

Article type : Original Article

Job change facilitates healing in a cohort of patients with occupational hand eczema

Running head: Occupational hand eczema and job change

T.K. Carøe¹, N.E. Ebbenhøj², J.P.E. Bonde², S.G. Vejlstrup², and T. Agner¹

¹Department of Dermatology, University of Copenhagen,

Bispebjerg Hospital, Bispebjerg Bakke 23, 2400 Copenhagen, Denmark

²Department of Occupational and Environmental Medicine, University of Copenhagen,

Bispebjerg Hospital, Bispebjerg Bakke 23, 2400 Copenhagen, Denmark

Corresponding author: Tanja Korfitsen Carøe

Email: tanja.korfitsen@dadlnet.dk

Funding sources: The study is independent research funded by The Danish Working Environment Research Fund (Arbejdsmiljøforskningsfonden) and The Health Foundation (Helsefonden).

Conflicts of interest: None declared

This article has been accepted for publication and undergone full peer review but has not been through the copyediting, typesetting, pagination and proofreading process, which may lead to differences between this version and the Version of Record. Please cite this article as doi: 10.1111/bjd.16095

This article is protected by copyright. All rights reserved.

What is already known about this topic?

- Occupational hand eczema affects young people, and often takes on a chronic course.
- It presents a financial burden to society and negatively influences working life.
- Information on the outcome of job change on prognosis of hand eczema is sparse.

What does this study add?

- Change of/end of profession has a positive effect on healing and improvement of occupational hand eczema.
- However change of/end of profession affects health-related quality of life (HR-QoL) in a negative direction.
- Changed work procedures within the same profession have a beneficial effect on hand eczema and do not influence HR-QoL.

Abstract

Background Occupational hand eczema is a frequent and often chronic disease and knowledge of the consequences of change of profession is sparse.

Objectives To compare severity of hand eczema and health related QoL HR-QoL in patients who after 5 years were still in the same profession and those who were not.

Methods The study is a register-based cohort study including patients with recognised occupational hand eczema in Denmark in 2010 and 2011. Outcomes were eczema related parameters and Dermatology Life Quality Index (DLQI) obtained from a follow-up questionnaire after 5 years.

Results A total of 1496 participants were included in the study. More participants who changed or ended profession reported complete healing of hand eczema at follow up, compared to participants still in the same profession (OR=1.62 (1.06-2.47) and OR=2.85 (1.83-4.42), respectively), as well as increased improvement at follow-up (OR=1.91(1.44-2.54) and OR=1.51(1.09-2.10), respectively), while DLQI for participants who changed or ended profession was increased at follow up, (Incidence Rate Ratio (IRR)= 1.12 (0.98-1.28) and IRR= 1.29 (1.11-1.51), respectively). Subgroup analyses of patients with irritant or allergic occupational hand eczema did not differ markedly from this result. Change of work procedures was positively associated with improvement (OR=2.31(1.51-3.54)), and did not markedly influence DLQI.

Conclusion Change of profession has a beneficial effect on eczema parameters, but a negative effect on HR-QoL, indicated by increased DLQI. Change of work procedures while staying in the same profession positively influenced improvement, with no marked influence on HR-QoL, and should be considered as an alternative to job change.

Background

Occupational hand eczema has its onset in young age and often takes on a chronic course (1,2). It presents a financial burden to society due to sick leave, early retirement and loss of job. Patients with occupational hand eczema may choose to change profession or stay in the same job, sometimes with changed exposures and work procedures. However, the evidence concerning the outcome of job change on prognosis of hand eczema is sparse (3–5).

In some countries, like Germany, it is mandatory for patients to change profession when the disease is recognised as occupational. In other countries, including Denmark, the tradition is

more conservative, trying to keep the affected individuals in their respective jobs, and making job change optional – although in real life often influenced by opportunities on the labour market. It is important to understand the consequences of change of profession with regard to prognosis of hand eczema, since change of profession may have considerable financial and personal consequences.

The aim of the present study is to compare prognoses, assessed as hand eczema healing (clear/not clear), improvement since recognition, number of severe cases and HR-QoL, in patients with recognised occupational hand eczema still working in the same profession in relation to those who were not, at follow-up 4-5 years later. The findings may serve as a basis for future legal regulation in relation to occupational hand eczema and job adherence.

