
The Urticaria Severity Score: a sensitive questionnaire/index for monitoring response to therapy in patients with chronic urticaria

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Background: Despite the existence of numerous dermatology-specific quality-of-life questionnaires, there exists a need for a well-validated instrument to evaluate and monitor patients with chronic urticaria.

Objective: To develop and validate a novel chronic urticaria-specific questionnaire, the Urticaria Severity Score (USS).

Methods: The USS was developed with 12 questions and 7 response options per question included in the final questionnaire. The USS was pilot tested on 28 patients with symptomatic chronic urticaria, and a modified version was tested in 80 patients. In this latter group, the USS was compared with the previously validated Dermatology Life Quality Index (DLQI). Patients completed both questionnaires at baseline and at follow-up (median, 2 weeks). Spearman rank correlation tests were used to compare the USS with the DLQI. At a subsequent visit, 9 additional patients completed the USS to evaluate test-retest reliability.

Results: There was a positive correlation between the USS and DLQI at baseline ($r = 0.64$) and follow-up ($r = 0.69$). The test-retest reliability correlation for the USS was adequate ($r = 0.96$) ($P = .001$). The USS was more sensitive in detecting symptom improvement than the DLQI. The mean (SD) "raw score" change from baseline to follow-up for the USS was 9.95 (12.80), whereas the mean (SD) change from baseline to follow-up for the DLQI was 2.25 (4.87).

Conclusions: The USS is a valid and reliable instrument for monitoring urticaria severity. The USS is more sensitive than the DLQI for quantifying urticaria severity and may be more applicable in the evaluation of urticaria-specific treatment efficacy.

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INTRODUCTION

Urticaria is a common skin condition, which is estimated to afflict 10% to 20% of the US population at some time in their life.^{1,2} Chronic urticaria refers to the daily or almost daily presence of itchy wheals for at least 6 weeks.¹ Chronic urticaria has been shown to have a significant impact on patients' quality of life (QOL), including sleep disturbances, social isolation, altered emotions, and difficulties with activities of daily living.^{3,4} The disability and reduced QOL in untreated patients with chronic urticaria have been reported to be comparable to those of elderly patients with ischemic heart disease.³

The treatment of chronic urticaria presents a challenge to many clinicians. Possible triggering agents must be identified and avoided, if possible. Regardless of the cause, first-line treatments for chronic urticaria include first- and second-generation antihistamines, which reduce itching and decrease the number of wheals.^{5–7} Severe cases may be treated with courses of oral steroids and other modalities, including dapsone, colchicine, tacrolimus, cy-

closporine A, hydroxychloroquine, montelukast, and plasmapheresis.^{8–11}

Studies assessing QOL and treatment efficacy for chronic urticaria have used measures such as the total symptom score (ie, pruritus, number of hives, and interference with sleep and daily activities), general health questionnaires (eg, Nottingham Health Profile and 36-Item Short Form Health Survey), Dermatology Life Quality Index (DLQI), and other dermatology-specific questionnaires (eg, the Skindex and Dermatology-Specific Quality of Life instruments).^{7,12–16} The DLQI is a 10-question tool developed to measure and compare disability in different skin conditions, such as psoriasis, acne, basal cell carcinoma, and atopic dermatitis.¹⁷ Although the DLQI is a reliable and validated measure for comparing disability in different skin conditions, it is not specific to chronic urticaria.⁴ However, the DLQI has been validated for urticaria.¹⁸ To our knowledge, only 1 urticaria-specific tool (ie, the chronic urticaria QOL questionnaire) has been developed and validated; this instrument reflects the effects of chronic urticaria on QOL and can be used to evaluate treatment-induced clinical changes.¹⁹ This article describes the development, preliminary use, reliability testing, and validation of an easy-to-use chronic urticaria index, the Urticaria Severity Score (USS). This tool combines degree of symptoms, QOL measures relevant to chronic urticaria, and the amount and type of medication required to control symptoms.

