

Sustainability of interdisciplinary secondary prevention in patients with occupational hand eczema: a 5-year follow-up survey

Annika Wilke¹, Günther Gediga², Tanja Schlesinger¹, Swen M. John¹ and Britta Wulfhorst¹

¹Department of Dermatology, Environmental Medicine and Health Theory, University of Osnabrück, Sedanstraße 115, 49090 Osnabrück, Germany and

²Department of Psychology, Evaluation and Statistics, University of Münster, Fliegerstraße 21, 48149, Münster, Germany

doi:10.1111/j.1600-0536.2012.02132.x

Summary

Background. Occupational hand eczema (OHE) is common in 'wet work' occupations. Thus, effective and sustainable prevention strategies are needed.

Objectives. To investigate the long-term effectiveness (sustainability) of an interdisciplinary secondary prevention programme.

Methods. One hundred and thirty-four patients with OHE consecutively participated in an outpatient skin protection seminar comprising dermatological and educational interventions. Data were obtained at baseline (T0) and at 9 months (T1) and 5 years (T2) after participation. A cohort of 84 patients was available for analysis of the outcomes 'job continuation', 'skin condition', 'skin protection behaviour', and 'disease management'.

Results. At T2, 71.4% of patients remained in their occupation. The prevalence and severity of self-reported OHE were significantly reduced as compared with T0 ($p = 0.007$, $p = 0.002$). Of the patients, 13.1% gave up work because of OHE at T2. The intervention was most successful in patients suffering from milder forms of OHE, and there was less success in patients with severe OHE. The results showed a significant reduction in the frequency of 'hand washing' ($p = 0.003$) but no measurable change in the use of skin care products ($p = 1.000$).

Conclusions. The intervention showed sustainable long-term effects. Early detection and reporting of OHE in the initial stages of the disease is of utmost importance for the effectiveness of secondary prevention. In cases of severe OHE, inpatient programmes may be indicated.

Key words: follow-up; effectiveness; evaluation; hand eczema; intervention; occupational; patient education; prevention; sustainability; wet work.

Introduction

In recent years, occupational skin diseases have been recognized as the predominant occupational diseases annually reported to the German employers' liability insurance

associations (1). The prevalence of occupational skin diseases, which appear in >90% of cases as irritant and/or allergic hand eczema, is highest in 'wet work' occupations (2–4).

At the University of Osnabrück, different measures, ranging from primary to tertiary prevention of occupational hand eczema (OHE), have been developed since 1993. In the context of secondary prevention, interdisciplinary programmes comprising both dermatological patient management and health educational interventions are being offered to patients showing the first clinical signs of OHE. The short-term and long-term effectiveness of this prevention approach have been demonstrated by

Correspondence: Annika Wilke, Department of Dermatology, Environmental Medicine and Health Theory, University of Osnabrück, Sedanstraße 115, 49090 Osnabrück, Germany. Tel: +49 541 405 1847; Fax: +49 541 969 2445. E-mail: awilke@uos.de

Conflicts of interest: The authors have declared no conflicts of interest.

Accepted for publication 17 May 2012

means of controlled studies in hairdressers and geriatric nurses (5–9). As compared with control groups, both the risk of job loss because of OHE and the severity of hand eczema were significantly decreased after participation (7–9).

Owing to the continuing high prevalence of OHE and the need for effective prevention strategies, a programme for secondary prevention was developed in 2001. The programme was aimed at wet work employees suffering from OHE who were insured by the Institution for Statutory Accident Insurance in the Health and Welfare Services (BGW). Unlike previous programmes, it was not limited to specific occupations (10, 11). This interdisciplinary measure has been successfully integrated by various other German employers' liability insurance associations into their regular schemes of patient care.

Although there are several studies that have already examined the short-term effects of this programme (10, 11), there is a further need to investigate the long-term effectiveness several years after the intervention. This is of particular importance, as occupational hand eczema typically shows a chronic or relapsing course (12–14). The aim of the present study was to examine the sustainability regarding the outcomes 'remaining in job', 'skin condition', 'skin protection behaviour', and 'disease management'.

Methods

Intervention

The programme combines dermatological treatment and health educational interventions. It aims to enable the participants suffering from OHE to remain in work without severe skin lesions and to initiate health-promoting behaviour, focusing on skin protection (10, 11). The prevention measure comprises two outpatient seminars ('first seminar' and 'refresher seminar'). Each seminar takes 2 days. In addition to dermatological consultation and examination, the programme includes a 1-day skin protection seminar conducted by health educators, as well as individual counselling and recommendations concerning the choice and use of appropriate protective gloves and skin care products. A dermatologist has seen the patients first and advised on specific risks such as pre-existing glove allergies. During the 'refresher seminar', which usually takes place approximately 3 months after the first seminar, the participants exchange experiences, adjustments are made where necessary, and the participants are trained again, with a focus on skin protection according to their current needs. Detailed descriptions regarding the concept and contents of this programme (10) and

similar secondary prevention approaches following the Osnabrück concept have already been published (7–9, 15–19).

