforward to use the PGA in clinical practice to assess clinical changes over time. The simple intervention of routinely adding PGA scoring to physicians' billing sheets after the patient encounter yielded rich clinical data that could, for example, be used to adjust for severity when assessing performance measures or cost of care. It could also be used to measure the effects of implementation of guidelines or other care interventions on outcomes. In our case, PGA scoring allowed us to determine that the majority of our clinic's new patients with acne and/or psoriasis present with moderate to severe disease, as might be expected from a tertiary academic medical center. It also provided a quantifiable metric to demonstrate that these patients' conditions significantly improved under our dermatologic care and allowed us to evaluate the degree of both individual and aggregated clinical improvement. Thus, the comprehensive information gleaned from PGA incorporation may ultimately be relevant to patient care as well as a potential driver of quality improvement at the departmental level.

A number of studies have previously correlated PtGA with PGA assessments.[13,17,20] Thus, our overall high concordance between patient and physician scores in our limited subset was consistent with what would be anticipated from the existing literature. The high concordance between PGA and PtGA scores demonstrates that the PGA represents an adequate reflection of disease severity in our clinic and that our physicians were likely not inadvertently inflating their patients' improvements over time. Furthermore, patients' self-monitoring may also be useful in the clinical setting and might be accurately quantified using global assessment scores.[21]

Given the correlation between PtGA and PGA scores, the possibility of unburdening physicians and exclusively using the PtGA to track outcomes merits consideration. However, for several reasons, we believe the PGA to be superior. First, using the PtGA engenders an additional administrative barrier; nurses would need to preidentify incoming patients with acne and/or psoriasis and ensure their receipt of the correct paperwork. Furthermore, requiring the PGA on billing sheets ensures a near-perfect response rate from physicians. Given the lack of similar control over patient participation, it would be challenging to receive as high of a response rate with the PtGA. However, as we continually define patient-centered treatment goals to optimize health outcomes for acne and psoriasis, the information gathered from PtGA scores represents an opportunity to guide clinical decision making for routine treatment, which suggests that these scores may be valuable to collect as well.

Strengths and Limitations

The strengths of our analysis include the large population and the extended timeframe over which scores were captured. The subset of patients completing the PtGA assessments was representative of the overall acne and psoriasis populations treated at our institution in terms of mean age and sex proportions.

Limitations of this analysis include a small sample of dual patient and clinician global assessment scores for which interobserver agreement was calculated. Additionally, there was a possibility of selection bias in psoriasis, given that 2 of the 5 participating PtGA clinicians maintain a clinical interest in treating patients with psoriasis with systemic therapy–requiring disease. As such, PGA and PtGA scores favored the severe end of the clinical spectrum. Similarly, our patient population was derived from a large academic institution, which may also represent a higher frequency of severe disease. The subset of PGA and PtGA responses was collected over a 6-month period, predominantly during winter; this may partially account for the higher frequency of severe psoriasis scores in this population, reflecting the disease's tendency to worsen in the winter. In addition, 1 clinician had a lower PGA-PtGA correlation than most, emphasizing the need to consistently train both clinicians and patients on appropriate scale completion. We recommend replicating this study in a private practice environment to ensure the persistence of PGA feasibility, correlation with the PtGA, and discriminatory capacity even with a lower disease severity.

In addition, though the acne PGA in our study correlated well with patient-reported severity, it may not yet be optimized to detect some important aspects of clinical improvement. For example, it does not distinguish between scarring vs nonscarring papules (**Table 1**). The current FDA PGA scale that we used may benefit from future adaptation for the clinical setting, considering factors such as depth, scarring, and/or requirement of systemic therapy. We look forward to continued clinical PGA scale refinements.

Conclusions

As we advance quality-improvement initiatives in health care delivery, the PGA is a convenient system that represents a potentially valuable tool for establishing baseline acuity and for measuring and reporting patient outcomes over time in dermatology. Incorporating this measure into everyday practice is an achievable task, which can contribute important insight into patients' disease severity and response to treatment. We have subsequently incorporated this measurement into our electronic charge capture system, which requires entry of these data to complete the charge.

