

Effects of time and recall of patch test results on quality of life (QoL) after testing. Cross-sectional study analyzing QoL in hand eczema patients 1, 5 and 10 years after patch testing

Wasim N. Jamil and Magnus Lindberg

Department of Dermatology, School of Medical Sciences, Örebro University Hospital, 701 85 Örebro, and Faculty of Medicine, Section of Medical Sciences, Örebro University, 701 82 Örebro, Sweden

doi:10.1111/cod.12734

Summary

Background. Patch testing can improve health-related quality of life (HRQoL).

Objectives. To study the impact on HRQoL of elapsed time after patch testing (1–10 years), and how the outcome of testing and patients' recall affects HRQoL.

Patients/materials/methods. The Dermatology Life Quality Index (DLQI) questionnaire was sent to all patients (aged 18–65 years) who were patch tested for suspected contact allergy in 2009, 2005 and 2000 at the Department of Dermatology in Örebro.

Results. The response rate was 51% ($n = 256$). The DLQI score was significantly lower at 10 years after patch testing (mean DLQI = 5.5) than at 1 year (mean DLQI = 7.7). Work was the most impaired aspect. A binary logistic model showed that only time (10 years after testing) was associated with no effect, a light effect or a moderate effect (DLQI < 10) on HRQoL. No such association was seen for patients with negative or positive test results concerning full recall, partial recall or no recall of diagnosed allergens.

Conclusions. Although there was an improvement in HRQoL over time, the work aspect remained a major problem. The improvement was not affected by the outcome of testing and patients' recall of test results.

Key words: contact dermatitis; DLQI; HRQoL; patch testing.

Health-related quality of life (HRQoL) is an umbrella term that describes a patient's subjective perception of the impact of a disease on their health status, including physical, psychological and social functioning, wellbeing, and satisfaction with life (1–4). HRQoL represents an important assessment of chronic non-fatal diseases, as the burden is experienced more in living with chronic diseases than in dying from them (2, 5). Contact dermatitis, for example hand eczema, is a chronic disease with a

fluctuating course (6) and a negative impact on the patient's HRQoL (7, 8). The Dermatology Life Quality Index (DLQI) is a dermatology-specific instrument that has been used as a measure for assessing HRQoL in hand eczema patients (1). DLQI studies have shown that the extent of impairment of HRQoL depends on age (9), personal history of atopic eczema (9), severity of the disease (10, 11), lower socioeconomic status, and the ability to recall relevant positive contact allergens (12).

Patch testing is an objective and cost-effective (13) method used for the clinical work-up of patients in whom allergic contact dermatitis is suspected or needs to be excluded (14, 15). In addition, being patch tested because of suspected allergic contact dermatitis gives an improvement in quality of life (QoL) (16, 17). Thomson et al. showed an improvement in QoL in patients with relevant positive patch test results, at a 2-month follow-up, as compared with patients with negative patch test results

Correspondence: Professor Magnus Lindberg, Department of Dermatology, Örebro University Hospital, Södra Grev Rosengatan, SE-701 85 Örebro, Sweden. Tel: +46 19 6021000. E-mail: magnus.lindberg@regionorebrolan.se

Conflicts of interest: The authors declare no conflict of interests. Funding: Regional Research Foundation Örebro-Uppsala, Sweden, Örebro County Council.

Accepted for publication 25 October 2016

(12). Woo et al. found that patch testing was beneficial for patients with positive and those with negative patch test results at a 6-week follow-up (16). On evaluation of QoL and time from patch testing, Hald et al. showed improvement in DLQI at a 6-month follow-up, whereby patients with positive patch test results were more likely to have improved (18), whereas Hutchings et al. found no correlation between QoL and time at a 4-year follow-up among patients with occupational contact dermatitis (19).

In today's dermatological clinics, patch testing is indicated for patients in whom allergic contact dermatitis is suspected or cannot be excluded. After patch testing, patients are given verbal and written information about the result, and patients with positive patch test results are given further information on how to avoid products containing their allergens. To the best of our knowledge, no previous studies have looked at HRQoL a long time after patch testing, or whether changes in QoL depend on how well patients remember the positive results of patch testing. The aims of this study were to investigate the impact of time on HRQoL after patch testing, and to determine how HRQoL was affected by the outcomes of patch testing and by how well patients remembered positive results of patch testing over time.