Evaluation design and cohorts

Between June 2001 and December 2002, a total of 277 consecutive patients took part in this prevention measure, which had become an element of regular patient care in Germany. The examined subcohort ($n = 134$) consisted of participants fulfilling the inclusion criteria (suspected OHE; wet work occupation) who attended both the first seminar and the refresher seminar. Controls were not used, for ethical and legal reasons, as effectiveness had already been proven in previous studies and each patient has to be offered an immediate skin protection seminar by the employers' liability insurance associations in Germany [for details, see Ref. (9)]. Hence, the current study was an uncontrolled prospective pretest/post-test survey (surveillance study).

As summarized in Fig. 1, data records of the study cohort were collected before intervention at a baseline assessment (T0), and at a first follow-up 9 months (T1) and at a second follow-up 5 years (T2) after the intervention. A semi-standardized interview and standardized questionnaires were used as research tools at T0 and T1/T2, respectively. The parameters 'remaining in job', 'skin condition', 'skin protection behaviour' and 'individual coping with the disease' were defined as success criteria. The participants were informed about the voluntariness of participation in this survey and the anonymous data analysis, and gave informed consent.

Inclusion in the study was based on the time when the suspected OHE was reported to the employers' liability insurance associations. Because of continuing therapy by the treating local dermatologist or previous sick leave, some participants were free of OHE at baseline (T0).

Data analysis

Data were stored and analysed with PASW STATISTICS 18 (SPSS, Chicago, IL, USA) for Windows™. Descriptive statistics were calculated for all items. Chi-square tests were carried out for calculation of the significance of contingency tables. Additional statistical and systematic analyses with chi-square tests were carried out to ensure that drop-outs, for example caused by non-response, did not create a systematic selection bias. McNemar's test was performed on dichotomous dependent variables. Wilcoxon's non-parametric rank sum test was carried out to calculate significances for dependent samples. The Mann–Whitney *U*-test and the Kruskal–Wallis test were used for analysis of differences between two or more independent

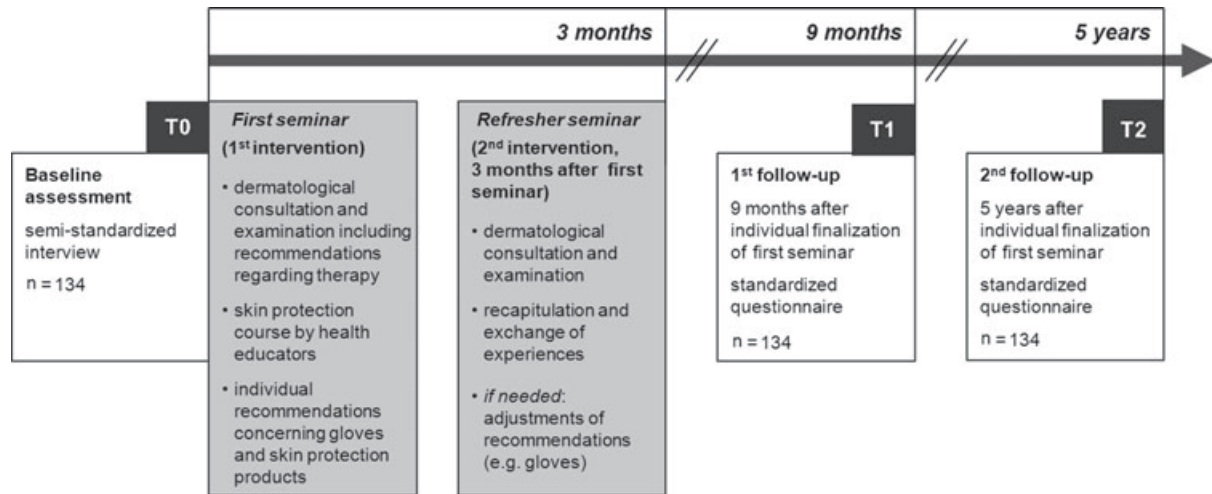


Fig. 1. Overview of the interventions, the study design, and the three assessments: T0 (baseline), T1 (first follow-up), and T2 (second follow-up).

subgroups. For all tests, a significance level of 0.05 was chosen.

Results

Response rates, drop-outs, and description of the cohort

At the 5-year follow-up, a response rate of 77.6% ($n = 104$) was obtained. The data records of 20 patients who had participated in an inpatient rehabilitation measure following the secondary prevention programme were excluded from further analyses. This intensive inpatient prevention measure (tertiary prevention) would presumably have biased the data by influencing the outcome parameters (9, 20, 21).

A cohort ($n = 84$) composed mostly of females (89.3%, $n = 75$) remained for further analyses. The age ranged from 23 to 68 years [mean 45.1 years, standard deviation (SD) 11.3]. At baseline, the vast majority of participants were employed in occupations in the healthcare sector, for example as nurses and medical assistants (73.8%, $n = 62$). Another 16 participants (19.0%) worked as cleaners or kitchen employees. The average duration of occupation was 15.7 years (SD 9.9). With regard to external risk factors, participants specified contact with hand disinfectants, skin cleansers, surface disinfectants, cleansing products, and water. As 97.6% ($n = 82$) of the total cohort stated that they wore gloves at the workplace, glove occlusion was another external risk factor for almost all participants. Kitchen employees also had contact with foods. These irritant exposures can be characterized as typical for the above-mentioned occupational groups (22–26).

