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Occupational hand eczema with reference to job change and prevention

Tanja Korfitsen Carøe
Ph.D Thesis 2017

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Tanja Korfitsen Carøe

Faculty of Health and Medical Sciences

University of Copenhagen

Department of Dermatology

Bispebjerg Hospital

Department of Occupational and Environmental Medicine

Bispebjerg Hospital

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Author:

Tanja Korfitsen Carøe, MD
University of Copenhagen,
Department of Dermatology
Bispebjerg Hospital, Denmark
and
Department of Occupational and Environmental Medicine
Bispebjerg Hospital, Denmark

Supervisor:

Tove Agner, Professor, MD, DMSc
University of Copenhagen,
Department of Dermatology
Bispebjerg Hospital, Denmark

Niels Erik Ebbehøj, MD, DMSc
University of Copenhagen,
Department of Occupational and Environmental Medicine
Bispebjerg Hospital, Denmark

Jens Peter Bonde, Professor, MD, DMSc
University of Copenhagen,
Department of Occupational and Environmental Medicine
Bispebjerg Hospital, Denmark

Assessment Committee:

Jacob Pontoppidan Thyssen, Associate Professor, MD, PhD
(Chairperson)
University of Copenhagen
Department of Dermatology and Allergy
Gentofte Hospital, Denmark

Charlotte Gotthard Mørtz, Professor, MD, PhD
University of Southern Denmark
Department of Dermatology and Allergy Centre
Odense Hospital, Denmark

Cecilia Svedman, Associate Professor, MD, PhD
Lund University
Department of Occupational and Environmental Dermatology
Skåne Hospital, Sweden

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Preface and Acknowledgements

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This thesis is based on the following papers:

Paper I

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Paper II

Carøe T., Ebbehøj N, Bonde J, Vejlstrup, S., & Agner T. Job change facilitates healing in a cohort of patients with occupational hand eczema. *Accepted for publication in British Journal of Dermatology October 2017*

Paper III

Carøe T., Ebbehøj N, Bonde JP., Flachs EM., & Agner T. Hand eczema and wet work: dose-response relationship and effect of leaving the profession. *Accepted for publication in Contact Dermatitis October 2017.*

Contents

Abbreviations

In alphabetic order

ACD = Allergic Contact Dermatitis

CI = Confidence Interval

CU = Contact Urticaria

DLQI = Dermatology Life Quality Index

HR-Qol = Health-Related Quality of Life

ICD = Irritant Contact Dermatitis

IRR = Incidence Rate Ratio

NOSQ = Nordic Occupational Skin Questionnaire

OACD = Occupational Allergic Contact Dermatitis

OCU = Occupational Contact Urticaria

OICD = Occupational Irritant Contact Dermatitis

OR = Odds Ratio

RAST = Radioallergosorbent test

1. English summary

Background This thesis addresses factors associated with job change, as well as the consequences of change of exposures within the workplace in employees with occupational hand eczema. Occupational hand eczema is the most frequently recognised single group of occupational diseases in Denmark, median age at onset is 35-36 years, and the disease often takes a chronic course. Occupational hand eczema has a significant negative impact on health-related quality of life (HR-QoL) for the individual patient and is a major economic burden to society. Theoretically, occupational hand eczema should disappear when the exposure ends, however some studies have shown that this may not be the case. In Germany you are legally obligated to cease all activities that have caused or aggravated the occupational hand eczema after recognition, whereas, there are no legal requirements regarding this in Denmark.

Methods The study includes all patients with recognised occupational hand eczema in Denmark in the year 2010 and 2011. Baseline data, obtained from the Labour Market Insurance in Denmark, comprises demographic data, as well as information on atopic dermatitis, diagnosis (irritant, allergic contact dermatitis and contact urticaria), contact allergy/allergies, work exposures and profession at time of notification. A follow-up questionnaire was sent to participants by mail 4-5 years after recognition of the occupational disease. Based on these data factors associated with job change and the consequences of job change were examined.

Results Having a contact allergy (occupational relevance or not) and having severe hand eczema was positively associated with leaving the profession, as was young age and low level of education. A positive, although modest effect of leaving the job was found in respect to healing and improvement of hand eczema, however, this was not reflected in HR-QoL, which on the contrary worsened slightly. Staying in the same profession with changed work procedures also had a positive effect on improvement of hand eczema, and this did not negatively influence HR-QoL. A sub-

analysis performed on participants with recognised occupational hand eczema due to wet work, also confirmed the positive effect of job change on improvement and healing of hand eczema in this group. However, it also showed that even a minor decrease in exposure to wet work was associated with a better chance of healing and improvement of the hand eczema in a dose-response dependent manner.

Conclusion Results from this thesis indicate that special attention should be paid to patients with contact allergy as well as those with severe hand eczema, since these factors may lead to job change. This emphasises the importance of allergy testing of all patients with occupational hand eczema at an early stage. In the workplace, exposure should be scrutinised (not only to allergens but also to irritants), since even minor changes can lead to improvement of hand eczema. A work place visit with professional guidance on exposures and skin care could be one way of dealing with this issue. In addition, leaving the profession increases the chance for improvement and healing, although the effect on healing is modest, and should be considered when changes made to the work environment fail to make a sufficient impact.

2. Danish summary

Baggrund Denne afhandling omhandler faktorer associeret med jobskifte, samt konsekvenserne af ændring på arbejdspladsen hos ansatte med arbejdsbetinget håndeksem. Arbejdsbetinget håndeksem udgør den største enkeltgruppe af anerkendte erhvervssygdomme i Danmark. Medianalderen er 35-36 år, og sygdommen bliver ofte kronisk. I teorien burde arbejdsbetinget eksem forsvinde, når eksponeringen ophører, men nogle undersøgelser har peget på, at dette nok ikke er tilfældet. I Tyskland er man forpligtet til at ophøre med alle arbejdsrelaterede aktiviteter, som har forårsaget eller forværret det arbejdsbetingede eksem efter anerkendelse af en erhvervssygdom, hvorimod vi i Danmark ikke har noget lovkrav om dette. Arbejdsbetinget håndeksem har en væsentlig negativ indvirkning på sundhedsrelateret livskvalitet for den enkelte patient og er en stor økonomisk byrde for samfundet.

Metode Studiet inkluderer alle patienter med anerkendt arbejdsbetinget håndeksem i Danmark i år 2010 og 2011. Baseline data er indhentet fra Arbejdsmarkedets Erhvervsforsikring i Danmark og omfatter demografiske data samt information om atopisk dermatitis, diagnose (irritativt eller allergisk eksem og kontaktnældefeber), kontakt allergi(er)), arbejdseksponeringer og erhverv på tidspunktet for anmeldelsen. Et opfølgende spørgeskema blev sendt til deltagerne 4-5 år efter anerkendelse af erhvervssygdommen. Baseret på disse data blev faktorer relateret til jobændringer, samt konsekvenser af jobændringer undersøgt.