Methods

In order to study the impact of time on HRQoL after patch testing and to determine how HRQoL is affected by the outcomes of patch testing, a retrospective cross-sectional study was performed during the first half of 2010 at the Dermatology Clinic at Örebro University Hospital, Sweden. All patients aged 16–85 years who had been patch tested with the Swedish baseline series because of an indication of contact dermatitis in 2009, 2005 and 2000 were given the Nordic Occupational Skin Questionnaire (NOSQ) (20) and the DLQI (21). Questionnaires were sent at 1, 5 and 10 years after patch testing to 484 patients who had been patch tested with the Swedish baseline series for suspected allergic contact dermatitis. After one reminder, a total of 246 questionnaires were received (response rate 51%).

The DLQI is a 10-question questionnaire that covers the impact of dermatitis on QoL over the past week with regard to the following aspects: symptoms and feelings, daily activities, leisure, work and school, personal relationships, and treatment. Each question is rated from 0 (not at all) to 3 (very much). The sum of the responses to two questions makes up the score for each aspect mentioned above, except for the aspects treatment and work and school, which correspond to one question each. The maximum DLQI score is 30. The higher the

score, the greater the impairment of HRQoL. To evaluate HRQoL after patch testing, we compared the total mean DLQI and mean DLQI subscales among the groups at 1, 5 and 10 years after patch testing. The baseline characteristics of the groups were analysed by asking patients about the presence of hand/forearm eczema in the last 12 months, previous atopic dermatitis, and occupation. A 'yes' response to the question 'Have you ever had an itchy skin condition which occurred on and off for at least 6 months and sometimes was localized in the skin folds?' was defined as previous atopic dermatitis. High-risk occupations for contact dermatitis were defined as hairdressing, nursing, cleaning, food handling, metal working, manufacturing, construction, machine tool operation, food preparation, printing, metal plating, leather work, engine servicing, and floristry (22).

Information on how well patients recalled the outcomes of patch tests as a predictive variable for HRQoL was obtained through a question in NOSQ: 'What allergies have you been diagnosed with? Specify allergies and estimate the year of diagnosis or indicate that you don't know.' Patients were divided into groups of those who reported the correct name or substance of every allergen, those who reported part of the correct name or substance of one or more of the diagnosed allergen(s), those who had forgotten the outcome of the patch test, and those who correctly reported negative outcomes of the patch test. The correct name of an allergen was defined as the correct chemical name. This part of the analysis, concerning how well patients recall test results, has previously been published in detail (23).

During the time period covered in this study (1–10 years), all patch tested patients were given both verbal and written information about the results of their patch tests, about each diagnosed allergen, and about finding and avoiding allergen-containing substances. More than 10 dermatologists performed patch testing at the clinic during this period.

A binary logistic regression analysis was performed on all patients to examine the impacts of predictive factors (time from patch testing, recalling patch test results, age, and sex) on HRQoL, with the dichotomized DLQI score as outcome, such that a score of <10 was considered to indicate no, little or moderate impacts on HRQoL, and a score of ≥ 10 was considered to indicate a very large or extremely large impact on HRQoL, in accordance with Hongbo et al. (24). The results were expressed as odds ratios (ORs) with 95% confidence intervals (CIs).

In power calculations, a standard deviation of 4.8 points was used (25, 26). In order to detect the minimal clinically important difference in the DLQI, which is

3.3 points (27), we needed to include 33 patients in each group (power of 80%).

All analyses were performed in STATISTICA, version 13 (28). For comparison between non-parametric data, the χ^2 and Kruskal–Wallis tests were used; Student's *t*-tests and one-way ANOVA were used for parametric data. DLQI scores were analysed with both parametric and non-parametric methods. Tukey Unequal N HSD tests were used for additional explorations of the differences among means when a global significant difference was detected between the three groups. A *p*-value of <0.05 was considered to indicate significance. The study was approved by the Ethics Committee of Uppsala, Sweden.