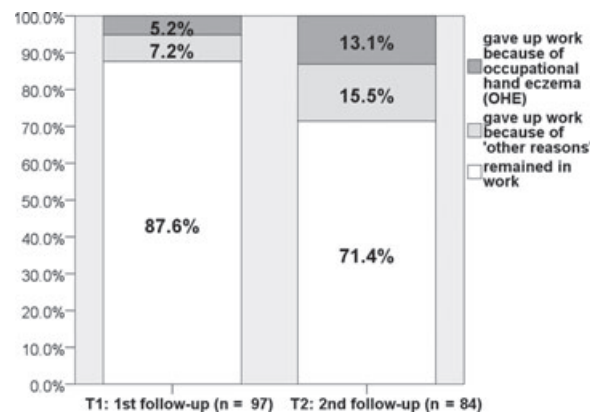


Fig. 2. Job continuation at T1 (9 months after intervention) and T2 (5 years after intervention).

Remaining in work

As occupational hand eczema may finally lead to job loss, the parameter 'remaining in work' was a main outcome in the evaluation. At T2 (5 years after intervention), 60 employees (71.4%) were able to remain in their original wet work occupation, as opposed to 87.6% ($n = 85$) at T1 (9 months after the intervention) (Fig. 2). Eleven participants (13.1%) related job loss to OHE. Retirement, parenthood and professional development are examples of 'other reasons' for not remaining in the original occupation (15.5%, $n = 13$).

Self-reported skin lesions

Given the aim of the prevention measure ('remaining in work without severe skin lesions'), the skin condition

Table 1. Self-reported presence of occupational hand eczema (OHE) in a cohort of 43 patients who were investigated at T0, T1, and T2 (McNemar's test)

	Presence of OHE		<i>p</i> -value	–	+
	%	<i>n</i>			
T0	83.7	36	0.581	8	5
T1	76.7	33			
T1	76.7	33	0.057	11	3
T2	58.1	25			
T0	83.7	36	0.007	13	2
T2	58.1	25			

T0, baseline before intervention; T1, 9 months after intervention; T2, 5 years after intervention.

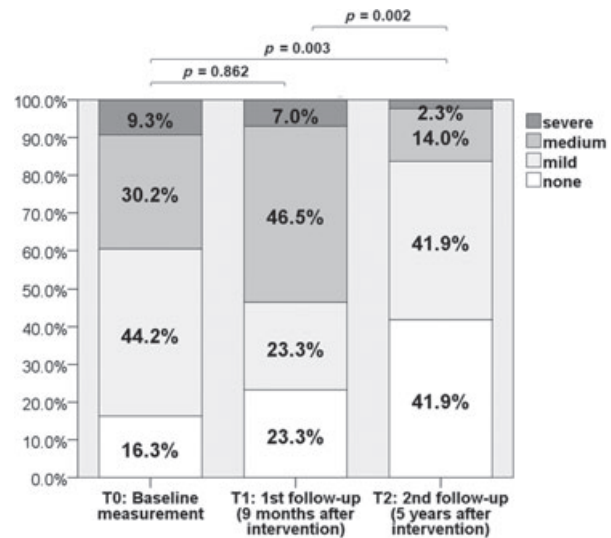
+, cases that changed from negative to positive; –, cases that changed from positive to negative.

also represents an important outcome for the long-term evaluation. As an improvement in the skin condition could also result from a job change being associated with reduced skin exposure, only employees remaining in their original wet work occupation at T2 (5 years after the intervention) were included in the analysis. By investigation of a dataset of 43 complete data records available at T0, T1, and T2, systematic differences that might have been caused by the above drop-outs (e.g. job change and non-response) were avoided.

As shown in Table 1, 83.7% (*n* = 36) reported having hand eczema at T0, as opposed to 58.1% (*n* = 25) at T2. The percentage of participants reporting hand eczema significantly decreased within 5 years after participation (*p* = 0.007). In comparison with T0, the short-term evaluation (T1, 9 months after the intervention) showed only a slight decrease, by 7.0% (76.7%, *n* = 33), of patients with hand eczema (*p* = 0.057).

Regarding the self-reported severity of OHE (Fig. 3), the frequency of medium and severe hand eczema decreased significantly from 39.5% (*n* = 17) at T0 to 16.3% (*n* = 7) at T2 (*p* = 0.002, *z* = −3.092). The greater part of the improvement in OHE was found to have taken place between T1 and T2. No significant change concerning the severity of hand eczema was found between T0 and T1 (*p* = 0.862, *z* = −0.173). Regarding the individual course of OHE, 55.8% (*n* = 24) of participants reported improved skin status at T2 as compared with T0, whereas 11.6% (*n* = 5) reported a deterioration.