Resultater Kontaktallergi (arbejdsbetinget eller privat) og svært håndeksem var forbundet med at forlade professionen, det samme var ung alder og lavt uddannelsesniveau. En positiv, omend beskeden effekt af at forlade professionen blev fundet med hensyn til helbredelse og forbedring af håndeksem, men dette afspejledes ikke i livskvalitet, som forværredes lidt. Det at forblive i samme profession med ændrede arbejdsprocedurer havde også positiv effekt på forbedring af håndeksem, og dette påvirkede ikke livskvaliteten negativt. En delanalyse udført

på deltagere med anerkendt arbejdsbetinget håndeksem på grund af vådt arbejde viste, at selv en mindre reduktion i udsættelse for vådt arbejde var forbundet med en bedre chance for helbredelse og forbedring af håndeksem på en dosisresponsafhængig måde.

Konklusion Resultater fra denne afhandling tyder på, at særlig opmærksomhed bør rettes mod patienter med kontaktallergi såvel som dem med svær håndeksem, da disse faktorer er forbundet med jobskifte. Dette understreger vigtigheden af allergitestning af alle patienter med arbejdsbetinget eksem på et tidligt stadium. På arbejdspladsen bør eksponeringerne, såvel allergifremkaldende som irritative, afdækkes, da selv små ændringer kan medføre en betydelig forbedring af håndeksem. Et arbejdspladsbesøg med professionel rådgivning om eksponeringer og hudpleje kan være en måde at håndtere dette emne på. At forlade professionen kan også føre til forbedring og helbredelse, selv om effekten er beskeden, og bør overvejes, når ændringer i arbejdsmiljøet ikke har tilstrækkelig effekt.

3. Introduction

Background

Occupational skin diseases constituted 34% of all recognised occupational cases of contact dermatitis in 2015 in Denmark (1) thereby being the most commonly recognised single group of occupational diseases in Denmark. Most cases of occupational contact dermatitis (OCD) are caused by irritants, and the single most important risk factor is wet work (2). Occupational irritant contact dermatitis (OICD) constitutes 70% of recognised cases of OCD, occupational allergic contact dermatitis (OACD) constitutes 15%, mixed OICD and OACD 10% and occupational contact urticaria (OCU) 5% (2).

Women are more often affected than men by a ratio of approximately 3:2. Both groups experience onset at an early age (2–4). The average age of official recognition of hand eczema as an occupational disease is 35-36 years (2–4).

Theoretically, occupational hand eczema should disappear when the exposure ends, however some studies have shown that this may not be the case (5,6). Meding et al 2005 found in their 12 year follow-up study that eczema often evolves into a chronic disease and that more than 12 years after onset about 70% of patients still had ongoing eczema (5). Other studies discuss the phenomenon of persistent post-occupational dermatitis (6–8) and concluded that some patients continue to have hand eczema after termination of exposures. Another study showed that approximately 1/3 of the patients were unemployed or on sick leave 2 years after recognition (9).

Socio-economic consequences

Occupational hand eczema is a financial burden on society, particular due to the chronic course of the disease (10–12) and the fact that the disease often has its onset at a young age (2,3) thereby often resulting in sick leave, change of occupation and re-training. In Germany you are legally obligated to cease activities that have caused or aggravated an occupational disease after recognition (13). In Denmark, on the

contrary, you are not encouraged by the law to make occupational changes. In this thesis the aim was to highlight the issue of job change.

Classification of occupational hand eczema

Hand eczema can be divided into subgroups (14), comprising irritant contact dermatitis (ICD), allergic contact dermatitis (ACD), and contact urticaria (CU), which are all related to environmental exposures, and atopic hand eczema, vesicular endogenous hand eczema, and hyperkeratotic endogenous hand eczema, all endogenous forms, which may be aggravated by environmental exposures. Occupational contact dermatitis has not been defined clearly in the literature (15), however, it can be interpreted as contact dermatitis of the hands caused by or aggravated by a relevant exposure in the workplace within a relevant time period. Furthermore, to be accepted as primarily occupational, work time exposure should exceed leisure time exposure.

Effect of job change

It is common among patients with occupational hand eczema to change occupation. It is not known which factors are associated with job changes or if changing profession or simply changing work procedures are equally beneficial in regard to prognosis. The long-term effects of advice regarding change of profession versus remaining in the same profession and in regard to changing working procedures are of significant importance, and it needs to be clarified in order to help the patients with occupational hand eczema. Previous studies have been ambiguous in this matter. Some studies generally indicated that job change may have a positive effect on hand eczema in respect to eczema parameters (8,16–22), while other studies do not find that job changes have any effect (23–25). Even though previous studies have investigated effect of job change only a few studies have looked into the effect of also changing work procedures (16,26) and none of the studies have taken health related quality of life (HR-QoL) into consideration. An older Danish study has discussed the risk of lower social status due to change of occupation (27) and this factor should be born in mind when dealing with occupational hand eczema patients. Furthermore,

data is needed on whether different subgroups (according to occupation or type of exposure) should be given differing advice with respect to job change.

OACD vs OICD

Previous studies have discussed differences in prognosis between the subgroups OACD and OICD. One study finds a better prognosis of allergic contact dermatitis in comparison to irritant contact dermatitis (28), two studies found that the prognosis is better for irritant contact dermatitis (23,29), however the majority do not find any difference (16,26,30,31). Information on the effect of job change for patients with OACD versus OICD, and whether a difference exists is sparse. Data from a recent Finnish study indicates a positive effect of change for both irritant and allergic contact dermatitis with no significant difference between the groups (16).

Wet work

Wet work (frequent exposure to water and/ or use of occlusive gloves) is an important risk factor for occupational hand eczema comprising approximately 60% of all recognised cases of occupational irritant contact dermatitis in Denmark (2). Occupations with high rates of exposure to wet work are, among others, healthcare, cleaning, kitchen work and hairdressers (32–38).

The definition of wet work is not agreed upon the literature but it is often divided into: wet hands >2 hours per day at work, frequency of hand washing >20 times per day at work and usage of occlusive gloves > 2 hours per day at work (38,39). In Germany regulations have been implemented to minimise exposure to wet hands at work (not more than 2 hours spent with wet hands per day at work) and to minimise frequent hand washing at work (40).