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METHODS

Participants and Background

Institutional review board approval was obtained from the Montefiore Medical Center, Bronx, New York, institutional review board. Study participants were men or women 18 years or older who were willing to grant informed consent. These individuals were recruited from the outpatient clinical services of the Division of Allergy/Immunology of the Albert Einstein/Montefiore Medical Center with inclusion criteria as follows: aged 18 years or older and diagnosed as having *chronic urticaria*, which was defined as hives occurring at least 3 times per week for 6 weeks or longer, with no determinable precipitating factors. Exclusion criteria were as follows: any chronic illness (eg, hepatic or renal insufficiency or autoimmune disease) or infection (eg, human immunodeficiency virus); use of any prescription medications, except antihistamines or corticosteroids used to treat urticaria; inability to understand or comply with the instructions of this study; and pregnant or lactating individuals.

Patient visits (and corresponding data collection) were conducted in all 4 seasons of the year with an overview of patient-clinician interactions as follows (described in more detail later): initial USS pilot test with subsequent modification, baseline visit in which the QOL instruments (ie, USS and DLQI) were administered, and first follow-up visit 1 to 4 weeks later in which both questionnaires were re-administered. Regarding reliability testing (described later), 9 patients meeting the noted inclusion and exclusion criteria were administered the USS; after completion of the instrument, these patients were re-administered the USS 2 hours later.

Development of the USS

Items for the USS were formulated based on a combination of the following: (1) statements of adult patients with chronic urticaria attending the outpatient allergy clinic at the Montefiore Medical Center, (2) a literature review of medications with demonstrated efficacy in the treatment of urticaria,^{6,7,12} (3) other dermatology QOL questionnaires,^{3,4} and (4) suggestions from clinicians in the field of allergy/immunology regarding symptoms, QOL disturbances, and other problems associated with chronic urticaria.

Twelve questions were designed to measure distinct aspects of QOL impairment, the degree and duration of pruritus and/or swelling, distribution of body area with hives and/or itch, and amount of medication required to control symptoms (Fig 1). The USS had the following opening statement, "Answer each question according to how your skin has affected your life over the past week. Please answer every question." A draft of the USS was pilot tested on 28 patients with chronic urticaria, and minor alterations were made to improve clarity based on patient responses and clinician observations.

Scaling and Scoring of the USS

Likert scales with 7 or 8 response options were used to maximize questionnaire responsiveness. Of the 12 questions, 10 were scored on a scale of 0 to 7, with higher scores

reflecting greater severity of symptoms, increased disruption of QOL components (eg, sleeping, work/school attendance, and social life), and increased amounts of medication (eg, antihistamine or oral corticosteroid) use. Of the 12 questions, 2 reflected body areas experiencing symptoms and had 8 answer choices per question; increased scores suggested more extensive urticaria involvement. One of the USS questions (amount of oral corticosteroid used) was double weighted (ie, the item score was multiplied by 2) based on our assumption that the need for oral corticosteroids reflected an increased severity of disease. The USS could be calculated by adding the score of each question, thereby resulting in a maximum of 93 and minimum of 0. Higher scores correlated with greater symptom severity and QOL impairment.

Preliminary Use of the USS

After the pilot test stage and USS revisions, the modified USS and DLQI were administered to 80 patients between the ages of 18 and 74 years at an initial visit. The instruments were administered to patients with chronic urticaria at our allergy/immunology clinic within the context of a baseline medical history/physical examination; the surveys were used in no particular order (ie, neither survey was necessarily administered before the other). After both questionnaires were administered, completed, and collected, all participants were given the same treatment plan (ie, a daily nonsedating antihistamine combined with a strict allergen elimination regimen). All participants were also instructed regarding the use of additional medications (eg, antihistamines or oral corticosteroids) on an as-needed basis. By allowing ad libitum use of medications, we were able to evaluate the utility of the questionnaires in a more realistic clinical scenario. Patients were seen at follow-up intervals (median, 2 weeks; range, 1–4 weeks), and both questionnaires were again re-administered in the physicians' office in no particular order. By using different techniques of measurement of agreement, the following relationships were subsequently analyzed: correlation and variability between USS and DLQI at baseline, correlation and variability between USS and DLQI at follow-up, and correlation and variability between USS difference from baseline to follow-up and DLQI difference from baseline to follow-up. The Wilcoxon matched-pair signed-rank test was used to compare the means of USS scores at baseline and follow-up and the means of DLQI at baseline and follow-up because the distributions of the data sets are nonparametric (only the USS at baseline and the USS at follow-up approximated normal distribution).