In order to evaluate the long-term effectiveness (T2) in relation to the severity of hand eczema at the time of participation (T0), the entire T2 cohort (*n* = 104) was divided into subgroups on the basis of the following classification criteria: (i) job continuation, (ii) gave up work because of 'other reasons', (iii) gave up work

**Fig. 3.** Self-reported severity of occupational hand eczema in a cohort of 43 patients who were investigated at T0, T1, and T2 (Wilcoxon's rank sum test).

because of OHE, and (iv) participation in an inpatient measure (20, 21). As shown in Table 2, 71.4% (*n* = 10) of those with self-assessed 'severe' hand eczema at T0 subsequently gave up work because of OHE (21.4%) or participated in an inpatient rehabilitation measure (50.0%); 84.6% (*n* = 11) of those without hand eczema and 63.8% (*n* = 30) of those with mild hand eczema remained in work. The Kruskal–Wallis test showed significant differences between the four independent subgroups [$\chi^2 = 12.34$, degrees of freedom = 3, *p* = 0.006]. Whereas cohort 1 ('job continuation') can be considered to be a 'success' for the secondary prevention programme, cohort 3 ('gave up work because of OHE') and cohort 4 ('participation in inpatient measure') can be considered to be 'no success'. Analysis of the differences between the two cohorts 'success' and 'no success' with the Mann–Whitney *U*-test showed statistically significant differences (*p* = 0.001, *z* = −3.370). The comparison of patients with self-assessed 'mild' and 'severe' skin disease at T0 revealed better long-term success rates for patients who initially described a milder form of hand eczema (odds ratio 5.77, 95% confidence interval 1.53–21.8).

In summary, the results indicate a strong correlation between the severity of hand eczema at the time of participation in the secondary prevention programme and the long-term effectiveness defined by the ability to remain in work without the need to participate in a subsequent inpatient prevention measure.

Table 2. Self-reported severity of hand eczema at T0 in relation to the four T2 subcohorts (n = 104)

		T2 subcohorts								Σ
		(1) Job continuation		(2) Gave up work because of 'other reasons'		(3) Gave up work because of OHE		(4) Participation in inpatient measure		
		%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	
Severity of hand eczema (T0)	None	84.6	11	15.4	2	–	–	–	–	13
	Mild	63.8	30	8.5	4	12.8	6	14.9	7	47
	Medium	50.0	15	23.3	7	6.7	2	20.0	6	30
	Severe	28.6	4	–	–	21.4	3	50.0	7	14

OHE, occupational hand eczema.

Table 3. Daily frequencies of 'hand washing' and 'using skin care products' at T0, T1, and T2

	T0	T1	T2	<i>p</i> -value ^a (T0/T2)
Daily frequency of 'hand washing' (median)	15.0 (<i>n</i> = 101)	10.0 (<i>n</i> = 61)	10.0 (<i>n</i> = 51)	<i>p</i> = 0.003
Daily frequency of 'using skin care products' (median)	5.5 (<i>n</i> = 114)	8.0 (<i>n</i> = 60)	6.0 (<i>n</i> = 48)	<i>p</i> = 1.000

T0, baseline before intervention; T1, 9 months after intervention; T2, 5 years after intervention.

^aWilcoxon test.

Skin protection behaviour

Improving individual skin protection behaviour is the main aim of the skin protection seminars conducted by health educators. The recommendations made were evidence-based and adjusted to wet work occupations (e.g. to reduce the frequency of hand washing) (27).

Table 3 shows a significant decrease in the daily frequency of 'hand washing' on comparison of the medians reported at T0 (15.0 times/day) and T2 (10.0 times/day) (*p* = 0.003, *z* = −2.92). However, the long-term evaluation revealed the frequency of 'using skin care products' at T2 (6.0 times/day) to be nearly equal to that at T0 (5.5 times/day) (*p* = 1.000, *z* = 0.00).

Disease management and satisfaction with the prevention measure

Improving the patients' disease management and supporting their perceived self-efficacy are further aims of the programme. At T2, 90.0% (*n* = 54) stated that coping with the OHE had improved since participation. Another 85.0% (*n* = 51) reported that it was possible to put much of the advice that they had been given during the skin protection seminar into practice. Furthermore, nearly all participants (96.7%, *n* = 58) were positive that they were able to influence their skin condition noticeably by applying skin protection measures; 85.0% (*n* = 51) reported feeling no or only minor inconvenience associated with this skin protection behaviour in their daily routine; 88.4% (*n* = 53) disagreed with the statement 'I am worried at being unable to carry on my occupation because of the skin disease' at T2.

Even 5 years after the intervention, the vast majority (95.0%, *n* = 57) stated that they would recommend participation in the education programme to other workers suffering from OHE. This corresponds to the result at T1 (97.6%, *n* = 83).

Discussion

In the present study, we examined the long-term effectiveness of an interdisciplinary skin protection seminar by longitudinally following up the participants 5 years after the intervention. Of the participants, 71.4% (*n* = 60) remained in their original wet work occupations. The self-reported skin status significantly improved with regard to the presence and severity of the disease. Eleven patients had given up work because of OHE (13.1%). The secondary prevention programme showed the best success rates in those patients who reported milder forms of OHE at the time of participation. The self-assessed frequency of hand washing was significantly reduced, and the results indicate good disease management.

The response rate of 77.6% (*n* = 104) can be considered satisfactory with regard to the long follow-up period. It is similar to the response rates of the intervention groups of two controlled follow-up questionnaire studies in hairdressers (response rate 80.0%, 5-year follow-up) and geriatric nurses (response rate 80.4%, 6-year follow-up) (8, 9). The results regarding the success criterion 'remaining in job' can be compared with these two follow-up studies, as the interventions are, for the most part, similar; 58.7% and 65.3% of the intervention groups and 29.1% and 56.8% of the controls remained in work (8, 9).