Wet work (including wet hands, hand washing and use of occlusive gloves) has previously been identified as a large contributor to developing ICD (33,35,37,41–49). There is experimental evidence of increased skin irritation after wet work (50,51). Whether many short exposures to wet-work may be more damaging than one single long exposure (52) has been discussed however more studies are needed to provide evidence for this.

It has been claimed that water exposure during leisure time is a significant factor in developing hand eczema. Some studies have shown that patients with high exposure to wet work at their workplace also have a high exposure during leisure time (35,53,54). It has been suggested that exposure during leisure time could be more important than work-related exposure (54).

With all this in mind, however, not much is known about the amount of wet work that is required to elicit hand eczema in workers with varying individual susceptibility, or if a decrease in the amount of wet work is enough to reduce the frequency of hand eczema.

Occlusive gloves

Occlusive gloves form part of the protective measures in wet work but have themselves been shown to elicit negative effects (55,56). However the irritant role of occlusion by gloves has also been challenged (57). In the review by Tiedemann et al 2015 the negative effect of occlusion was found to be limited but that long term use of gloves was found to pose a risk of ICDs and it was found that glove occlusion tends to worsen the negative effect of detergents on the skin (57).

Individual susceptibility

Development of ICD is a complex process and individual susceptibility also plays a role.

Studies have shown that atopic dermatitis plays an important factor in susceptibility to hand eczema (58–61) and that patients with ICD and atopic dermatitis have persistent disease more frequently, along a longer duration of the disease than participants without atopic dermatitis (31,61–63).

Filaggrin is a protein that is important in the skin barrier function and a mutation in the gene expressing filaggrin may result in defective skin barrier function (64). There has also been speculation that filaggrin null mutations alone play a role in susceptibility to hand eczema (62). However in a later study, by the same study group, this finding could not be replicated (65) and the authors, among others,

suggest that it is in combination with atopic dermatitis that filaggrin null mutation increases the susceptibility to hand eczema (63,65).

4. Aim of the thesis

I. To identify factors associated with leaving the profession where the hand eczema originated or aggravated in a cohort of occupational hand eczema patients.

II. To assess the consequences of job change in a cohort of patients with occupational hand eczema, with respect to healing, improvement and severity of hand eczema, as well as HR-QoL.

III. To assess consequences of change of profession in a subgroup of patients with occupational hand eczema due to wet work, and to evaluate the dose-response relationship between intensity of wet work and healing/ improvement of hand eczema.

5. Design

The present study is a descriptive, register-based cohort study including all participants over 18 years of age with recognised occupational hand eczema in Denmark during a 2-year period starting 1 January 2010. Follow-up was by questionnaire 4-5 years later, in 2015.

Information was gathered from the Labour Market Insurance in Denmark (previously known as the National Board of Industrial Injuries), where impartial legal decisions are taken regarding workers compensation in Denmark (66). Doctors are required by law to report suspected cases of occupational disease to the Labour Market Insurance, and this provided a unique opportunity to make use of the data to carry out a registry-study of occupational hand eczema.

6. Materials & methods

Participants

Patients, over 18 years of age, recognised by the Labour Market Insurance in Denmark as having occupational hand eczema within a 2-year period: starting 1 January 2010 to 31 December 2011 were eligible for the study, and received a follow-up questionnaire sent out by mail in June 2015.

Data collection

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 (OICD, OACD and OCU), any contact allergy/allergies (occupational and non-occupational), work exposure that led to the hand eczema (i.e. wet work) and profession at the time of notification. All patients with notified occupational hand eczema were evaluated by a specialist in Dermatology or a specialist in Occupational and Environmental Medicine, with the evaluation including a patch test (as a minimum the baseline series), supplemented with relevant special allergens or 'series of allergens'. Whenever a protein contact dermatitis (CU) was suspected, a prick test, Radioallergosorbent test (RAST test) or a histamine release test (HR test, an in vitro diagnostic test for measuring allergen induced histamine release (67)) were performed (68). A prick test (or RAST test or HR test) was only conducted in patients with suspected allergic contact urticaria. All patients exposed to rubber gloves were tested for rubber latex allergy. Information on allergic contact sensitisation (both relevant and irrelevant to the occupational hand eczema) was gathered from the specialist statement/medical files along with information on current or previous (relevant) diseases, which make up the obligatory information given in the statements (68). Participants were registered as having atopic dermatitis if they had a current or previous medical history of atopic dermatitis recorded in the specialist statements or medical files (68).

Classification of diagnosis

The diagnosis (allergic or irritant) was taken from the legal decision reached by the Labour Market Insurance in Denmark which was based on information gathered from the medical statements/medical files on the relevance of exposures with respect to occupation. If an allergy was found to be relevant to occupational exposure the diagnose OACD was reached. If relevant irritant exposure was present and no occupational relevant allergy was found, the diagnosis OICD was reached.
The decisions reached by the Danish Labour Market Insurance offered no distinction between types of allergy (type I and type IV). With respect to the OCU diagnosis, the author went through test results and exposures in the medical files in all cases involving allergy, to determine which cases were type I allergies and which were not, and accordingly classified the hand eczema as either OACD or OCU.
Cases diagnosed with only OICD were classified as OICD. Cases with combined diagnoses of OICD and OACD were grouped as OACD, based on the assumption that ICD in combined cases may not be consequently reported. Cases with OCU or OCU combined with other diagnoses (OICD, OACD or both) were grouped as OCU.

Educational level

Educational level was graded using baseline information on profession and divided into 5 groups; unskilled profession, skilled profession, higher education 1-3 years, higher education 3-4.5 years and higher education ≥ 5 years (68). This grading system was used to simplify the educational system used in Denmark (69).

Questionnaire

A paper questionnaire was sent by mail in June 2015 to all patients who had recognised occupational hand eczema in 2010 or 2011. The questionnaire was tested on 7 patients in the outpatient clinic at Bispebjerg Hospital and adjustments were made according to the comments from the patients.

The questionnaire contained questions on current job situation, current profession, changes of procedures, self-rated severity (healing, improvement, current severity score 0-10, severity at its worst), Dermatology Life Quality Index (DLQI) and current amount of wet work. See questionnaire in appendix I.

Change of profession

Profession at baseline was classified according to the Danish Occupational Classification Systems 5-digit code (70) based on the information in the files of the Labour Market Insurance in Denmark. The professions were grouped by the first 2 digits in the 5-digit job code, according to the system. See appendix 2.
The system was designed in 1979, and is the original occupational classification system used in Denmark and is still being used in the departments of Occupational and Environmental medicine in Denmark to classify the patients into professional groups.
Profession at follow-up was obtained by the question: '*What is your current profession?*
Change of profession was assessed as any change in the 5-digit code from baseline to follow-up. The only exception was participants who were in training/education at baseline and at follow-up were working in the particular professions towards which their training was directed. These participants were grouped as *'same profession'* even though the code was different. The rest of the group *'same profession'* included participants that at follow-up had the same 5 digit code as at baseline. Participants who were no longer active in the labour market were grouped as *'outside the labour market'* according to their answer to the question: *'What are your present occupational status?'* and included participants on leave, out of work, students not in a job, stay-at home parents, and participants who are retired from the labour market.