Results

There were no differences in age, sex or patch test results between responders and drop-outs (Table 1). The response was significantly higher at 1 year after patch testing (58%) than at 5 and 10 years after patch testing (43% and 49%, respectively).

Table 2 shows the characteristics of responders at 1, 5 and 10 years after patch testing regarding sex, age, presence of hand/forearm eczema in the last 12 months, previous atopic dermatitis, occupation, and outcomes of patch testing. There were no statistically significant differences between the groups regarding sex, hand/forearm eczema in the last 12 months, previous atopic dermatitis, occupation, or outcomes of patch testing. On analysis, the mean age was lower in the group at 1 year after patch testing than in the group at 10 years after patch testing (*p* = 0.005).

Mean DLQI total scores and mean values of DLQI subscale scores at 1, 5 and 10 years are shown in Table 3. There was a statistically significant lower mean DLQI total score in the group at 10 years after patch testing (mean DLQI = 5.5), corresponding to a small effect on the patient's life (DLQI scores 2–5), than in the group at 1 year after patch testing (mean DLQI = 7.7), corresponding to a moderate effect on the patient's life (DLQI scores 6–10). The comparison of DLQI mean subscale scores showed that the group at 10 years after patch testing had significantly lower HRQoL scores in the categories symptoms/feelings, daily activity and leisure than the group at 1 year after patch testing.

The most impaired subscale was work/school at 1, 5 and 10 years after patch testing. In response to the DLQI question regarding the effect on work/school ('Over the last week, has your skin prevented you from working or studying?') (22), 77% of 108 answered 'yes' at 1 year after patch testing, 67% of 64 answered 'yes' at 5 years after patch testing, and 72% of 74 answered 'yes' at 10 years after patch testing.

Table 1. Comparison of drop-outs and responders

		Drop-outs	Responders	Significance
Total, % (no.)		49 (239)	51 (246)	
Sex, % (no.)	Females	65 (155)	66 (162)	<i>p</i> = 0.81 ^a
	Males	35 (84)	34 (84)	
Patch testing, % (no.)	Negative	50 (119)	45 (110)	<i>p</i> = 0.26 ^a
	Positive	50 (120)	58 (136)	
Years after patch testing, % (no.)	1	42 (77)	58 (108)	<i>p</i> = 0.019^a
	5	57 (84)	43 (64)	
	10	51 (78)	49 (74)	
Mean age (years) ± SD		47 ± 16	48 ± 17	<i>p</i> = 0.24 ^b

SD, standard deviation.

Bold, *p* < 0.05.

^aStatistical analysis with χ^2 test.

^bStatistical analyses with Student's *t*-test.

Table 4 shows the mean total DLQI score in relation to the ability to recall positive allergens/substances for the pooled patch tested patients. There were no statistically significant differences in mean total DLQI score between the group forgetting all diagnosed allergens or substances used in patch testing and the group recalling some or all diagnosed allergens or substances used in patch testing.

A logistic regression model was used for all patients to determine the predictive factors associated with DLQI < 10, corresponding to no, light or moderate impact on HRQoL. Predictive variables were age, sex, time from patch testing, negative patch test and positive patch test results, and recalling all or some of the diagnosed allergens/substances, or forgetting all of the diagnosed allergens/substances. Logistic regression analysis showed a significant effect only for a lapse of 10 years after patch testing and DLQI < 10 (odds ratio 2.6, 95%CI: 1.0–6.7; *p* = 0.046) (Table 5).

Discussion

The results of our study suggest that the elapse of a long time, in our study population 10 years after patch testing, has a positive impact on HRQoL. In the group at 10 years after patch testing, we found a significantly higher quality of life, as measured by DLQI, corresponding to a small disease effect on patients' lives, than in the group at 1 year after patch testing, who had a moderate disease effect. This improvement concerned leisure, daily activity, and symptoms/feelings, whereas work, personal relationships and side-effects of treatments showed no improvement. Work and school was the most impaired dimension at 1, 5 and 10 years after patch testing.