Furthermore, the percentage of those who gave up work because of OHE is of concern; 12.8% (hairdressers) and 6.9% (geriatric nurses) in the intervention cohorts, as compared with 27.3% (hairdressers) and 13.6% (geriatric nurses) in the controls (8, 9). In similar 1-year follow-up studies, patients working as healthcare workers and cleaning and kitchen employees reported job loss because of OHE at frequencies of 8.7% ($n = 18$) and 9.2% ($n = 12$), respectively (16, 24). These data corroborate our findings that interdisciplinary outpatient prevention programmes have positive long-term effects concerning the possibility of remaining in work despite OHE.

As regards the outcome 'prevalence of hand eczema', both the presence and severity significantly decreased after participation. At T2, 41.9% ($n = 18$) reported being free of OHE. However, as 16.3% ($n = 7$) were free of OHE at T0, a clearance rate of 25.6% can be concluded. Studies have found the long-term prognosis of OHE in terms of complete clearance to be relatively poor (12–14). In a Swedish 12-year follow-up study, 85% of the patients reported skin symptoms in the follow-up period, and only 28% considered themselves to have recovered from hand eczema (13). In 2004, Cahill et al. reviewed 15 studies from 1958 to 2002, and found clearance rates for occupational contact dermatitis ranging from 18% to 72%. Nine of these studies reported rates between 18% and 40% (14). These findings indicate that the majority of cases of OHE are characterized by a chronic and relapsing course, and that complete clearance and recovery can be expected in only a minority of patients. A 1-year follow-up study in healthcare workers found a self-reported clearance rate of 32.0% (16). Against this literature background, our clearance rate of 25.6% of patients who reported being free of OHE can be considered as satisfactory and in line with expectations.

The increase in the number of patients reporting medium and severe hand eczema between T0 and T1 seems to indicate a rather unexpected worsening of OHE after participation. However, a further analysis of different items of the preliminary study and the results of a telephone interview at T1 showed an effective improvement (10). These results, which may seem conflicting on first sight, may indicate an increased subjective awareness concerning the perception of even low-grade symptoms at T1 (e.g. skin dryness). This change in perception can be assumed to be induced by the intervention, which aims to raise the participants' awareness with regard to interpreting and recognizing even low-grade symptoms as clinical signs (6, 10).

Dermatological examinations are the 'gold standard' for assessing hand eczema. However, for budgetary and organizational reasons, and because of the size of the

cohort, these could not be carried out in this long-term follow-up, which had to rely on self-reports instead. There are some studies that have assessed the validity of self-diagnosed hand eczema. Most of these studies reported self-diagnosis of hand eczema to have a relatively low sensitivity (0.53–0.73) and a high specificity (0.93–1.00) (28–33). These results indicate that self-reported diagnosis of hand eczema tends to underestimate the true prevalence. It should be kept in mind that these studies were conducted in cohorts recruited from specific occupations (28–31, 33, 34) but not in patients who had already been diagnosed with (and taught about) hand eczema, as is the case with our population. Svensson et al. found a substantial difference in the accuracy of self-assessment of the presence of hand eczema between participants recruited from the population (sensitivity 0.68, specificity 0.92) and patients who had been referred to a dermatological clinic for hand eczema (sensitivity 0.94, specificity 0.29) (35). Whereas the data obtained from the cohort recruited from the population precisely correspond to the previously outlined tendency for patients to underestimate the own condition, the data for the dermatological patients indicate a high sensitivity and an overestimation of the prevalence of hand eczema instead. These findings are in accordance with those of Cvetkovski et al., who also found the patients' self-rating of OHE to be more severe than the dermatologists' assessment (36). This corroborates the conclusion of Flyvholm, who considered 'questionnaire studies to be valid for evaluating the effects of interventions on occupational skin diseases' (37). For our cohort, an increased rather than a decreased sensitivity regarding the perception of skin diseases might be assumed, because of previous medical diagnosis and treatment and educational interventions. As the previously discussed data on the sensitivity and specificity of self-reporting of hand eczema indicate, we may conclude that the finding of 41.9% of patients reporting being free of hand eczema in the current study is not likely to be a significant underestimation of the true prevalence. As our data on the presence and severity of hand eczema revealed significant improvements in both of these between T0 and T2, we assume that the percentage of patients reporting OHE has effectively improved 5 years after participation. However, as 58.1% of patients reported hand eczema 5 years after participation, our results also corroborate the fact that OHE is typically characterized by a chronic and relapsing course. Therefore, it is a realistic aim of this prevention programme to strive for 'avoidance of severe skin lesions', as complete and lasting recovery cannot be achieved in some cases. This should be explained to the patients as part of the educational intervention, as should the

importance of consistent and intensified skin protection behaviour.