Methods

The study is a register-based cohort study including all persons above the age of 18 with recognised occupational hand eczema in Denmark within the 2year period, January the 1st 2010 to 31st of December 2011.

Baseline data was obtained from the Labour Market Insurance in Denmark. Data includes demographic information (age at onset and gender, information on atopic eczema, diagnosis (occupational irritant contact dermatitis (OICD), occupational allergic contact dermatitis (OACD) and occupational contact urticaria/protein contact dermatitis), any contact allergy(ies) (occupational and non-occupational), and job/profession at time of notification. The health-related information was based on specialist statements and/or medical files from Dermatological Departments or Departments of Occupational and Environmental Medicine. All participants had been patch tested at baseline with the European baseline series, supplemented with special allergens or series when relevant. On suspicion of protein contact dermatitis/ contact urticaria, a prick test, RAST test (specific IgE) or a histamine release test

(in vitro diagnostic test for measuring allergen induced histamine release (6), had been performed.

With respect to the subgroups OICD and OACD, cases with combined diagnoses (i.e. allergic and irritant) were grouped as allergic, as were cases with allergic contact urticaria.

Classification of profession at baseline was registered according to the files in the Labour Market Insurance, and was based on the Danish Occupational Classification System (7). The 2 first digits in the 5-digits job code in the Danish Occupational Classification System (7) was used to group the professions into major professions.

A questionnaire was sent out to the participants in 2016, 4-5 years after recognition of occupational disease. The questionnaire comprised questions on current job situation and status of hand eczema.

Participants were divided into those who at follow-up were in the same profession as at baseline, those who had changed profession and those who were outside the labour market. Change of profession was classified as change in the 5 digit code from the Danish Occupational Classification System (7) from baseline to follow-up. Profession at follow-up was obtained from a question in the questionnaire on current profession. Based on a specific question regarding change of work procedures, participants who were still in the same profession as at baseline were divided into those who had changed routines and those who had not.

The four outcomes investigated were healing (hand eczema reported as “clear”), improvement since baseline, number of severe cases, and HR-QoL at follow-up. Hand eczema was reported as “clear” when the participant reported being free of eczema the previous 12 months. Improvement of the hand eczema was rated according to the

Accepted Article

participant's answer to the question: "How will you describe the severity of your occupational eczema compared to the severity in 2010/2011, when your case was recognised?" and divided into "better" vs "same or worse". If the participants answered "better" the hand eczema was classified as "improved". Participants, who answered that they had been free of hand eczema since recognition and therefore did not answer the questions on self-evaluated improvement, were placed in the group "improved". Severe cases at follow up were defined according to how the participants rated their hand eczema on a scale from 0 (clear) to 10 (worst) at follow-up. The assessment of severe cases were taken from NOSQ 2002 question D12 and translated into Danish, zero being no eczema and 10 being very severe eczema (8), and scores at 9 or 10 were classified as "severe hand eczema". If participants answered that they had been free of hand eczema since recognition and therefore did not answer the questions on self-evaluated severity (score 0-10) at follow-up the score 0 was given.

HR-QoL was assessed using the validated DLQI-score from 0-30, where low values indicate low influence on quality of life. The variable was applied as a continuous scale (9).

The Photographic Guide for assessing severity of chronic hand eczema was also employed in the questionnaire (10) however this was not completed by 28% of the participants, due to an imprecise formulation in the questionnaire, indicating that participants with healed hand eczema were not supposed to answer this question, and it was therefore decided not to include data from this question in the analyses.

The trial was approved by the Danish Data Protection Agency (BHH-2014-032). Permission for the study is given by the Ethical Committee in Denmark (Protocol no.: H-6-2014-106).

Statistics

Logistic regression analysis was used to test for differences regarding severity (healing of hand eczema, improvement, and number of severe cases at follow-up), and change of profession and work procedures, respectively. DLQI was used as a continuous scale, and as the scores were not normally distributed, a negative binomial regression analysis was applied to test for differences regarding DLQI and change of profession and of work procedures, respectively. Number of severe cases at baseline were assessed from the questionnaire, where the participants were asked to rate the severity of their hand eczema “at its worst” on a scale from 0 (clear) to 10 (worst) (8), and dichotomised into “clear to moderate eczema” (scale score 0-8) and “severe eczema” (scale score 9-10) (11). This division was chosen to focus on the most severe hand eczema cases at follow-up.