Table 2. Characteristics of patients after patch testing regarding sex, age, outcomes of patch testing, hand eczema in the last 12 months, arm eczema in the last 12 months, previous skin atopy, and occupation

		Year after patch testing			p-value	
		1	5	10		
Total, % (no.)		44 (108)	26 (64)	30 (74)		
Sex, % (no.)	Females	69 (74)	66 (42)	62 (46)	0.67 ^a	
	Males	31 (34)	34 (22)	38 (28)		
Patch testing, % (no.)	Negative	44 (48)	48 (31)	43 (32)	0.82 ^a	
	Positive	56 (60)	52 (33)	57 (42)		
Mean age (years) ± SD		44 ± 17	50 ± 16	53 ± 15	0.0029^b	0.43 ^c
						0.0051^d
Hand eczema in the last 12 months, % (no.)	Yes	44 (47)	47 (30)	53 (39)	0.48 ^a	0.22 ^e
	No	56 (61)	53 (34)	47 (35)		
Arm eczema in the last 12 months, % (no.)	Yes	42 (45)	56 (36)	58 (43)	0.052 ^a	
	No	58 (63)	44 (28)	42 (31)		
Previous skin atopy, % (no.)	Yes	66 (71)	61 (39)	58 (43)	0.060 ^f	
	No	26 (28)	36 (23)	39 (29)		
Occupation	Do not know	8 (9)	3 (2)	3 (2)		
	High risk	21 (21)	24 (15)	22 (16)	0.41 ^f	
	Other	58 (57)	55 (34)	44 (32)		
	Student	8 (8)	6 (4)	7 (5)		
	Retired	13 (13)	15 (9)	26 (19)		

SD, standard deviation.

Bold, $p < 0.05$.^a χ^2 test.^bOne-way ANOVA.^cComparison between group at 5 years and group at 10 years after patch testing.^dComparison between group at 1 year and group at 10 years after patch testing.^eComparison between group at 1 year and group at 5 years after patch testing.^fKruskal–Wallis.

In practice, patch testing is a period during which patients have at least three regular contacts with a dermatologist. The first contact is for the decision on patch testing. The second and third contacts are for patch test reading, information on patch test results, and final diagnosis. Patch tested patients report improvements in QoL within 1 year (12, 13, 16–18, 29). However, over time, skin exposure to allergens and other harmful stimuli is likely to change and evolve at a patient's home and workplace, during hobbies, and in personal care products (30).

Our findings of improvements in leisure and daily activities over time are attributable to patients' ability to adopt certain avoidance strategies in these environments, thereby diminishing the effects of contact dermatitis on QoL. Regarding occupational aspects, we found that work was still the most impaired aspect at 1, 5 and 10 years after patch testing. In accordance with our results, previous studies showed that patients with hand eczema reported work or school as the most impaired item in QoL (31, 32). This implies an economic burden of contact dermatitis on patients' lives, and perhaps indicates that patients with contact dermatitis still have difficulties in adopting avoidance strategies in workplaces.

Logistic regression analysis was performed to determine the factors that were independently associated with high HRQoL. The results from logistic regression showed that how well patients recalled the allergens/substances used in patch testing was not associated with no, light or moderate effect on QoL; the only significant factor that was associated with no, light or moderate effect on QoL was time after patch testing. Few studies have been performed to determine whether recalling the results of patch testing influences patients' HRQoL and management of contact eczema. At 2–3 months of follow-up, Lewis et al. (33) showed that 72% of 43 patients with relevant positive patch test results reported patch testing as being helpful, whereas 32% of 62 patients with negative patch test results considered patch testing to be helpful. Both Woo et al. (16) and Thomson et al. (12) found, at 6 weeks and 2 months of follow-up, respectively, overall improvements in perceived eczema severity and QoL for patch tested patients, but a significant improvement was seen only for the group with clinically relevant positive patch test results. On the other hand, a short-term study by Agrawal et al. (29) showed significant improvements in QoL, for patients with positive and negative patch test results, at

Table 3. Characteristics of patients after patch testing regarding mean Dermatology Life Quality Index (DLQI) total scores and mean subscale scores