Test-Retest Reliability of the USS

The reliability of the USS was evaluated through a panel of 9 patients with chronic urticaria seen at 1 of our allergy/immunology clinics. This substudy followed initial modification of the USS but was temporally independent of the baseline and follow-up visits (as noted previously). The 9 patients were chosen from the clinic's patient base and were not the same patients as those seen during the preliminary use

Urticaria Severity Score

Name:
MR#

Date:
Diagnosis:

Answer each question according to how your skin has affected your life over the **past week**. Please answer every question.

1. Over the past week, how uncomfortable or itchy has your skin been?

Not at all-----→a little -----→a lot-----→very much							
0	1	2	3	4	5	6	7

2. How many days over the past week did you have hives or itch?

0	1	2	3	4	5	6	7
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3. On average, how many hours did you have hives or itch each day?

< 1	1-2	3-4	5-6	7-8	9-10	11-12	>12
0	1	2	3	4	5	6	7

- 3a. What was the maximum number of hours your hives or itch lasted each day?

< 1	1-2	3-4	5-6	7-8	9-10	11-12	>12
0	1	2	3	4	5	6	7

4. On average, on which parts of your body were there hives or itch? (Circle all that apply)

head/ neck chest/abdomen back right arm
left arm right leg left leg genitals and/or buttocks

- 4a. On the worst day, on which parts of your body was there hives or itch? (Circle all that apply)

head/ neck chest/abdomen back right arm
left arm right leg left leg genitals and/or buttocks

5. On average, how many pills did you take each day?

- a. Antihistamine (Benadryl or other)

0	1	2	3	4	5	6	7
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- b. Prednisone or Methylprednisolone x2

0	1	2	3	4	5	6	7
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6. How many days did you have episodes of swelling over the past week?

0	1	2	3	4	5	6	7
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7. How many nights did your hives or itch interfere with sleeping?

0	1	2	3	4	5	6	7
---	---	---	---	---	---	---	---

8. Did your skin interfere with work or school?

Not at all-----→a little -----→a lot-----→very much							
0	1	2	3	4	5	6	7

9. Did your skin interfere with your social life?

Not at all-----→a little -----→a lot-----→very much							
0	1	2	3	4	5	6	7

Figure 1. The questions used to determine the Urticaria Severity Score.

of the USS (as noted previously). During a particular clinic day, all of our patients with chronic urticaria, as part of the panel on that given day, were asked to participate in the test-retest portion of the study. Among these patients, 9 agreed to participate and were, therefore, administered the

instrument in the physicians' office. Two hours after completion, the patients were given a second identical questionnaire that was again completed in the physicians' office. The results were analyzed using the Spearman rank correlation test for nonparametric data.

Validation of the USS

Validation measures included those used for other QOL instruments and accepted guidelines from the literature.^{19,20} After comparisons were made between the USS and DLQI, sensitivity analysis was performed to evaluate which instrument was more effective in detecting symptom improvement. Based on this result, a retrospective power analysis was performed. Reliability (ie, reproducibility) was evaluated through the test-retest study (as previously described). Statistically significant cutoff values were set at $P < .05$. All statistics were analyzed through SPSS statistical software version 15.0 (SPSS Inc, Chicago, Illinois) and STATA statistical software version 10.0 (Statcorp, College Station, Texas).

RESULTS

Sample Characteristics

The main patient sample included 80 patients (21 men and 59 women) whose mean (SD) age was 42.8 (16.2) years; their mean (SD) urticaria duration was 4.22 (6.76) years (data not shown). All patients who were approached agreed to participate, and all forms were fully completed.

Correlation Between the USS and the Previously Validated DLQI

Among our 80-patient sample, the USS and DLQI were administered at baseline and follow-up. The mean (SD) time to follow-up was 1.80 (6.76) weeks (range, 1–4 weeks). The mean (SD) USS scores were 35.4 (13.9) (range, 8–78) at baseline and 25.4 (14.0) (range, 0–63) at follow-up (Fig 2). The mean (SD) DLQI scores were 7.8 (6.0) (range, 1–27) at baseline and 5.5 (5.1) (range, 0–21) at follow-up (Fig 2). The mean (SD) USS change from baseline to follow-up was 9.95 (12.80), whereas the mean (SD) DLQI change from baseline to follow-up was 2.25 (4.87). As expected, there was a linear association (although wide variability) between the USS and the DLQI at baseline ($r = 0.64$) (Fig 3) and at follow-up ($r = 0.69$) (Fig 4).