A previously defined set of co-variables were included in the model: age (continuous variable), gender, atopic dermatitis, diagnosis (irritant, allergic or contact urticaria) and the severity “at its worst”(11).

Wilcoxon rank sums test was used to test for difference in age between responders and non-responders in the sub group analysis on work procedures.

Statistical analysis was performed using SAS ENTERPRICE GUIDE 7.1 (SAS, Cary, NC, USA).

Results

Effects of change of job or job loss

Questionnaires were sent to 2703 participants identified from the Labour Market Insurance in Denmark, and 1565 (58.0%) responded. The gender distribution was 1135 (72.6%) women and 430 (27.4%) men (11). A total of 26 participants who did not have hand eczema and 43

Accepted Article

participants who had not filled out information on current job situation, were excluded. 1496 participants were included in the study, 1089 (72.8%) women and 407 (27.2%) men. Median age was 38 years (quartiles 27-48 years). At follow-up 728 (48.7%) participants were still in the same profession, 487 (32.5%) had changed profession and 281(18.8%) were outside the labour market (11). The content of the group outside the labour market was retirement/early retirement (n=121), unemployment (n=101), leave of absence (maternity leave, parental leave, educational leave or other types of leave) (n=34), student not at a workplace (n=23) and stay-at home (n=2).

Healing of hand eczema at follow up was reported by 19.5% of the participants who changed their profession and 27.3% of the participants outside the labour market, compared to 15.8% still in the same profession. Thus, participants who changed profession or left their profession reported "clear" significantly more often than those who stayed in the same profession OR=1.62 (1.06-2.47) and OR=2.85 (1.83-4.24), respectively (Table 1). 64.9% of the participants who had changed profession and 58.2% of the participants outside the labour market reported improvement of their hand eczema since recognition compared to 53.1% of the participants still in the same profession. Thus markedly more participants who changed profession or left their profession reported improvement compared to those who stayed in the same profession (OR=1.91 (1.44-2.54) and 1.51 (1.09-2.10)), respectively (Table 1). With respect to improvement of hand eczema, we found a marked interaction between change of profession and severe hand eczema "at its worst". Participants with severe hand eczema had a more positive effect of change of profession on improvement of hand eczema than participants with less severe hand eczema. For the severe group the odds of having improved hand eczema was an additional 89.0% higher (OR=1.89 (1.01-3.53)). With respect to number of severe cases, a total of 61 (4.1%) answered that they had severe eczema (score 9 or 10) at follow-up; 3.5% of participants still in the same profession, 3.1% of participants who

changed profession and 7.6% outside the labour market, respectively. Thus, change of profession and being outside labour market did not significantly influence number of severe cases at follow-up, OR=0.75 (0.37-1.55) and OR= 1.61 (0.83-3.12) (Table 1). Data on HR-QoL is given in Table 1. Participants who changed to another profession and participants outside the labour market had higher DLQI score, i.e. lower HR-QoL, compared to participants who stayed in the same profession, OR=1.12 (0.98-1.28), and, OR=1.29 (1.11-1.51), respectively.

Effects of change of work procedures

728 (48.7%) participants were still in the same profession at follow-up, and information on whether or not they had changed work procedures was obtained from 619 participants. Of the 109 participants who did not respond to the question on work procedures, 93 participants answered that they had changed job and therefore did not answer the question, however, according to our definition using the occupational code classification system, they had not changed profession.

Besides the 109 that did not answer the question on work procedures 15 participants did not answer the question on healing, 15 did not answer the question on improvement, 8 did not answer the question on severity and 10 did not answer the question on DLQI.

No difference was found between the respondents and non-respondents with respect to gender ($p=0.152$) and major groups of professions ($p=0.209$). The age differed among the two groups, median age in respondents regarding the question on work procedure was 41 years and 34 years for non-respondents ($P=0.001$).