Although the use of the PGA system has been most validated for assessment of psoriasis and acne to date, its applicability may potentially expand across a variety of future conditions and clinical settings. If PGA scoring was implemented more broadly, data at the institutional level could prove valuable to quantitatively demonstrate the positive impact of physicians' treatment plans. Ultimately in dermatology, measures such as the PGA scoring system can facilitate improved outcomes, validate practice guidelines, and provide accountability and feedback to physicians, patients, and health care stakeholders.

Article Information

Corresponding Author: Alexandra B. Kimball, MD, MPH, Clinical Unit for Research Trials and Outcomes in Skin, Department of Dermatology, Massachusetts General Hospital, 50 Staniford St, Ste 240, Boston, MA 02114 (harvardskinstudies@partners.org).

Accepted for Publication: August 30, 2014.

Published Online: December 30, 2014. doi:10.1001/jamadermatol.2014.3513.

Author Contributions: Ms Pascoe and Dr Kimball had full access to all of the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis.

Study concept and design: Pascoe, Corey, Cheng, Kimball.

Acquisition, analysis, or interpretation of data: Pascoe, Enamandram, Corey, Cheng, Javorsky, Sung, Donahue, Kimball.

Drafting of the manuscript: Pascoe, Enamandram, Corey, Cheng, Javorsky.

Critical revision of the manuscript for important intellectual content: Pascoe, Enamandram, Corey, Cheng, Javorsky, Sung, Donahue, Kimball.

Statistical analysis: Pascoe, Enamandram, Corey, Donahue, Kimball.

Obtained funding: Pascoe.

Administrative, technical, or material support: Javorsky, Sung.

Study supervision: Cheng, Kimball.

Conflict of Interest Disclosures: Dr Sung received funding from Janssen Pharmaceuticals. No other disclosures were reported.

Funding/Support: This study was supported in part by funds from a National Psoriasis Foundation fellowship (Dr Sung) and from the Department of Dermatology, Massachusetts General Hospital, Harvard Medical School.

Role of the Sponsor: The funding institutions had no role in the design and conduct of the study; collection, management, analysis, and interpretation of the data; preparation, review, or approval of the manuscript; and decision to submit the manuscript for publication.

Additional Contributions: We are indebted to all of the faculty members of the Department of Dermatology, Massachusetts General Hospital, Harvard Medical School, who participated in collection of PGA data.

References

1. Elston DM, Sieck CK, Sullivan JN, Behal R, Kaleba EO. Developing ambulatory care physician performance measures. *J Am Acad Dermatol*. 2008;59(3):505-513.
PubMed | Google Scholar | Crossref

2. Fitzgerald AA, Allen LA, Masoudi FA. The evolving landscape of quality measurement for heart failure. *Ann N Y Acad Sci*. 2012;1254:131-139.
PubMed | Google Scholar | Crossref

3. Glaab T, Vogelmeier C, Buhl R. Outcome measures in chronic obstructive pulmonary disease (COPD): strengths and limitations. *Respir Res*. 2010;11:79-99.
PubMed | Google Scholar | Crossref

4. Grekin SJ, Ellis CN. Evaluating the severity of dermatologic disorders. *Dermatol Ther*. 2009;22(3):191-198.
PubMed | Google Scholar | Crossref

5. Wilson RL, Feldman SR. Physician performance measures in dermatology. *J Am Acad Dermatol*. 2010;63(2):e29-e35.
PubMed | Google Scholar | Crossref

6. Freedman JD, Gottlieb AB, Lizzul PF. Physician performance measurement: tiered networks and dermatology (an opportunity and a challenge). *J Am Acad Dermatol*. 2011;64(6):1164-1169.
PubMed | Google Scholar | Crossref

7. Robinson A, Kardos M, Kimball AB. Physician Global Assessment (PGA) and Psoriasis Area and Severity Index (PASI): why do both? a systematic analysis of randomized controlled trials of biologic agents for moderate to severe plaque psoriasis. *J Am Acad Dermatol*. 2012;66(3):369-375.
PubMed | Google Scholar | Crossref

8. US Department of Health and Human Services; Food and Drug Administration; Center for Drug Evaluation and Research (CDER). *Guidance for industry: acne vulgaris: developing drugs for treatment*.http://www.fda.gov/downloads/Drugs/.../Guidances/UCM071292.pdf. Accessed October 3, 2014.