Change of work procedures

For participants still in the '*same profession'* a subgroup analysis was made by dividing these participants into *'change of working procedures'* and *'same working procedures'* according to their answer to the question: *'Do you have the same work routines?'* (71).

Eczema parameters

Eczema status at follow-up was assessed from response to the questionnaire. *Healed/clear of hand eczema* was defined as not having had hand eczema the previous 12 months. Improvement of the hand eczema was rated according to the participants' answer to the question: *'How would you describe your occupational eczema compared to status in 2010/2011 when your case was recognised?' ('better', 'the same' or 'worse')* and divided into *'better' or 'the same or worse'*. If the participants had answered *'better'* the hand eczema was classified as *'improved'*. Participants who had answered that their hand eczema had healed since recognition and therefore did not answer the questions on self-evaluated improvement were placed in the group *'improved'*. Severity 'at follow-up' and 'at its worst' was defined according to how the participants rated their hand eczema on a scale from 0 (healed hand eczema) to 10 (worst case scenario) at time of follow-up and 'at its worst' in the questionnaire. The severity scale was taken from NOSQ (Nordic Occupational Skin Questionnaire) 2002 question D12 and translated to Danish, 0 being 'healed' and 10 being 'very severe eczema' (72). Participants who responded that they had been clear of hand eczema since recognition, and therefore did not answer the questions on self-evaluated severity (score 0-10) at time of follow-up, were given the score 0. The scores were dichotomised and a score at 9 or 10 was classified as 'severe hand eczema''. This division was chosen to focus on the most severe hand eczema cases at follow-up. HR-QoL was analysed using the validated DLQI-questionnaire with ranging from 0-30, where lower score means better HR-QoL (73).

Wet work

A subgroup analysis was carried out on all the participants who had had their cases recognised due to exposure to wet work. A total of 954 participants were recognised due to wet work at baseline but only 778 of these were still active at the labour market at follow-up. The participants' amount of wet work at follow-up was examined based on their answer to the following two questions, *'What are you currently exposed to at work? Wet hands: no exposure, less than ½ hours per day, between ½-2 hours per day, more than 2 hours per day'*, and *'How many times do you wash your hands on a normal day? 0-5 times a day, 6-10 times a day, 11-15 times a day, 16-20 times a day, more than 20 times a day'?* The question regarding number of hand washes was asked, both for working hours and leisure time.

Ethical issues

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

Statistics

By performing logistic regression analysis factors associated with leaving the profession during follow-up according to demographic, medical and professional characteristics at baseline were examined. Odds ratio (OR) was adjusted for age group (18-25, 26-35, 36-45, 46-55, 56+), sex, atopic dermatitis, diagnosis (OICD, OACD or OCU), severity 'at its worst' (mild to moderate score 0-8 and severe score 9-10) and educational level (unskilled, skilled, higher education 1-3 years, higher education 3-4.5 years, higher education ≥5 years).
Difference in eczema parameters (healed, improvement, and severity 'at follow-up') in relation to leaving the profession and change in work procedures were examined by logistic regression analysis. DLQI was tested in relation to leaving the profession

and change in work procedures by a negative binomial regression analysis to calculate Incidence Rate Ratio (IRR), because DLQI was not normally distributed. DLQI was applied as a continuous scale. In the subgroup analysis for wet work the Cochrane-Armitage trend was applied to test for linear trend and data met the assumptions for the categories wet hands and hand washing. The outcomes 'healing' and 'improvement' in relation to wet hands and hand washing was tested by a Poisson model to calculate relative risk (RR). For glove usage the Cochrane-Armitage test only met assumptions for improvement and not for healing. All 3 models were adjusted for age (continuous variable), gender, atopic dermatitis and severity 'at its worst' (71,74).

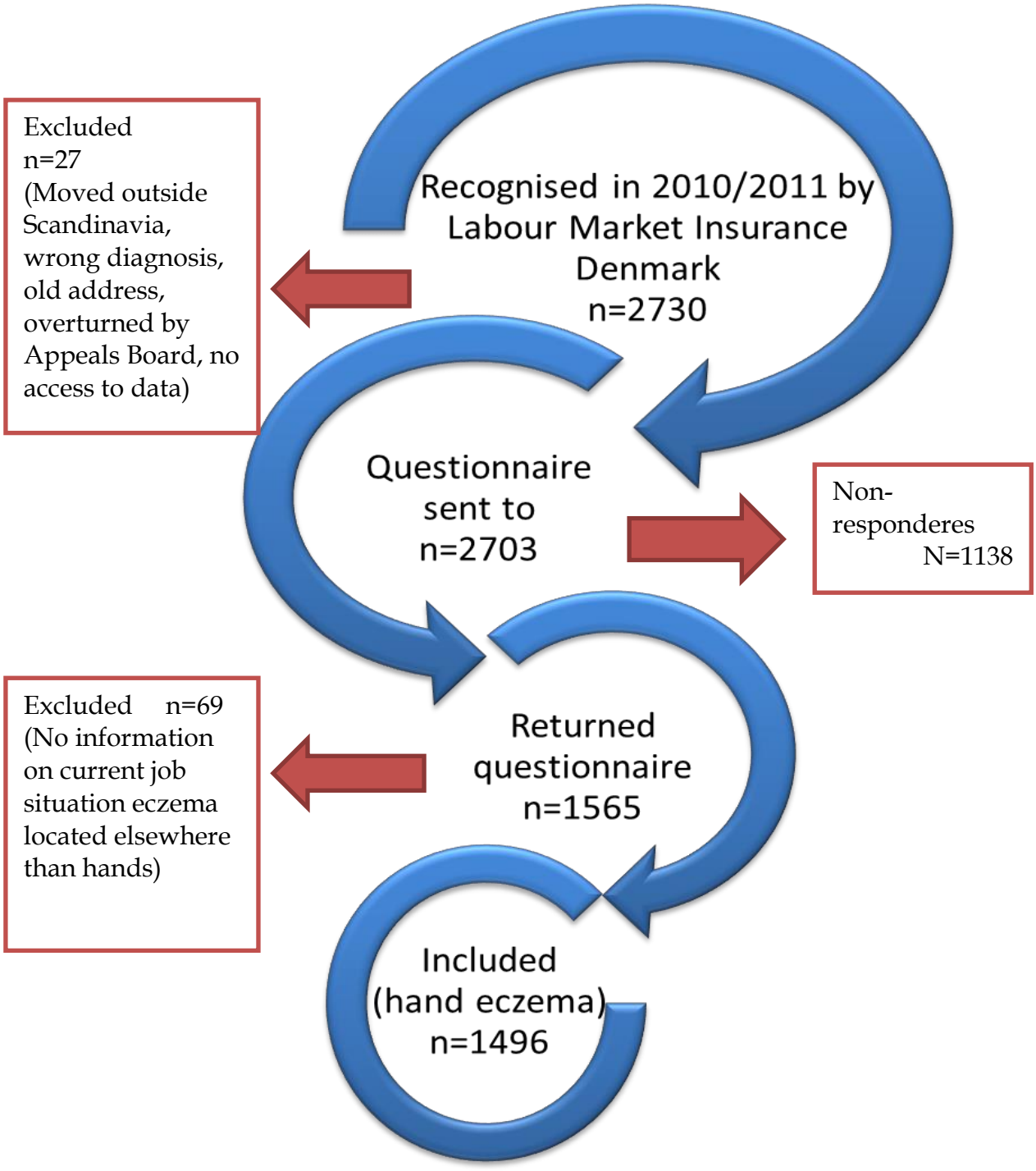
The Pearson correlation coefficient was used to test for correlation between exposure at work and in leisure time (74).