A total of 174 (28.1%) participants had changed work procedures at follow-up while 445 (71.9%) had not. Change of work procedures did not markedly influence healing rate; 31 (18.0%) of those who changed work procedures reported “clear” as compared to 61 (14.1%) of those who had the same work procedures, OR=1.29 (0.66-2.55), (Table 2). Participants who had changed work procedures, markedly more often reported improvement compared to those who had not, 63.7% versus 46.2 %, OR=2.31 (1.51-3.54), (Table 2). Change of work procedures did not markedly influence the number of participants with severe eczema at follow-up, OR=0.39 (0.10-1.46) (Table 2), and also did not markedly influence HR-QoL OR=0.99 (0.80-1.22) (Table 2).

Subgroup analysis

With regard to subgroups of participants with OICD and OACD at follow-up, 48.4% and 49.4% , respectively, were still in the same profession as at baseline (11). No major differences were found for the subgroups as compared to the total group of participants still in the same profession, 16.7% of the participants with OICD and 13.5% of patients with OACD reported “clear” at follow up, 53.7% of participants with OICD versus 51.7% of the participants with OACD reported improvement, and 3.7% of the participants with OICD and 2.9% of the participants with OACD reported severe eczema at follow-up. With respect to HR-QoL, DLQI for participants still in the same profession was 2 (0-4) in the OICD group and 2 (0-5) in the OACD group (Table 3).

Discussion

Occupational hand eczema is a marked personal burden for the patient and a financial burden on society, and change of profession may appear as a possible solution to the problem. In the present study we overall found a markedly positive effect of leaving the profession on healing

and improvement of hand eczema, while HR-QoL was on the contrary influenced in a somewhat negative direction.

In theory occupational hand eczema should heal when the exposure is removed, however several studies have shown that this is unfortunately not the case in reality. Meding et al 2005 found that only 28% of the patients with occupational hand eczema had recovered after 12 years at follow-up (2) and a newer Danish study reported that only 32% was healed at follow-up after 7 years (12). A German study with a 3 week inpatient followed by a 3 week outpatient intervention phase found an improvement rate of 31.6% for all hand eczema patients (working or not) at 3 years follow-up (13). Other studies have discussed persistent post-occupational dermatitis and conclude that even though the exposure ends some patients may continue to have severe hand eczema symptoms (14–16).

Most previous data on the association between job change and the severity of hand eczema points in the direction of a positive effect, however evidence is sparse.

In two Finish studies (3,4), patients with occupational skin disease/hand eczema were followed-up after 6 months and again after 7-14 years, respectively. At follow-up 7-14 years later the healing rate was 46% for participants who had changed occupation, 28-52% for participants not working (unemployed, retired, other reasons) and 31% for participants still in the same occupation. The results are slightly more optimistic than the findings in our study however the follow-up period was also longer (7-14 years compared to our 4-5 years follow-up) and the study group smaller (N=605) as compared to ours. After 6 month staying in the same profession was found to be a significantly negative prognostic factor for hand eczema (3), and after 7-14 year markedly more participants who had changed occupation were clear

of hand eczema (4). Change of profession was in these studies defined as change to a different occupation, and this positive influence of job change is in line with our findings. In a Danish study including 5324 graduated hairdressers, significantly more hairdressers currently working in the trade than ex-hairdressers had suffered from hand eczema the past 12 months (17), assessed by a self-administrated questionnaire. Since hairdressers are exposed to a substantial burden of wet work, in combination with chemicals with the ability to cause contact allergy, they constitute a group of workers in particular at risk for development of hand eczema, and results therefore cannot directly be compared to our data. In an older questionnaire-based study examining 1011 female cleaners (18) with a follow-up period of 2 years, it was reported that those who had left the cleaning profession had significantly fewer self-assessed symptoms of hand eczema (18).

Three studies, one from Canada (19) and two from Australia (16,20) dates back more than 20 years. The Canadian study reported a trend towards less active skin disease for participants who had changed job compared to those still in the same job after 0.5- 8 years (19), and both the Australian studies showed a significantly higher healing rate in those who changed job (16,20). In these three studies the majority of the participants were males, as opposed to our population with a preponderance of females. Moreover, data (16,19,20) was gathered 25-30 years before our data, and therefore not directly comparable, however, the trend towards better outcome for participants with changed profession remains.