	Year after patch testing				<i>p</i> -value, Kruskal–Wallis test	One-way ANOVA			
	All	1	5	10					
Total DLQI, mean $\pm$ SD	6.51 $\pm$ 5.50	7.69 $\pm$ 6.37	6.00 $\pm$ 4.91	5.47 $\pm$ 4.34	0.022	0.008	0.69 ^a	0.015^b	0.18 ^c
Symptoms and feelings, mean $\pm$ SD	1.89 $\pm$ 1.63	2.24 $\pm$ 1.76	1.77 $\pm$ 1.57	1.47 $\pm$ 1.40	0.013	0.006	0.56 ^a	0.010^b	0.22 ^c
Daily activities, mean $\pm$ SD	0.83 $\pm$ 1.40	1.09 $\pm$ 1.63	0.70 $\pm$ 1.20	0.57 $\pm$ 1.11	0.032	0.019	0.85 ^a	0.038^b	0.19 ^c
Leisure, mean $\pm$ SD	0.63 $\pm$ 1.31	0.83 $\pm$ 1.48	0.59 $\pm$ 1.26	0.35 $\pm$ 1.03	0.027	0.033	0.56 ^a	0.044^b	0.45 ^c
Work/school, mean $\pm$ SD	2.22 $\pm$ 1.29	2.34 $\pm$ 1.22	2.05 $\pm$ 1.39	2.20 $\pm$ 1.29	0.35	0.34			
Personal relationship, mean $\pm$ SD	0.56 $\pm$ 1.32	0.72 $\pm$ 1.59	0.53 $\pm$ 1.02	0.35 $\pm$ 1.05	0.30	0.17			
Treatment, mean $\pm$ SD	0.35 $\pm$ 0.69	0.45 $\pm$ 0.80	0.30 $\pm$ 0.58	0.24 $\pm$ 0.57	0.16	0.099			

SD, standard deviation.

The Tukey Unequal N HSD test was used for additional explorations of the differences among means when a global significant difference was detected among three groups.

Bold, $p < 0.05$.

^aComparison between group at 1 year and group at 5 years after patch testing.

^bComparison between group at 1 year and group at 10 years after patch testing.

^cComparison between group at 6 years and group at 10 years after patch testing.

Table 4. Mean total Dermatology Life Quality Index (DLQI) score in relation to the recall ability among patients with positive patch test results

	Number	DLQI mean		Mann–Whitney test	Student's <i>t</i> -test
		total score	$\pm$ SD		
Recalled all or some of the allergens	92	7.1	5.7	$p = 0.11$	$p = 0.21$
Forgot all allergens	43	5.8	5.5	–	–

SD, standard deviation.

a 6 weeks of follow-up. In our long-term follow-up study, patch test results and how well the results of patch testing were recalled were not associated with the improvement in HRQoL. Our results suggest that further work is needed to understand the factors influencing QoL of hand eczema patients.

One limitation of our study is the response rate of 51% after one reminder. However, we included all patients who had been patch tested during the years of the study, and there were no significant differences in age, sex or patch test results between responders and non-responders. Also, the power calculation showed acceptable numbers of included patients for comparison of HRQoL of patients at 1, 5 and 10 years after patch testing, comparison of patients with positive and negative patch test results, and comparison of patients who recalled and did not recall the results of patch testing.

A limitation of the study design is that we have not prospectively studied a single cohort of patients over time in order to evaluate their QoL after patch testing. The idea of using a cross-sectional design covering the three different time intervals was to evaluate QoL of our patch tested patients in regard to the normal patch testing procedure at the clinic. The practice in our clinic, described above, has not changed over the years, and it does not differ from that of any other dermatological clinic in Sweden. The three groups at 1, 5 and 10 years after patch testing were comparable; we found no statistical significance difference among them regarding the presence of hand/forearm eczema in the last 12 months, previous atopic dermatitis, or occupation.

A strength of our study is that the recalled allergens could be compared with the patients' medical records. The relevance of allergens could not be evaluated in this study, owing to the long period of follow-up after patch testing. Relevance is, in and of itself, a complicated question. Our patients visited a clinic that was not specialized in patch testing, and the quality of the relevance assessment is doubtful, partly because of variation in the competence of the doctors evaluating the patch tests, and partly because the relevance of allergens can change over time. That is why we have concluded that, over time, patients require periodic visits to healthcare for evaluation of the clinical relevance of positive patch test allergens and to receive further information about avoidance of allergens.