Furthermore, our findings show that, especially for patients with a more severe kind of hand eczema, an outpatient secondary prevention measure alone might not be sufficient to deal with the OHE. It must be considered that 20 participants were not included in the analysis, because of consecutive participation in an inpatient prevention measure (20, 21). An examination of these cases showed that 7 patients could not remain in their original occupation because of OHE 5 years after the intervention. This rate is comparatively low, considering the fact that all 20 patients have suffered from a severe type of OHE, which is the prerequisite for inpatient rehabilitation (tertiary prevention). This result indicates that the hierarchical multi-step intervention procedure applied by most German employers' liability insurance associations (Stufenverfahren Haut) provides relevant help for most patients affected by OHE (20, 38, 39). In this hierarchical prevention concept, the described outpatient intervention achieves better success rates in employees who suffer from milder forms of hand eczema at the time of participation. This underpins the fact that it is of the utmost importance to detect OHE as soon as possible, in the initial stage of disease (40). In Germany, this should preferably occur in the context of the so-called 'dermatologist's procedure', which obliges dermatologists and occupational physicians to immediately inform the responsible public statutory employers' liability insurance body in the case of a suspected OHE (41, 42).

As skin protection behaviour was based on self-reports of patients, the validity of these data is likely to be limited. Nevertheless, the results seem to indicate a sustainable reduction regarding the frequency of hand washing. The unchanged frequency in the use of skin care products might suggest a need for the implementation of further 'refresher seminars'. An additional outpatient skin protection course (e.g. conducted a few years later) might further improve the sustainability of the programme by providing an opportunity to retrain the patients in skin protection behaviour. It needs to be mentioned that the current study investigated only two out of many aspects that are important in achieving effective skin protection. In future studies, more detailed information, for example on the use of hand disinfectants instead of hand washing, or the correct use of protection gloves, will have to be assessed.

Concerning disease management, the participants reported improved abilities to cope with OHE after participation. Furthermore, they had a positive attitude about skin protection measures being able to positively influence the skin condition. These results indicate

increased self-efficacy among the participants. Perceived self-efficacy is a psychological construct that describes the subjective conviction of a person about having sufficient personal competence to be able to handle new, stressful or difficult situations. Self-efficacy is required for a sustainable change of unhealthy behaviour into health-promoting behaviour (e.g. to consistently perform skin protection measures to avoid OHE) (43, 44).

There are some limitations to this study. As a result of the scientific evidence showing the effectiveness of this prevention approach by means of controlled studies in hairdressers and geriatric nurses (5, 7, 8, 17), the concept of outpatient interdisciplinary skin protection seminars has been subsequently integrated into the regular supply of patient care by most German employers' liability insurance associations. As insurants are entitled to preventive offers by German social insurance law, a controlled study design was neither ethical nor legal for the implementation and evaluation of this programme. The uncontrolled, longitudinal pretest/post-test design remains feasible for long-term follow-up studies, as recently discussed (9).

Furthermore, the lack of medical data (e.g. regarding atopy, diagnoses, patch test results, or disease severity) also represents a limitation of our study, which is based on self-reports alone. Future studies aimed at evaluating the effectiveness of prevention programmes should include information on these aspects by combining self-reports with the standardized collection of data on atopy, diagnoses and disease severity rated by dermatologists.

Moreover, it needs to be emphasized that the sample used to analyse the presence and severity of OHE was drawn from cohort 1 ('job continuation') (Table 2). At T0, this cohort was characterized by better skin status than in the cohort that gave up work because of OHE (cohort 3) or consecutively took part in an inpatient measure (cohort 4). These drop-outs minimize the bias of data on the one hand, but they reduce the size of the sample on the other hand, so subsequent studies including larger samples are recommended for the future.

The employees who were able to remain in their occupation (71.4%, $n = 60$) continued to be exposed to wet work, irritants, and, partially, to high hygiene standards. Nonetheless, most showed none or only mild hand eczema. Thus, the results of the present study are in accordance with previous findings showing the legitimacy and effectiveness of skin protection seminars within the above-mentioned hierarchical multi-step intervention procedure. As compared with other intervention studies focusing on the prevention of OHE in various occupations (7–9, 15, 16, 18, 24, 45–50), the particular

strength of this study lies in providing 5-year follow-up data. This allows conclusions to be drawn regarding the long-term sustainability of this and similar secondary preventive measures.

Acknowledgements

The authors especially thank Harald Buck for the follow-up of the participants.