USS Reliability and Sensitivity

The reliability of the USS was evaluated through the test-retest method. The correlation between test (baseline) and retest (2 hours later) was 0.96, and the scatterplot indicates that there was only minimal variation (Fig 5).

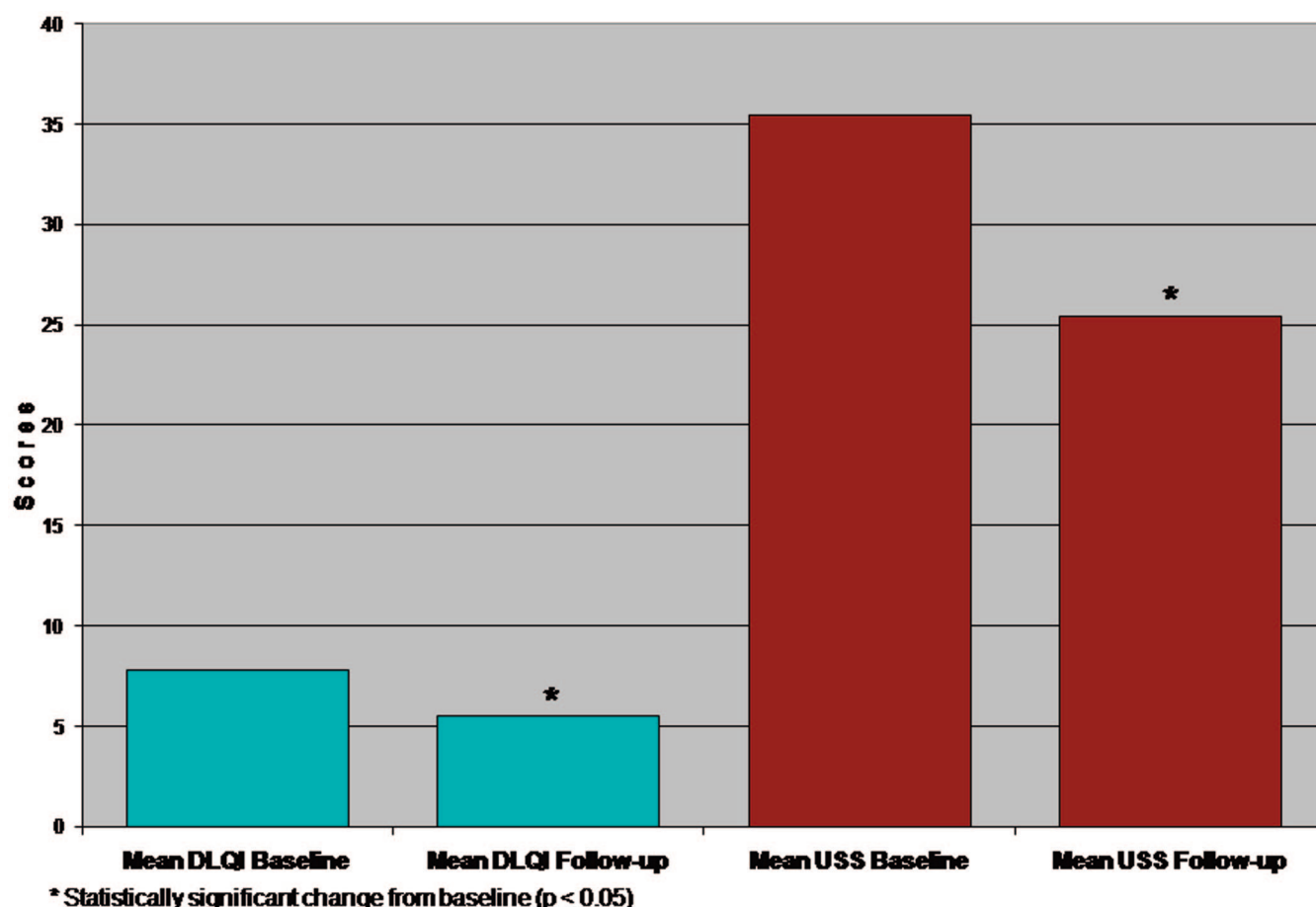


Figure 2. Mean Dermatology Life Quality Index (DLQI) and Urticaria Severity Score (USS) values at baseline and follow-up.