In summary, a long elapsed time after patch testing, in our study population 10 years, had a positive impact on

Table 5. Logistic regression analysis of predictors for no, light and moderate effect on quality of life

Predictors		Odds ratio	95%CI	p-value
Years after patch testing	10	2.62	1.02–6.72	0.046
	5	1.35	0.57–3.18	0.50
	1	Reference	–	–
Sex	Women	1.22	0.57–2.63	0.61
	Men	Reference	–	–
Patch test	Remember all diagnosed allergens	1.27	0.44–3.70	0.66
	Forget all diagnosed allergens	2.05	0.60–6.95	0.25
	Negative patch test result	1.73	0.70–4.31	0.24
	Remember some of the diagnosed allergens	Reference	–	–
Age (years)	>65	2.08	0.43–9.97	0.36
	45–65	1.03	0.33–3.24	0.96
	35–44	1.16	0.29–4.66	0.84
	25–34	0.33	0.10–1.15	0.082
	<25	Reference	–	–

CI, confidence interval.

Bold, $p < 0.05$.

QoL. Patients' adoption of avoidance lifestyles in leisure time and daily activities are related to improvement in QoL, and this improvement in QoL was not significantly associated with patch test results or the ability to recall them. Patients still have concerns about treatment, social life, and especially work. These results suggest a need for periodic visits to healthcare for information

about treatment and avoidance strategies, especially in workplaces.

Acknowledgements

The authors thank Mrs. Ingallil Erikssohn for help with keeping track of the patients that participated in the study.

References

- Basra M K, Shahrugh M. Burden of skin diseases. *Expert Rev Pharmacoeconomics Outcomes Res* 2009; **9**: 271–283.
- Both H, Essink-Bot M L, Busschbach J, Nijsten T. Critical review of generic and dermatology-specific health-related quality of life instruments. *J Invest Dermatol* 2007; **127**: 2726–2739.
- Leidy N K, Revicki D A, Geneste B. Recommendations for evaluating the validity of quality of life claims for labeling and promotion. *Value Health* 1999; **2**: 113–127.
- Testa M A, Simonson D C. Assessment of quality-of-life outcomes. *N Engl J Med* 1996; **334**: 835–840.
- Chren M-M, Weinstock M A. Conceptual issues in measuring the burden of skin diseases. *J Invest Dermatol Symp Proc* 2004; **9**: 97–100.
- Thyssen J P, Johansen J D, Linneberg A, Menné T. The epidemiology of hand eczema in the general population – prevalence and main findings. *Contact Dermatitis* 2010; **62**: 75–87.
- Charan U P, Peter C V, Pulimood S A. Impact of hand eczema severity on quality of life. *Indian Dermatol Online J* 2013; **4**: 102–105.
- Meding B, Swanbeck G. Consequences of having hand eczema. *Contact Dermatitis* 1990; **23**: 6–14.
- Agner T, Andersen K E, Brandao F M et al. Contact sensitisation in hand eczema patients – relation to subdiagnosis, severity and quality of life: a multi-centre study. *Contact Dermatitis* 2009; **61**: 291–296.
- Yu M, Han T Y, Lee J H, Son S J. The quality of life and depressive mood among Korean patients with hand eczema. *Ann Dermatol* 2012; **24**: 430–437.
- Lau M Y, Matheson M C, Burgess J A et al. Disease severity and quality of life in a follow up study of patients with occupational contact dermatitis. *Contact Dermatitis* 2011; **65**: 138–145.
- Thomson K F, Wilkinson S M, Sommer S, Pollock B. Eczema: quality of life by body site and the effect of patch testing. *Br J Dermatol* 2002; **146**: 627–630.
- Rajagopalan R, Anderson R T, Sarma S et al. An economic evaluation of patch testing in the diagnosis and management of allergic contact dermatitis. *Am J Contact Dermatitis* 1998; **9**: 149–154.
- Lachapelle J-M. Historical aspects. In: *Contact Dermatitis*, 5th edition. Johansen J D, Frosch P J, Lepoittevin J-P (eds): Berlin, Springer-Verlag, 2011: pp. 1–9.
- Johansen J D, Aalto-Korte K, Agner T et al. European Society of Contact Dermatitis guideline for diagnostic patch testing – recommendations on best practice. *Contact Dermatitis* 2015; **73**: 195–221.
- Woo P N, Hay I C, Ormerod A D. An audit of the value of patch testing and its effect on quality of life. *Contact Dermatitis* 2003; **48**: 244–247.
- Rajagopalan R, Anderson R. Impact of patch testing on dermatology-specific quality of life in patients with allergic contact dermatitis. *Am J Contact Dermat* 1997; **8**: 215–221.
- Hald M, Agner T, Blands J, Johansen J D. Quality of life in a population of patients with hand eczema: a six-month follow-up study. *Acta Derm Venereol* 2011; **91**: 484–486.
- Hutchings C V, Shum K W, Gawkrödger D J. Occupational contact dermatitis has an