References

- 1 DGV. *DGV Statistics 2010: Figures and long-term trends*: Paderborn, Bonifatius GmbH, 2011.
- 2 Frosch P, John S M. Clinical aspects of irritant contact dermatitis. In: *Contact Dermatitis*, 4th edition, Frosch P, Menné T, Lepoittevin J P (eds): Berlin, Heidelberg, Springer-Verlag, 2006: pp. 255–294.
- 3 Diepgen T L. Occupational skin-disease data in Europe. *Int Arch Occup Environ Health* 2003; **76**: 331–338.
- 4 Dickel H, Kuss O, Blesius C R, Schmidt A, Diepgen T L. Occupational skin diseases in Northern Bavaria between 1990 and 1999: a population-based study. *Br J Dermatol* 2001; **145**: 453–462.
- 5 Wulfhorst B, Bock M, Skudlik C, John S M. Worker education and teaching programs: the German experience. In: *Handbook of Occupational Dermatology*, Kanerva L, Elsner P, Wahlberg J E, Maibach H I (eds): Berlin, Heidelberg, Springer Verlag, 2000: pp. 855–861.
- 6 Wulfhorst B. *Konzeption, Implementation und Evaluation einer gesundheitspädagogischen Maßnahme*: Osnabrück, Universitätsverlag Rasch, 2001.
- 7 Schürer N Y, Klippel U, Schwanitz H J. Secondary individual prevention of hand dermatitis in geriatric nurses. *Int Arch Occup Environ Health* 2005; **78**: 149–157.
- 8 Wulfhorst B, Bock M, Gediga G, Skudlik C, Allmers H, John S M. Sustainability of an interdisciplinary secondary prevention program for hairdressers. *Int Arch Occup Environ Health* 2010; **83**: 165–171.
- 9 Wilke A, Gediga G, Weinhöppel U, John S M, Wulfhorst B. Long-term effectiveness of secondary prevention in geriatric nurses with occupational hand eczema: the challenge of a controlled study design. *Contact Dermatitis* 2012; **66**: 79–86.
- 10 Schlesinger T. *Sekundäre Prävention in der Berufsdermatologie: Ein Vergleich unterschiedlich komplexer Schulungsmaßnahmen unter Berücksichtigung ausgewählter Berufe des Gesundheitswesens*: Berlin, Logos Verlag, 2005.
- 11 Schlesinger T, Schwanitz H J. Allgemeine Sekundäre Individualprävention (ASIP) in der Berufsdermatologie. *J Dtsch Dermatol Ges* 2003; **1** (Suppl. 1): 139.
- 12 Cvetkovski R S, Zachariae R, Jensen H, Olsen J, Johansen J D, Agner T. Prognosis of occupational hand eczema. *Arch Dermatol* 2006; **142**: 305–311.
- 13 Meding B, Lantto R, Lindahl G, Wrangsjö K, Bengtsson B. Occupational skin disease in Sweden – a 12-year-follow-up. *Contact Dermatitis* 2005; **53**: 308–313.
- 14 Cahill J, Keegel T, Nixon R. The prognosis of occupational contact dermatitis in 2004. *Contact Dermatitis* 2004; **51**: 219–226.
- 15 Weisshaar E, Radulescu M, Bock M, Albrecht U, Zimmermann E, Diepgen T L. Skin protection and skin disease prevention courses for secondary prevention in health care workers: first results after two years of implementation. *J Dtsch Dermatol Ges* 2005; **3**: 33–38.
- 16 Apfelbacher C, Soder S, Diepgen T L, Weisshaar E. The impact of measures for secondary individual prevention of work-related skin diseases in health care workers: 1-year follow-up study. *Contact Dermatitis* 2009; **60**: 144–149.
- 17 Klippel U. *Prävention berufsbedingter Dermatosen bei Beschäftigten in der Altenpflege*, Göttingen, V&R unipress GmbH, 2004.
- 18 Mertin M, Frosch P, Kügler K, Sieverding M, Goergens A, Wulfhorst B, John S M. Hautschutzseminare zur sekundären Individualprävention bei Beschäftigten in der Maschinenbau- und Metallbranche. *Dermatol Beruf Umwelt* 2009; **57**: 29–35.
- 19 Schwanitz H J, Riehl U, Schlesinger T, Bock M, Skudlik C, Wulfhorst B. Skin care management: educational aspects. *Int Arch Occup Environ Health* 2003; **76**: 374–381.
- 20 Skudlik C, Wulfhorst B, Gediga G, Bock M, Allmers H, John S M. Tertiary individual prevention of occupational skin diseases: a decade's experience with recalcitrant occupational dermatitis. *Int Arch Occup Environ Health* 2008; **81**: 1059–1064.
- 21 Skudlik C, Weisshaar E, Scheidt R, Elsner P, Wulfhorst B, Schönfeld M, John S M, Diepgen T L. First results from the multicentre study rehabilitation of occupational skin diseases – optimization and quality assurance of inpatient management (ROQ). *Contact Dermatitis* 2012; **66**: 140–147.
- 22 Jungbauer F H W, Van Der Harst J J, Schuttelaar M L, Groothoff J W, Coenraads P J. Characteristics of wet work in the cleaning industry. *Contact Dermatitis* 2004; **51**: 131–134.
- 23 Jungbauer F H W, Steenstra F B, Groothoff J W, Coenraads P J. Characteristics of wet work in nurses. *Int Arch Occup Environ Health* 2005; **78**: 248–251.
- 24 Soder S, Diepgen T L, Radulescu M, Apfelbacher C, Bruckner T, Weisshaar E. Occupational skin diseases in cleaning and kitchen employees: course and quality of life after measures of secondary individual prevention. *J Dtsch Dermatol Ges* 2007; **5**: 670–677.
- 25 Bauer A, Kelterer D, Bartsch R, Stadler M, Elsner P. Skin protection in the food industry. *Curr Probl Dermatol* 2007; **34**: 138–150.
- 26 Dulon M, Kromark K, Skudlik C, Nienhaus A. Prevalence of skin and back diseases in geriatric care nurses. *Int Arch Occup Environ Health* 2008; **81**: 983–992.
- 27 Nicholson P J, Llewellyn D, English J S. Evidence-based guidelines for the prevention, identification and management of occupational contact dermatitis and urticaria. *Contact Dermatitis* 2010; **63**: 177–186.
- 28 Livesley E J, Rushton L, English J S C, Williams H C. Clinical examinations to validate self-completion questionnaires: dermatitis in the UK printing industry. *Contact Dermatitis* 2002; **47**: 7–13.
- 29 Meding B, Barregård L. Validity of self-reports of hand eczema. *Contact Dermatitis* 2001; **45**: 99–103.
- 30 Yngveson M, Svensson A, Isacson A. Evaluation of a self-reported questionnaire on hand dermatosis in secondary school children. *Acta Derm Venereol* 1997; **77**: 455–457.
- 31 Susitaival P, Husman L, Hollmen A, Horsmanheimo M. Dermatoses determined in a population of farmers in a questionnaire-based clinical study including methodology validation. *Scand J Work Environ Health* 1995; **21**: 30–35.
- 32 Smit H A, Burdorf A, Coenraads P J. Prevalence of hand dermatitis in different occupations. *Int J Epidemiol* 1993; **22**: 288–293.