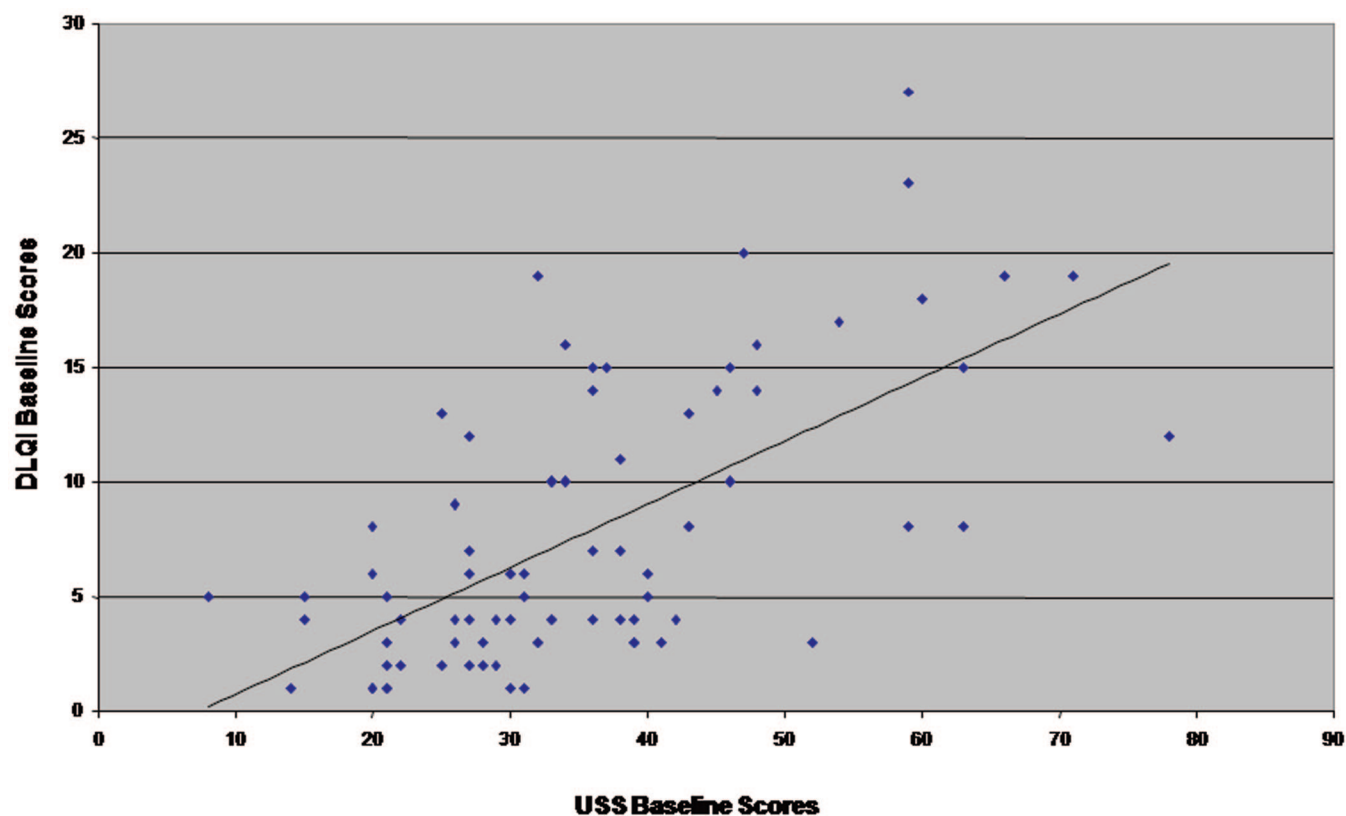


Figure 3. A linear association was seen between the Dermatology Life Quality Index (DLQI) and the Urticaria Severity Score (USS) at baseline ($r = 0.64$).