In the present study, in spite of a positive influence of change of profession on healing and improvement of hand eczema, no significant effect was found on number of severe cases at follow-up. This may be a result of the fact that severe hand eczema in itself has a poor prognosis as reported in previous studies (12,21). However, we found that change of profession did have a greater effect on improvement of severe hand eczema, suggesting that participants with severe hand eczema can benefit the most from a change of profession.

To our knowledge this study is the first to simultaneously evaluate influence of change of profession on eczema-related parameters and HR-QoL. DLQI is a dermatology specific questionnaire for assessment of HR-QoL for a variety of dermatological disease and not in particular addressing hand eczema in patients. A new tool to specifically evaluate HR-QoL for hand eczema patients, The Quality of Life in Hand Eczema Questionnaire (QOLHEQ), has recently been introduced (22) and guidelines for translation and validation have been developed (23). This new tool, however, was not available when designing the present study, however, it should be preferred for future studies.

We found that leaving the profession was associated with impairment of HR-QoL, in particular for participants outside labour market. Although HR-QoL is expected to correlate negatively to hand eczema severity (22), it is known that the relationship between HR-QoL and severity is complex, and may be influenced by numerous factors, including gender and age (23). In the present study, a likely interpretation is that the mental stress accompanying change of profession or loss of job has influenced the HR-QoL in a negative direction.

Although our findings of impairment of HR-QoL are statistically significant, the differences are rather small. A previous study indicated that the minimal clinically important difference (MCID) of the DLQI varies from 3 to 5 points (24), making the difference we found in our study beneath the MCID level. It may be that benefits from change of profession differ for different subgroups, such as OICD and OACD, however, in the present study we could not confirm this. The influence of job change with respect to sub-diagnosis has, to our knowledge, not been examined before.

Participants who stayed in the same profession, but changed work procedures also had a marked improvement of hand eczema, although not a significantly higher healing rate, as has previously been reported (20). Our more strict definition of healing may explain this difference, since Rosen et al (20) defined healing as “clearance of eczema” whereas we

defined healing as “no eczema the last 12 months”. Change of work procedures did in our study not negatively affect the HR-QoL, which is favourable as compared to the negative influence of job change on this parameter.

A significant advantage of this study is the strict definition of change of profession using the occupational coding system, and also the division of participants into those who changed to another profession and participants who left the labour market.

In our study we did not consider if the participants changed to a profession with more or less exposure than the previous profession which could be a potential source of bias. It is possible that some participants have changed to another high risk profession, thereby diminishing the effect of change. However, the study in this respect reflects real life, where patients are not always guided, or may not always follow guidance in their choice of a new career. We also did not obtain information about the cause leading to job change and whether it was due to hand eczema or not. However, the decision to change job is in many cases multifactorial, and may, besides hand eczema, also include factors such as options at the work place and personal circumstances, which may be difficult to separate from each other.

In conclusion, our data indicates that change of profession or leaving the profession has a positive effect on hand eczema with respect to healing and improvement of symptoms, in particular in participants with severe hand eczema, while HR-QoL is not improved, and is on the contrary even influenced in a negative direction. This should be considered when guiding patients with occupational hand eczema with respect to future work situations. Staying in the same profession with changed work procedures was found to have a beneficial effect with respect to improvement of hand eczema, and did not negatively influence HR-QoL and should be considered as an alternative to job change in situations where this presents a realistic choice. Future studies should further explore the effects of job change in specific occupations and related to different exposures.

This article is protected by copyright. All rights reserved.