- appreciable impact on quality of life. *Contact Dermatitis* 2001; **45**: 17–20.
- 20 Susitaival P, Flyvholm M A, Meding B et al. Nordic Occupational Skin Questionnaire (NOSQ-2002): a new tool for surveying occupational skin diseases and exposure. *Contact Dermatitis* 2003; **49**: 70–76.
 - 21 Finlay A Y, Khan G K. Dermatology Life Quality Index (DLQI) – a simple practical measure for routine clinical use. *Clin Exp Dermatol* 1994; **19**: 210–216.
 - 22 Behroozy A, Keegel T G. Wet-work exposure: a main risk factor for occupational hand dermatitis. *Saf Health Work* 2014; **5**: 175–180.
 - 23 Jamil W N, Eriksson I, Lindberg M. How well is the outcome of patch testing remembered by the patients? A 10-year follow-up of testing with the Swedish baseline series at the Department of Dermatology in Örebro, Sweden. *Contact Dermatitis* 2012; **66**: 215–220.
 - 24 Hongbo Y, Thomas C L, Harrison M A et al. Translating the science of quality of life into practice: what do dermatology life quality index scores mean? *J Invest Dermatol* 2005; **125**: 659–664.
 - 25 Fisker M H, Agner T, Lindschou J et al. Protocol for a randomised trial on the effect of group education on skin-protective behaviour versus treatment as usual among individuals with newly notified occupational hand eczema – the Prevention of Hand Eczema (PREVEX) Trial. *BMC Dermatol* 2013; **13**: 16; doi:10.1186/1471-5945-13-16..
 - 26 Cvetkovski R S, Zachariae R, Jensen H et al. Quality of life and depression in a population of occupational hand eczema patients. *Contact Dermatitis* 2006; **54**: 106–111.
 - 27 Basra M K, Salek M S, Camilleri L et al. Determining the minimal clinically important difference and responsiveness of the Dermatology Life Quality Index (DLQI): further data. *Dermatology* 2015; **230**: 27–33.
 - 28 Dell Inc. Dell Statistica (data analysis software system), version 13, 2015. Available at: <https://software.dell.com> (last accessed 30 November 2016).
 - 29 Agrawal S, Rijal A, Bhattarai S. Impact of patch testing on quality of life in patients with hand eczema: a follow-up study. *Kathmandu Univ Med J (KUMJ)* 2013; **11**: 216–220.
 - 30 Lazarov A, Rabin B, Fraidlin N, Abraham D. Medical and psychosocial outcome of patients with occupational contact dermatitis in Israel. *J Eur Acad Dermatol Venerol* 2006; **20**: 1061–1065.
 - 31 Wallenhammar L M, Nyfjall M, Lindberg M, Meding B. Health-related quality of life and hand eczema – a comparison of two instruments, including factor analysis. *J Invest Dermatol* 2004; **122**: 1381–1389.
 - 32 Boehm D, Schmid-Ott G, Finkeldey F et al. Anxiety, depression and impaired health-related quality of life in patients with occupational hand eczema. *Contact Dermatitis* 2012; **67**: 184–192.
 - 33 Lewis F M, Cork M J, McDonagh A J, Gawkrödger D J. An audit of the value of patch testing: the patient's perspective. *Contact Dermatitis* 1994; **30**: 214–216.