9. Tan JK, Fung K, Bulger L. Reliability of dermatologists in acne lesion counts and global assessments. *J Cutan Med Surg*. 2006;10(4):160-165.
PubMed | Google Scholar | Crossref

10. Eichenfield LF, Hebert AA, Schachner L, Paller AS, Rossi AB, Lucky AW. Tretinoin microsphere gel 0.04% pump for treating acne vulgaris in preadolescents: a randomized, controlled study. *J Drugs Dermatol*. 2012;29(5):598-604.
PubMed | Google Scholar | Crossref

11. Feldman SR, Fried RG, Herndon JH Jr, et al. Digital videography assessment of patients' experiences using adapalene-benzoyl peroxide gel in the treatment of acne vulgaris. *J Drugs Dermatol*. 2012;11(8):919-925.
PubMed | Google Scholar

12. Green L, Kircik LH, Gwazdauskas J. Randomized, controlled, evaluator-blinded studies conducted to compare the efficacy and tolerability of 3 over-the-counter acne regimens in subjects with mild or moderate acne. *J Drugs Dermatol*. 2013;12(2):180-185.
PubMed | Google Scholar

13. Palli MB, Reyes-Habito CM, Lima XT, Kimball AB. A single-center, randomized double-blind, parallel-group study to examine the safety and efficacy of 3mg drospirenone/0.02 mg ethinyl estradiol compared with placebo in the treatment of moderate truncal acne vulgaris. *J Drugs Dermatol*. 2013;12(6):633-637.
PubMed | Google Scholar

14. Tan JK, Jones E, Allen E, Pripotnev S, Raza A, Wolfe B. Evaluation of essential clinical components and features of current acne global grading scales. *J Am Acad Dermatol*. 2013;69(5):754-761.
PubMed | Google Scholar | Crossref

15. Langley RG, Ellis CN. Evaluating psoriasis with psoriasis area and severity index, psoriasis global assessment, and lattice system physician's global assessment. *J Am Acad Dermatol*. 2004;51(4):563-569.
PubMed | Google Scholar | Crossref

16. Spuls PI, Lecluse LL, Poulsen ML, Bos JD, Stern RS, Nijsten T. How good are clinical severity and outcome measures for psoriasis? quantitative evaluation in a systematic review. *J Invest Dermatol*. 2010;130(4):933-943.
PubMed | Google Scholar | Crossref

17. Cappelleri JC, Bushmakin AG, Harness J, Mamolo C. Psychometric validation of the physician global assessment scale for assessing severity of psoriasis disease activity. *Qual Life Res*. 2013;22(9):2489-2499.
PubMed | Google Scholar | Crossref

18. Ghodsi SZ, Orawa H, Zouboulis CC. Prevalence, severity, and severity risk factors of acne in high school pupils: a community-based study. *J Invest Dermatol*. 2009;129(9):2136-2141.
PubMed | Google Scholar | Crossref

19. Nevitt GJ, Hutchinson PE. Psoriasis in the community: prevalence, severity and patients' b and attitudes towards the disease. *Br J Dermatol*. 1996;135(4):533-537.
PubMed | Google Scholar | Crossref

20. Sampogna F, Picardi A, Melchi CF, Pasquini P, Abeni D. The impact of skin diseases on patients: comparing dermatologists' opinions with research data collected on their patients. *Br J Dermatol*. 2003;148(5):989-995.
PubMed | Google Scholar | Crossref

21. Armstrong AW, Parsi K, Schupp CW, Mease PJ, Duffin KC. Standardizing training for psoriasis measures: effectiveness of an online training video on Psoriasis Area and Severity Index assessment by physician and patient raters. *JAMA Dermatol*. 2013;149(5):577-582.
Article | PubMed | Google Scholar | Crossref