The USS was more sensitive in detecting symptom improvement compared with the DLQI. Eleven patients whose USS scores changed (range of score difference, -8 to 19) at follow-up had no change in their DLQI scores from baseline to follow-up. Only 2 patients whose DLQI scores changed (range of score difference, $1-3$) at follow-up had no change in their USS scores from baseline to follow-up. Two patients demonstrated no change in either USS or DLQI score from baseline to follow-up.

We also performed a retrospective power analysis to determine the necessary sample size for a proposed therapeutic trial. In considering a hypothetical 25% improvement of baseline symptom score with the USS and DLQI, 29 patients would be required using the USS compared with 44 patients using the DLQI. These data suggest that the USS displays increased sensitivity in detecting urticaria-specific clinical changes.

DISCUSSION

The QOL measures play key roles within the realms of direct patient care, clinical research, and health-related economics.¹⁴ The QOL assessments may be used to evaluate treatment effectiveness and can also be applied to routinely monitor patients with a particular disease state. The QOL scores may also serve as patient-centered outcome measures in the setting

of a research trial. Along these lines, QOL outcomes can highlight the disability from a given disease and guide appropriate resource allocation decisions. Numerous QOL questionnaires have been developed and validated in general health (eg, Nottingham Health Profile and 36-Item Short Form Health Survey), system-based (eg, DLQI), and disease-specific (eg, Psoriasis Disability Index) formats.¹⁴ To our knowledge, there exists only 1 validated tool for the evaluation of QOL in patients with chronic urticaria. In this article, we propose the USS, a user-friendly questionnaire that measures information relevant to urticaria and summarizes data into an overall score.

After its development and modification, the USS was administered to 80 patients as part of the validation procedure. A time scale within the order of weeks was selected as an appropriate time over which patients could easily recall events and is similar to that used in the DLQI. Our sample population encompassed a wide range of ages and was composed of nearly 74% women. This is consistent with the observation that chronic urticaria affects women more often than men.¹ The DLQI, instead of the chronic urticaria QOL questionnaire, was used as a comparison for this study because our data collection had begun before the publication of this latter instrument. However, we acknowledge the lack of a true gold standard for validation purposes, and although the