The Wilcoxon rank-sums test was used to test for difference in age between respondents and nonrespondents (68).

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

7. Summary of Results

Figure 1. Flow chart.



Baseline characteristics

Table 1. Baseline characteristics of the study population.

	Total, n (%)
Number of included patients	1496
Age group (years)	
18-25	312 (20.9)
26-35	385 (25.7)
36-45	336 (22.5)
46-55	294 (19.6)
56+	169 (11.3)
Sex	
Men	407 (27.2)
Women	1089 (72.8)
Atopic dermatitis	
No	1135 (75.9)
Yes	361 (24.1)
Patch test	
Negative	695 (46.5)
Positive	801 (53.5)
Diagnoses	
OICD	1067 (71.3)
OACD	370 (24.7)
OCU	59 (4.0)
Wet work	
No	542 (36.2)
Yes	954 (63.8)
Educational level	1495*
Unskilled profession	435 (29.1)
Skilled profession	784 (52.4)
Higher education 1-3 years	25 (1.7)
Higher education 3-4.5 years	209 (14.0)
Higher education ≥5 years	42 (2.8)
Severity ('at its worst')	1309
Mild to moderate	933 (71.3)
Severe	376 (28.7)

* One missing information on educational level: Job title 'self-employed'.

Factors associated with leaving the profession

A total of 768 (51.3%) of the participants had left the profession and 728 (48.7%) were still in the same profession at follow-up.

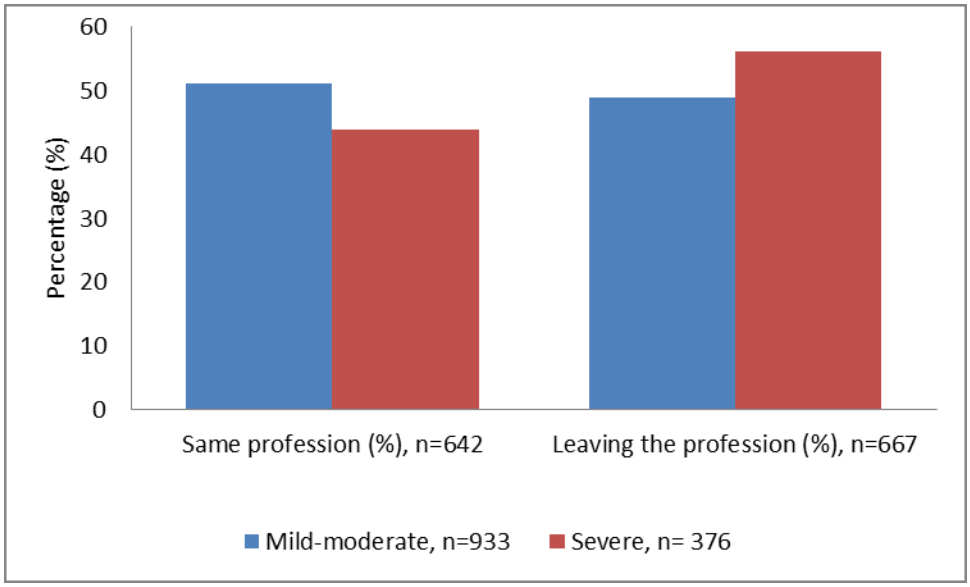
Positive patch

Having a positive patch test was associated with leaving the profession. Significantly more participants with a positive patch test (occupational relevance or not) left the profession than stayed in the same profession adjusted OR = 1.38 (1.02-1.87) (68).

Severity 'at its worst'

For self-assessed severity 'at its worst', the outcome 'severe' hand eczema was significantly associated with leaving the profession. Participants rating their hand eczema 'at its worst' as severe (score 9 or 10) left the profession significantly more often than participants rating their eczema 'at its worst' as mild to moderate (score 0-8). See Figure 2, adjusted OR=1.44. (1.11-1.87) (68).

Figure 2. Leaving the profession associated with severity 'at its worst'.



Mild to moderate score 0-8 (including healed) and severe score 9 to 10. N=1309.

Age group

Leaving the profession in which the hand eczema started was significantly more prevalent among the younger age groups, and there was a downwards trend in terms of leaving the profession with increasing age, except for the group aged ≥ 56 years old which also included persons who had retired from work (68).

Educational level

Working in an unskilled or skilled profession was associated with a significantly higher occurrence of having left the profession at follow-up compared to higher education 3-4.5 years, adjusted OR=5.51 (3.65-8.31) and adjusted OR=2.45 (1.68-3.56), respectively. No difference was found in respect to higher education 1-3 years and higher education $\geq$ 5 years (68).

Professional groups

A total of 71.4% of the cleaning personnel group had left the profession, which was a significantly larger proportion than in 'others', adjusted OR=2.26 (1.12-4.21). In direct contrast, healthcare workers markedly more often stayed in the same profession, and only 34.0% had left the profession, adjusted OR=0.36 (0.24-0.53). Frequency of leaving the profession differed markedly within the healthcare group. A total of 94.7% of the physicians and 75.8% of the nurses were in the same profession at follow-up compared to 64.7% of the social and healthcare assistants and 57.4% of the social and healthcare helpers (68). The groups are described in appendix 2.