Reference list

1. Carøe T, Ebbelhøj N, Agner T. A survey of exposures related to recognized occupational contact dermatitis in Denmark in 2010. *Contact Dermatitis*. 2014;70(1):56–62.
2. Meding B, Lantto R, Lindahl G, Wrangsjö K, Bengtsson B. Occupational skin disease in Sweden — A 12-year follow-up. *Contact Dermatitis*. 2005;53(6):308–13.
3. Mäлкönen T, Jolanki R, Alanko K, Luukkonen R, Aalto-Korte K, Lauerma A, et al. A 6-month follow-up study of 1048 patients diagnosed with an occupational skin disease. *Contact Dermatitis*. 2009;61(5):261–8.
4. Mäлкönen T, Alanko K, Jolanki R, Luukkonen R, Aalto-Korte K, Lauerma A, et al. Long-term follow-up study of occupational hand eczema. *Br J Dermatol*. 2010;163(5):999–1006.
5. Hjorth N AC. Rehabilitation in hand eczema. *Derm Beruf Umwelt*. 1986;34(3):74–6.
6. Stahl SP, Norn S, Weeke B. A new method for detecting histamine release. *Agents Actions*. 1984;14(3):114–6.
7. Arbejdskraftdirektoratet. Arbejdskraftdirektoratet. Dansk Fagkode. 2nd ed. 1986.
8. NOSQ. NOSQ-2002 / LONG translation master – Nordic Occupational Skin Questionnaire. 2002;1–19.
9. Finlay A, Karn G. Dermatology Life Quality Index (DLQI) - a simple practical measure for routine clinical use. *Clin Exp Dermatol*. 1994;19:210–6.
10. Coenraads PJ, Van Der Walle H, Thestrup-Pedersen K, Ruzicka T, Dreno B, De La Loge C, et al. Construction and validation of a photographic guide for assessing

severity of chronic hand dermatitis. *Br J Dermatol.* 2005;152(2):296–301.

11. Carøe T, Ebbelhøj N, Bonde J, Agner T. Occupational hand eczema and/or contact urticaria: Factors associated with change of profession or not remaining in the workforce. *Contact Dermatitis.* 2017;In pres.
12. Petersen AH, Johansen JD, Hald M. Hand eczema - Prognosis and consequences: A 7-year follow-up study. *Br J Dermatol.* 2014;171(6):1428–33.
13. Brans R, Skudlik C, Weisshaar E, Scheidt R, Ofenloch R, Elsner P, et al. Multicentre cohort study “Rehabilitation of Occupational Skin Diseases - Optimization and Quality Assurance of Inpatient Management (ROQ)”: results from a 3-year follow-up. *Contact Dermatitis.* 2016;75(4):205–12.
14. Sajjachareonpong PRS, Ahill JEC, Eegel TEK, Aunders HES, Ixon RON. Persistent post-occupational dermatitis. *Contact Dermatitis.* 2004;278–83.
15. Cahill J, Keegel T, Nixon R. The prognosis of occupational contact dermatitis in 2004. *Contact Dermatitis.* 2004;51(5–6):219–26.
16. Wall LM; Gebauer KA. A follow-up study of occupational skin disease in Western Australia. *Contact Dermatitis.* 1991;241–3.
17. Lysdal SH, Sørsted H, Andersen KE, Johansen JD. Hand eczema in hairdressers: A Danish register-based study of the prevalence of hand eczema and its career consequences. *Contact Dermatitis.* 2011;65(3):151–8.
18. Nielsen J. The occurrence and course of skin symptoms on the hands among female cleaners. *Contact Der.* 1996;34:284–91.
19. Holness D, Nethercott JR. Work outcome in workers with occupational skin disease.

Am J Ind Med. 1995;27(6):807–15.

20. Rosen RH, Freeman S. Prognosis of occupational contact dermatitis in New Wales, Australia. *Contact Dermatitis*. 1993;29:88–93.
21. Hald M, Agner T, Blands J, Veien NK, Laurberg G, Avnstorpe C, et al. Clinical severity and prognosis of hand eczema. *Br J Dermatol*. 2009;160(6):1229–36.
22. Agner T, Jungersted JM, Coenraads P-J, Diepgen T. Comparison of four methods for assessment of severity of hand eczema. *Contact Dermatitis*. 2013;69(2):107–11.
23. Agner T, Andersen KE, Brandao FM, Bruynzeel DP, Bruze M, Frosch P, et al. Hand eczema severity and quality of life: A cross-sectional, multicentre study of hand eczema patients. *Contact Dermatitis*. 2008;59(1):43–7.
24. Basra M, Salek M, Camilleri M, Sturkey R, Finlay A. Determining the Minimal Clinically Important Difference and Responsiveness of the Dermatology Life Quality Index (DLQI): Further Data. *Dermatology*. 2015;27–33.

Table 1.