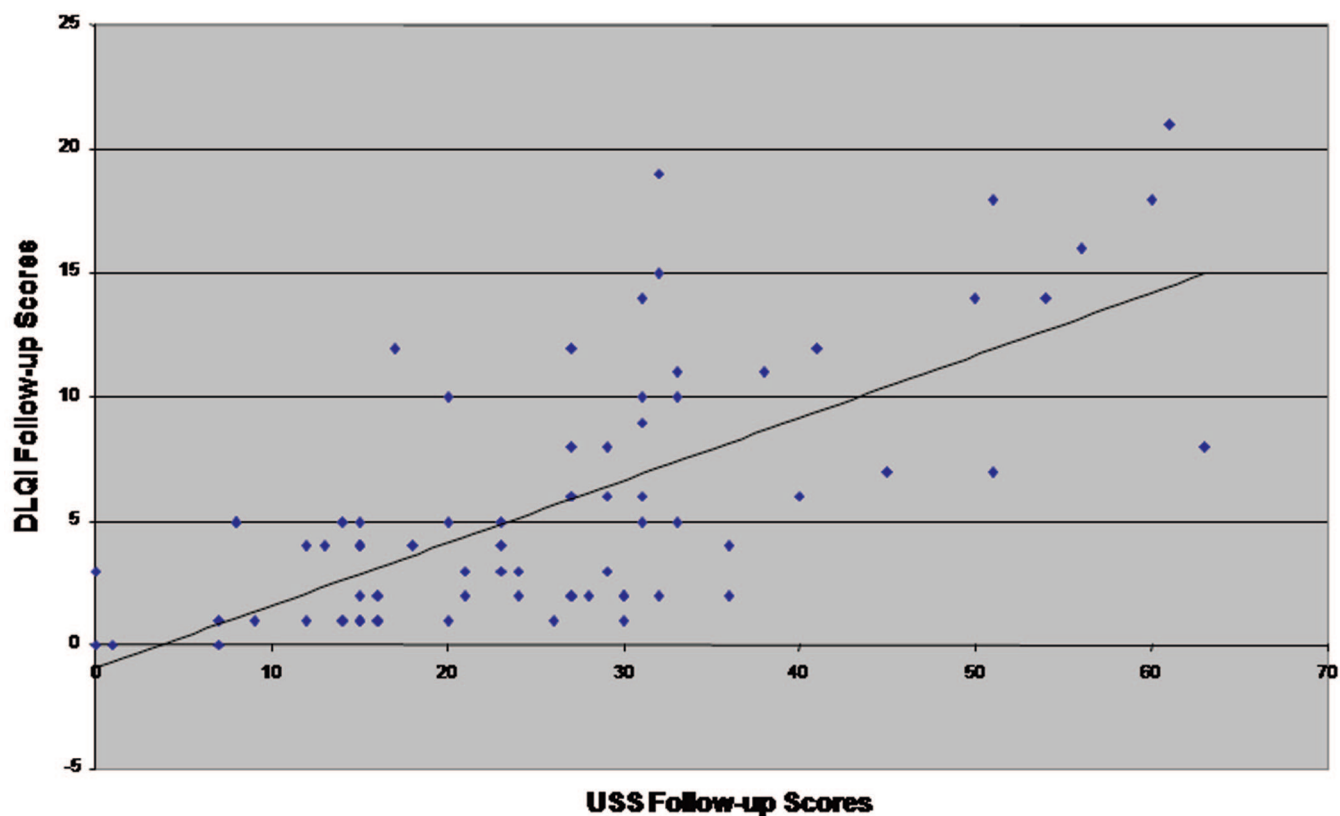


Figure 4. A linear association was seen between the Dermatology Life Quality Index (DLQI) and the Urticaria Severity Score (USS) at follow-up ($r = 0.69$).

DLQI has been frequently used for patients with chronic urticaria and validated for urticaria as such, this may represent a potential limitation of this study.

The USS was observed to have adequate test-retest reliability, therefore indicating reproducibility. The test-retest period was selected as only 2 hours because of the potential daily variability of individual USS questions. For example, our questionnaire listed specific body parts for which symptoms could change within the course of a day. However, we acknowledge that the 2-hour lag time may have been too short in light of the potential “carryover effect” from the original testing session. Furthermore, the 9 patients involved in reliability testing represented a relatively small number and may be a potential limitation of this study. The USS was also shown to be more sensitive in detecting changes in clinical status compared with the DLQI.

In contrast to the vast majority of reported QOL instruments, the USS includes measures of medication use and clinical disease severity. This aspect enables the evaluation of patients with active disease. The inclusion of medication measures also enables clinicians to evaluate the efficacy of pharmacotherapy in treating patients’ symptoms. The use of different disease parameters allows us to capture the full range of urticaria clinical manifestations. For instance, 2 patients can return for follow-up after being given treatment.

Both report being hive free. A standard QOL instrument would assign both of them low scores, indicating substantial improvement. However, one patient is taking oral corticosteroids, whereas the other is taking no medication. It is likely that the steroid-using patient still has active disease and the USS would reflect that difference. Similarly, some patients with urticaria present with severe pruritus and only minimal hives. The USS would detect that problem, whereas a traditional hive count would not. The assignment of double value to the numbers of steroid (5 mg of prednisone or 4 mg of methylprednisolone) tablets taken reflects the greater impact of systemic steroids vs antihistamines in suppressing urticaria symptoms. The versatile use of the USS may be one reason why it is more sensitive than the DLQI.

Although most of our findings have focused on the USS total score, perhaps the true clinical relevance of this questionnaire lies in the individual question items. For example, an individual question score of 3 or greater may suggest at least moderate disease activity, whereas a score of 5 or greater may reflect severe disease. Along these lines, an item score of at least 3 may warrant “low-grade” interventions (eg, avoidance of potential triggers and antihistamines as needed), whereas item scores of 5 or greater may warrant consideration for “high-grade” interventions (eg, systemic steroids and immunomodulator therapy). We propose serial measure-