Other factors

No correlation was found between leaving the profession and gender, atopic dermatitis or diagnosis (OICD, OACD and OCU).

Effect of leaving the profession

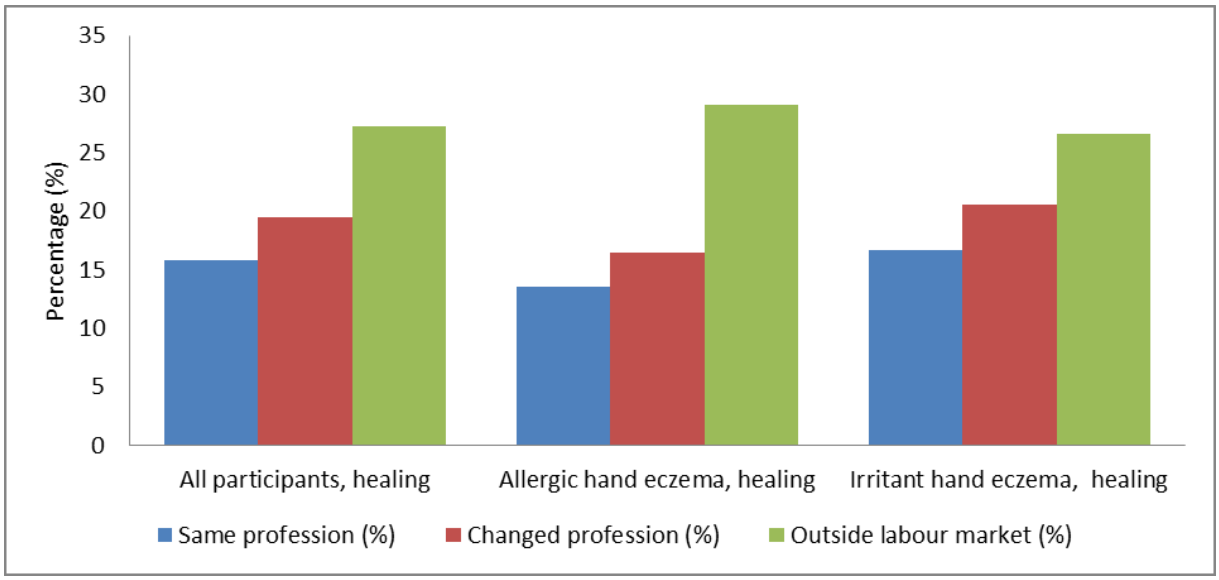
Healing

Healing of hand eczema was seen in 19.5% of the participants who had changed profession and 27.3% of the participants who were outside the labour market at

follow-up compared to 15.8% who had continued in the same profession (Figure 3). Participants who had changed profession or were outside the labour market had a higher healing rate at follow up (3.7% and 11.5% respectively) than participants still in the same profession, adjusted OR=1.62 (1.06-2.47) and adjusted OR=2.85 (1.83-4.24), respectively (71).

Regarding the subgroups OICD and OACD no major differences were found for healing in comparison with the total group of participants (71).

Figure 3. Healing of hand eczema at follow-up in relation to job change.



All participants n=1449, missing information on healing n=47.
Participants with allergic hand eczema n=414, missing information on healing n= 15.
Participants with irritant hand eczema n=1035, missing information on healing n=32.
Same profession (all participants n=710, allergic hand eczema n=208, irritant hand eczema n=502).
Changed profession (all participants n=472, allergic hand eczema n=127, irritant hand eczema n=345).
Outside labour market (all participants n=267, allergic hand eczema n=79, irritant hand eczema n=188).

Improvement

At follow-up 64.9% of the participants, who had changed profession, and 58.2% of the participants who were outside the labour market (at follow-up) reported improvement of the hand eczema compared to 53.1% of the participants who had continued in the same profession. The difference in improvement was 11.8% for participants with changed profession and 5.1% for participants outside the labour market in comparison to participants still in the same profession. Participants who had changed to another profession or were outside the labour market were more

likely to report improvement at follow up compared to participants still in the same profession, adjusted OR=1.91 (1.44-2.54) and adjusted OR=1.51 (1.09-2.10) respectively. The same trend was seen for OICD and OACD although it was not significant for allergic hand eczema.

An additional 89% greater effect of change of profession was found on improvement of hand eczema (participants with severe hand eczema 'at its worst' (adjusted OR=1.89 (1.01-3.53)) (71).

Severity

Change of profession or being outside the labour market did not significantly influence number of severe cases at follow-up, adjusted OR=0.75 (0.37-1.55) and adjusted OR= 1.61 (0.83-3.12), respectively (71).

HR-QoL

Participants who had changed profession or were not in employment at follow-up had a higher DLQI, i.e. lower HR-QoL, compared to participants who were still in the same profession, adjusted OR=1.12 (0.98-1.28) and adjusted OR=1.29 (1.11-1.51), respectively. The same trend was found for the subgroups irritant and allergic hand eczema (71).

Effect of changing working procedures

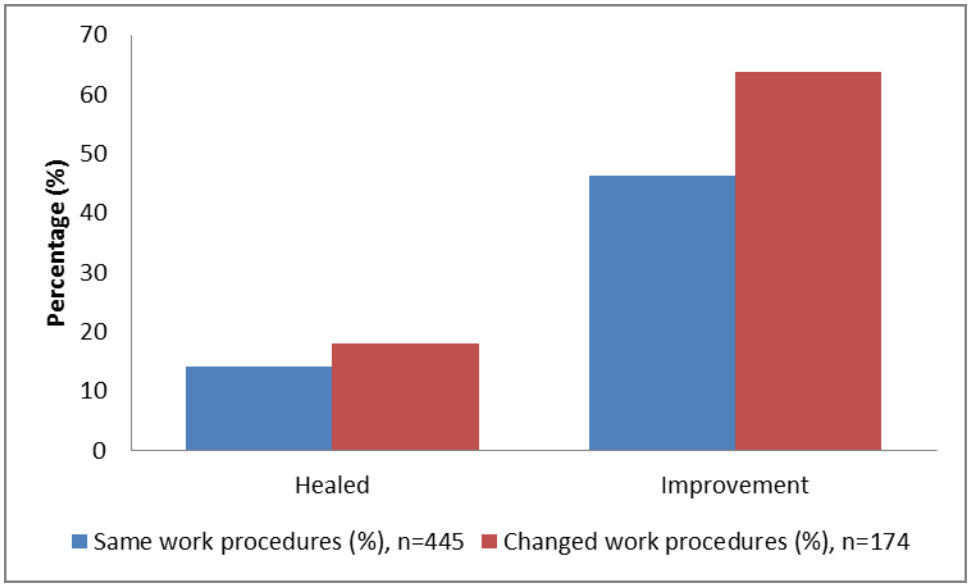
At follow-up, 728 (48.7%) participants were still in the same profession. Information on changed working procedures was obtained from 619 of these participants.
109 participants did not respond to the question on working procedures. Only participants still in the same profession were supposed to answer the question on working procedures and 93 participants had answered that they had changed job although they did not meet the criteria

for job change (change to a new profession with another job code), and thus had not answered the question on working procedures.