- 33 Bregnhøj A, Søsted H, Menné T, Johansen J D. Validation of self-reported hand eczema among Danish hairdressing apprentices. *Contact Dermatitis* 2011; **65**: 146–150.
- 34 Smit H A, Coenraads P J, Lavrijsen A P M, Nater J P. Evaluation of a self-administered questionnaire on hand dermatitis. *Contact Dermatitis* 1992; **26**: 11–16.
- 35 Svensson A, Lindberg M, Meding B, Sundberg K, Stenberg B. Self-reported hand eczema: symptom-based reports do not increase the validity of diagnosis. *Br J Dermatol* 2002; **147**: 281–284.
- 36 Cvetkovski R S, Jensen H, Olsen J, Johansen J D, Agner T. Relation between patients' and physicians' severity assessment of occupational hand eczema. *Br J Dermatol* 2005; **153**: 596–600.
- 37 Flyvholm M A, Bach B, Rose M, Jepsen K F. Self-reported hand eczema in a hospital population. *Contact Dermatitis* 2007; **57**: 110–115.
- 38 Skudlik C, Weisshaar E, Scheidt R, Wulfhorst B, Diepgen T L, Elsner P, Schönfeld M, John S M. Multicenter study 'medical-occupational rehabilitation procedure skin – optimizing and quality assurance of inpatient-management (ROQ)'. *J Dtsch Dermatol Ges* 2009; **7**: 122–127.
- 39 Skudlik C, John S M. Hierarchical multi-step intervention on the skin: practical implementation from the dermatological aspect. *Trauma Berufskr* 2007; **9**: 296–300.
- 40 Hald M, Agner T, Blands J, Johansen J D. Delay in medical attention to hand eczema: a follow-up study. *Br J Dermatol* 2009; **161**: 1294–1300.
- 41 Skudlik C, Breuer K, Jünger M, Allmers H, Brandenburg S, John S M. Optimal care of patients with occupational hand dermatitis: considerations of German occupational health insurance. *Hautarzt* 2008; **59**: 690–695.
- 42 John S M, Skudlik C, Römer W et al. Recommendation: dermatologist's procedure. *J Dtsch Dermatol Ges* 2007; **5**: 1146–1148.
- 43 Schwarzer R, Gutiérrez-Doña B. Health psychology. In: *International Handbook of Psychology*, 1st edition, Pawlik K, Rosenzweig M R (eds): London, Thousand Oaks, CA, Neu Dehli, SAGE Publications, 2000: pp. 452–465.
- 44 Bandura A. Perceived self-efficacy in cognitive development and functioning. *Educ Psychol* 1993; **28**: 117–148.
- 45 Mygind K, Borg V, Flyvholm M A, Sell L, Jepsen K F. A study of the implementation process of an intervention to prevent work-related skin problems in wet-work occupations. *Int Arch Occup Environ Health* 2006; **79**: 66–74.
- 46 Flyvholm M A, Mygind K, Sell L, Jensen A, Jepsen K F. A randomised controlled intervention study on prevention of work related skin problems among gut cleaners in swine slaughterhouses. *Occup Environ Med* 2005; **62**: 642–649.
- 47 Sell L, Flyvholm M A, Lindhard G, Mygind K. Implementation of an occupational skin disease prevention programme in Danish cheese dairies. *Contact Dermatitis* 2005; **53**: 155–161.
- 48 Nienhaus A, Rojahn K, Skudlik C, Wulfhorst B, Dulon M, Brandenburg S. Secondary individual prevention and rehabilitation in female hairdressers suffering from skin diseases. *Gesundheitswesen* 2004; **66**: 759–764.
- 49 Held E, Mygind K, Wolff C, Gyntelberg F, Agner T. Prevention of work related skin problems: an intervention study in wet work employees. *Occup Environ Med* 2002; **59**: 556–561.
- 50 Held E, Wolff C, Gyntelberg F, Agner T. Prevention of work-related skin problems in student auxiliary nurses. *Contact Dermatitis* 2001; **44**: 297–303.