Course of hand eczema and quality of life (DLQI) in relation to change/end of profession, n=1496

Self-reported healing of eczema during the last 12 month (n=1449, 47 missing)				
	N (%)	Clear n (%)	OR (95% CI) Univariate ^a	OR (95% CI) Adjusted ^{ab}
Same profession	710 (49.0)	112 (15.8)	1	1
Change of profession	472 (32.6)	92 (19.5)	1.29 (0.95-1.75)	1.62 (1.06-2.47)
Outside labour market	267 (18.4)	73 (27.3)	2.01 (1.44-2.81)	2.85 (1.83-4.42)
Self-evaluated improvement at follow-up (n=1459, 37 missing)				
	N (%)	Improvement n (%)	OR (95% CI) Univariate ^a	OR (95% CI) Adjusted ^{ab}
Same profession	708 (48.5)	376 (53.1)	1	1
Change of profession	476 (32.6)	309 (64.9)	1.63 (1.29-2.08)	1.91 (1.44-2.54)
Outside labour market	275 (18.9)	160 (58.2)	1.23 (0.93-1.63)	1.51 (1.09-2.10)
Self-evaluated hand eczema severity (assessed on a scale from 0-10) (n=1472, 24 missing)				
	N (%)	Severe hand eczema (9-10) n (%)	Crude OR (95% CI) ^a	OR (95% CI) Adjusted ^{ab}
Same profession	718 (48.8)	25 (3.5)	1	1
Change of profession	477 (32.4)	15 (3.1)	0.90 (0.47-1.73)	0.75 (0.37-1.55)
Outside labour market	277 (18.8)	21 (7.6)	2.27 (1.25-4.13)	1.61 (0.83-3.12)
Dermatology Life Quality Index (DLQI) (n=1475, 21 missing)				
	N (%)	DLQI Median (Q1- Q3)	Crude IRR (95% CI) ^c	Adjusted IRR (95% CI) ^{bc}
Same profession	717 (48.6)	2 (0-5)	1	1
Change of profession	486 (33.0)	2 (1-5)	1.08 (0.94-1.25)	1.12 (0.98-1.28)
Outside the labour market	272 (18.4)	3 (0-6)	1.37 (1.15-1.62)	1.29 (1.11-1.51)

Values with p-values < 0.05 are highlighted in the table.

Dermatology Life Quality index (DLQI). Low values indicate higher quality of life

^aLogistic regression. OR=odds ratio, CI=confidence interval.

^bVariables adjusted for: sex, age, atopic dermatitis, diagnosis and severity

^cNegative binomial regression with DLQI from 0-30 as outcome. Estimates have been back-transformed using exponential function, and represents incidence Rate Ratio (IRR), (e.g: adjusted ratio 1.29 = 29% higher score (lower quality of life) compared to the reference).

Table 2

Course of hand eczema and quality of life (DLQI) in relation to change of work procedures. N=728

Self-reported healing of eczema during the last 12 month for participants still in the same work (n=604, 124 missing)				
	N (%)	Clear n (%)	OR (95% CI) Crude^a	OR (95% CI) Adjusted)^{ac}
Same work procedures	432 (71.5)	61 (14.1)	1	1
changed work procedures	172 (28.5)	31 (18.0)	1.34 (0.83-2.15)	1.29 (0.66-2.55)
Self-evaluated improvement at follow-up for participants still in the same work (n=604, 124 missing)				
	N (%)	Improved n (%)	OR (95% CI) Crude^a	OR (95% CI) Adjusted)^{ac}
Same work procedures	433 (71.7)	200 (46.2)	1	1
changed work procedures	171 (28.3)	109 (63.7)	2.05 (1.42-2.95)	2.31 (1.51-3.54)
Self-evaluated hand eczema severity (0-10) for participants still in the same work (n=611, 117 missing)				
	N (%)	Severe eczema (score 9-10) n (%)	OR (95% CI) Crude^a	OR (95% CI) Adjusted)^{ab}
Same work procedures	439 (71.8)	3 (1.7)	1	1
changed work procedures	172 (28.2)	17 (3.9)	0.44 (0.13-1.52)	0.39 (0.10-1.46)
Dermatology Life Quality Index (DLQI) for participants still in the same work (n=609, 119 missing)				
	N (%)	DLQI score Median (Q1-Q2)	Crude IRR (95% CI)^c	Adjusted IRR (95% CI)^{bc}
Same work procedures	437 (71.8)	2 (0-5)	1	1
changed work procedures	172 (28.2)	2 (0-4)	0.94 (0.75-1.18)	0.99 (0.80-1.22)

Values with p-

values < 0.05 are highlighted in the table.