Changed work procedures were registered for 174 (28.1%) participants. 18.0% of the participants who had changed working procedures had healed at follow-up compared to 14.1% of the participants with the same working procedures (see figure 4). No significant difference was found in respect to healing, adjusted OR=1.29 (0.66-2.55). However 63.7% of the participants who had changed working procedures and 46.2% of participants with the same working procedures reported improvement at follow-up, a difference of 17.5% in favour of changed working procedures which was statistically significant, adjusted OR=2.31 (1.51-3.54).

The number of participants with severe hand eczema at follow-up was not affected by changed working procedures, adjusted OR=0.39 (0.10-1.46). Furthermore change of working procedures did not markedly influence HR-QoL, adjusted IRR=0.99 (0.80-1.22) (71).

Figure 4. Healing and improvement of the hand eczema at follow-up in relation to change of working procedures N=619.



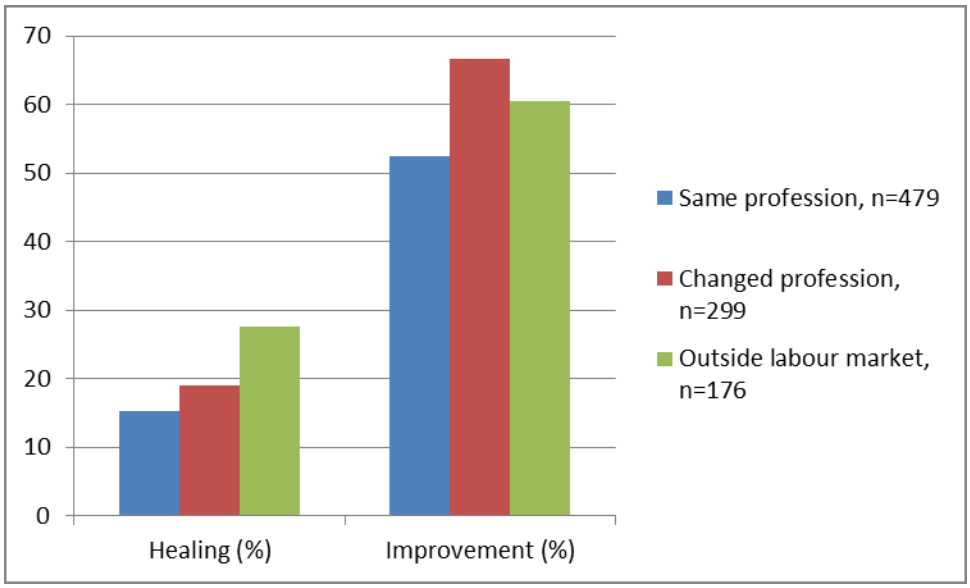
The Figure only includes participants still in the same profession at follow-up, who answered the question on change of work procedures. Missing 109.
Missing information on healing n=15.
Missing information on improvement n=15.

Subgroup analysis of wet workers: Effect of leaving the profession

A subgroup of 954 participants was recognised with occupational hand eczema due to wet work. Healing of the hand eczema was reported by 19.1% of the participants who had changed profession and 27.7% of the participants outside the labour market at follow-up compared to 15.3% of the participants still in the same profession (Figure 5). Leaving the profession in which the hand eczema had started increased the chance of healing. For participants who had changed profession a difference of 3.8% was found in comparison to staying in the same profession although the positive effect on healing was not statistically significant, adjusted OR= 1.46 (0.86-2.47). For participants outside the labour market, a statistically significant difference of 12.4% was found in comparison to those remaining in the same profession at follow-up, adjusted OR=3.15 (1.85-5.38). Improvement of the hand eczema was found for 66.6% of the participants who had changed profession and 60.5% of the participants who were outside labour market compared to 52.4% of the participants

still in the same profession (Figure 5), the difference was 14.2% in respect to change of profession and 8.1% in respect to being outside the labour market in comparison to staying in the same profession at follow-up. Both findings were statistically significant, adjusted OR=2.13 (1.49-3.05) and adjusted OR=1.79 (1.19-2.70), respectively (74).

Figure 5. Healing and improvement of hand eczema at follow-up in relation to change of profession for participants with recognised hand eczema due to wet work.



Missing information on healing n=20.
Missing information on improvement n=20.

While change of profession did not influence the DLQI score lowest HR-QoL was actually found among participants who at follow-up were outside the labour market and this was significantly different from the score found for participants still in the same profession, adjusted IRR=1.44 (1.17-1.77).

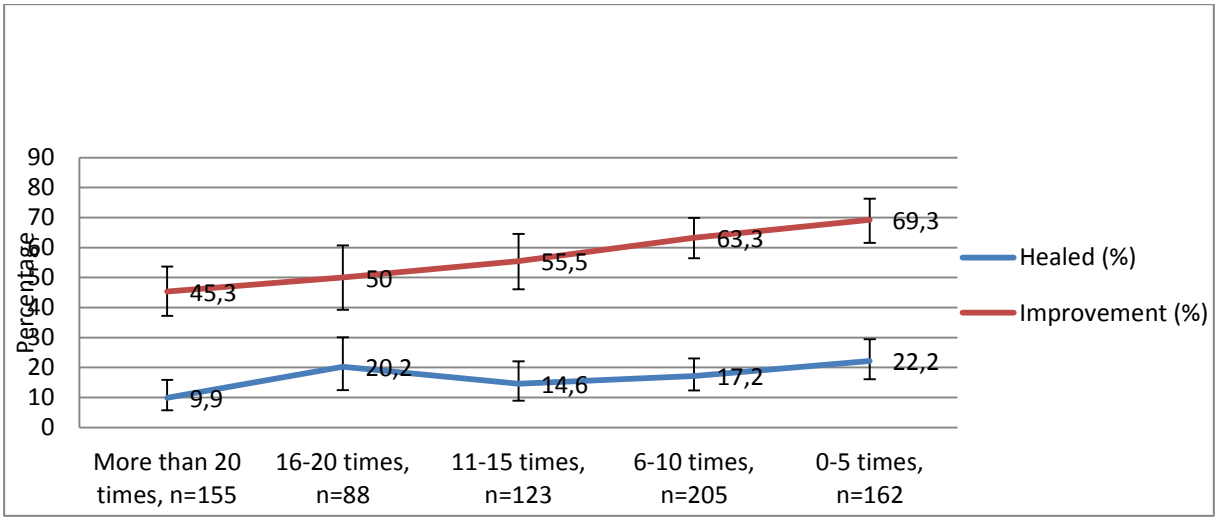
Wet work changes

Hand washing

An inverse dose-response relationship was found for frequency of hand washing at work and healing (p=0.013) and between frequency of hand washing and improvement of hand eczema (p <0.001) (figure 6). When moving to a lower category

of frequency of hand washing, the chances of healing increased by 26% (adjusted relative risk (RR)= 1.26 (1.06-1.50)) , and by 4% (adjusted RR= 1.04 (1.02-1.06)) for improvement (74).