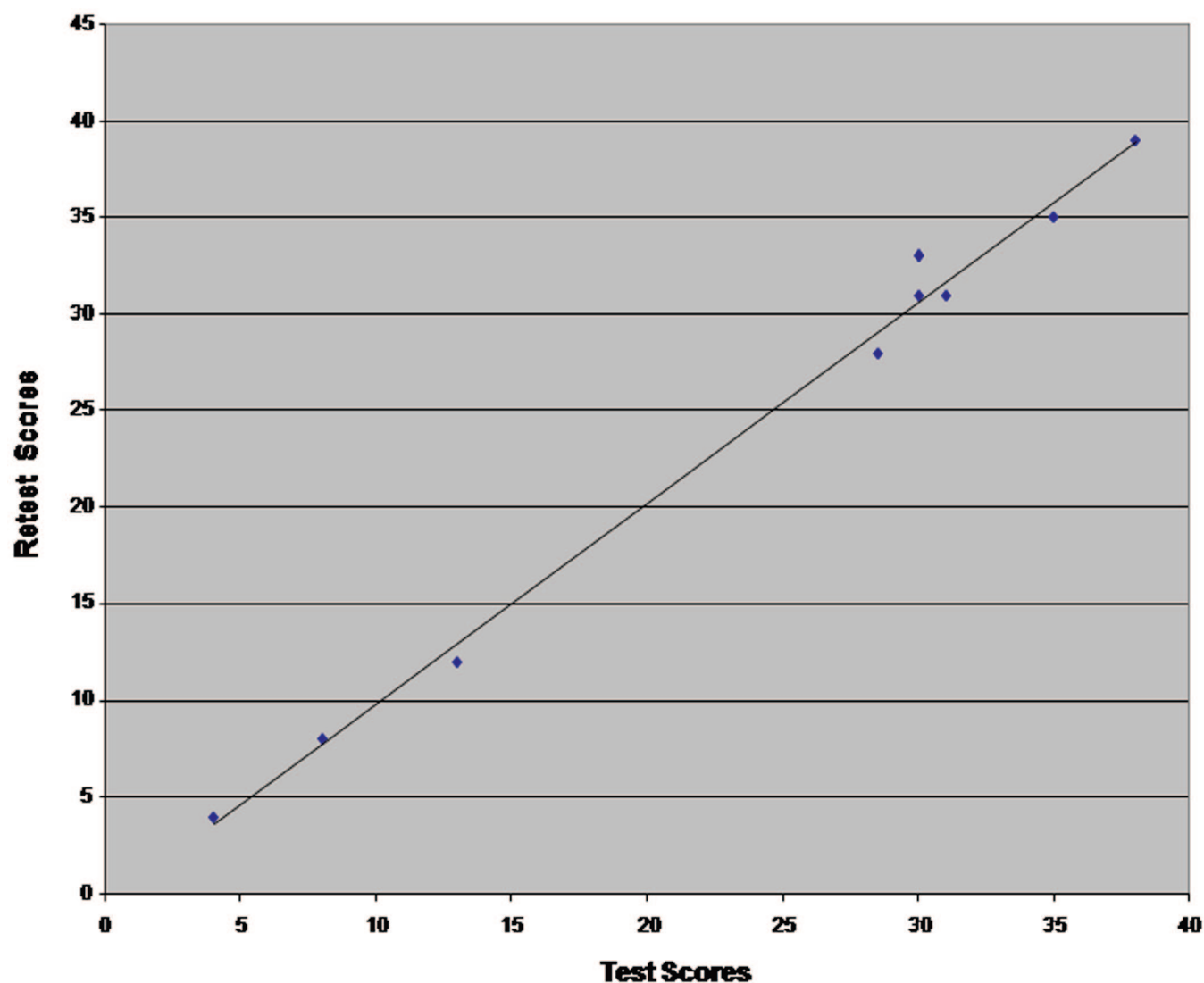


Figure 5. The reliability of the Urticaria Severity Score, as evaluated through the test-retest method ($t = 0.96$).

ments of the individual item and total scores in evaluating therapeutic success or failure and the need for additional therapy.

The USS is a sensitive, reliable, and valid instrument for monitoring disease severity, QOL, and treatment efficacy in patients with chronic urticaria. Its simplicity, ease of use, and scoring make it a practical tool for the evaluation and treatment of patients with chronic urticaria. Similar to other QOL questionnaires, the use of the USS can be potentially expanded to facilitate administration. Several examples include an illustrated version, translated versions, and a children's version. Future applications of the USS may facilitate the development and evaluation of clinical interventions geared toward improving QOL in patients with chronic urticaria.

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