Dermatology Life Quality index (DLQI). Lower is better.

^aLogistic regression. OR=odds ratio, CI=confidence interval.

^bVariables adjusted for: sex, age, atopic dermatitis, diagnosis and severity.

^cNegative binomial regression with DLQI from 0-30 as outcome. Incidence Rate Ratio (IRR). Estimates have been back-transformed using exponential function, and represent incidence rate ratio(IRR) (e.g: 0.99 = 1% decrease compared to the reference).

Table 3. Course of hand eczema and quality of life (DLQI) after change of profession among participants with occupational irritant hand eczema and occupational allergic hand eczema.

Self-reported healing of hand eczema during the last 12 month			
	Total	Healed	Adjusted OR (95% CI) ^a
Irritant (n=1035, 32 missing)			
Same profession	502 (48.5)	84 (16.7)	1
Change of profession	345 (33.3)	71 (20.6)	1.60 (0.99-2.61)
Outside labour market	188 (18.2)	50 (26.6)	2.68 (1.59-4.50)
Allergic (n=414, 15 missing)			
Same profession	208 (50.2)	28 (13.5)	1
Change of profession	127 (30.7)	21 (16.5)	1.65 (0.69-3.95)
Outside labour market	79 (19.1)	23 (29.1)	3.40 (1.45-7.97)
Self-evaluated improvement at follow-up			
	Total	Better	Adjusted OR (95% CI) ^a
Irritant (n=1045, 22 missing)			
Same profession	505 (48.3)	271 (53.7)	1
Change of profession	350 (33.5)	235 (67.1)	2.10 (1.50-2.94)
Outside labour market	190 (18.2)	110 (57.9)	1.58 (1.07-2.34)
Allergic (n=414, 15 missing)			
Same profession	203 (49.0)	105 (51.7)	1
Change of profession	126 (30.4)	74 (58.7)	1.54 (0.90-2.61)
Outside labour market	85 (20.5)	50 (58.8)	1.34 (0.74-2.44)
Self-evaluated hand eczema severity (assessed on a scale from 0-10)			
	Total	Severe hand eczema (9-10)	Adjusted OR (95% CI) ^a
Irritant (n=1048, 19 missing)			
Same profession	510 (48.7)	19 (3.7)	1
Change of profession	346 (33.0)	10 (2.9)	0.60 (0.25-1.43)
Outside labour market	192 (18.3)	14 (7.3)	1.20 (0.55-2.64)
Allergic (n=424, 5 missing)			
Same profession	208 (49.1)	6 (2.9)	1
Change of profession	131 (30.9)	5 (3.8)	1.34 (0.35-5.13)
Outside labour market	85 (20.1)	7 (8.2)	3.78 (1.03-13.83)
Dermatology Life Quality Index (DLQI)			
	Total	DLQI Median (Q1- Q3)	Adjusted RRI (95% CI) ^b
Irritant (n=1052, 15 missing)			
Same profession	507 (48.24)	2 (0-4)	1
Change of profession	354 (33.62)	2 (0-5)	1.07 (0.96-1.20)
Outside labour market	191 (18.14)	3 (1-6)	1.20 (1.05-1.37)
Allergic (n=423, 6 missing)			
Same profession	210 (49.6)	2 (0-5)	1
Change of profession	132 (31.2)	2 (1-5)	1.10 (0.91-1.33)
Outside labour market	81 (19.2)	3 (0-7)	1.31 (1.06-1.62)

Values with p-values < 0.05 are highlighted in the table.

Dermatology Life Quality index (DLQI). Lower is better.

^a Logistic regression. OR=odds ratio, CI=confidence interval. Variables adjusted for: sex, age, atopic dermatitis, diagnosis and severity.

^b Negative binomial regression with DLQI from 0-30 as outcome, Variables adjusted for: sex, age, atopic dermatitis, diagnosis and severity. Estimates have been back-transformed using exponential function, and represent incidence rate ratio (IRR) (e.g. 1.07 = 7% increase compared to the reference).