Figure 6. Eczema status at follow up by frequency of hand washing at work

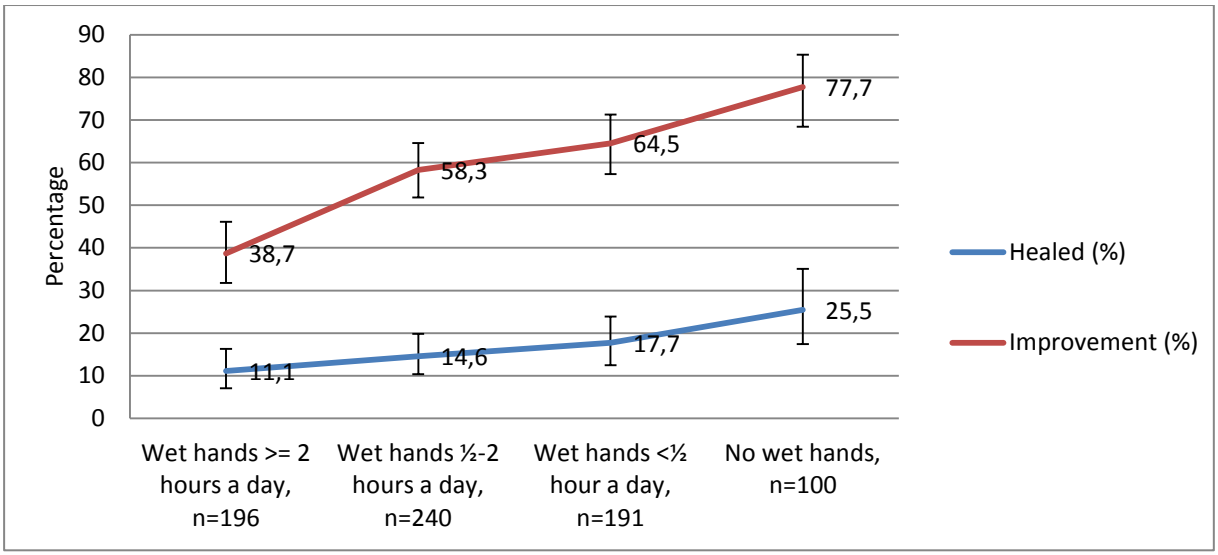


Participants with recognised wet work at baseline and still active at the labour market at follow-up n=778. Missing information on frequency of hand washing n=45. Missing information on healing n=13. Missing information on improvement n=15.
The arrow bars represent the 95% CI.

Wet hands

An inverse dose-response relationship was found between hours spent with wet hands at work and healing and improvement of hand eczema (Figure 7) (p=0.001 and <0.001, respectively). For each step down to a lower category of wet hands at work, the chance of healing increased with 35% (adjusted relative risk= 1.35 (1.05-1.75) and for every step down to a lower category of wet hands at work the chance of improvement increases by 8% (adjusted relative risk = 1.08 (1.05-1.10)) (74).

Figure 7. Eczema status at follow up by time spent with wet hands at work.



Participants with recognised wet work at baseline and still active at the labour market at follow-up n=778. Missing information on wet hands n=51. Missing information on healing n=12 and missing information on improvement n=13.
The arrow bars represent the 95% CI.

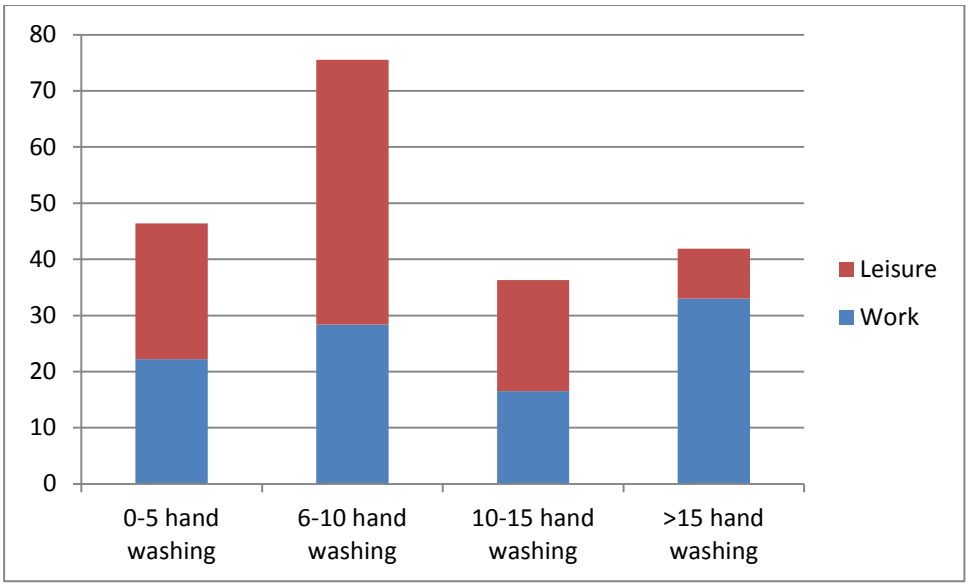
Glove usage

An inverse dose-response relationship was found between glove usage at work and improvement of hand eczema ($p<0.001$). The rate of improvement increased by 3% (adjusted RR= 1.03 (1.02-1.05) when going to a lower category of glove usage per working day. However no dose-response relationship was seen between glove usage and healing (74).

Leisure time versus work time

Frequency of hand washing at work and in leisure time was significantly correlated (value 0.496, $p<0.001$) (74). (See figure 8).

Figure 8. Frequency of hand washing at work and in leisure time.



8. Discussion

Key findings

The study aimed to identify factors associated with leaving the profession, and to assess the consequences of job change on hand eczema parameters for patients with occupational hand eczema. Having an allergic sensitisation (positive patch test), having severe hand eczema, being young and educated at a low level, were factors associated with leaving the profession, as was working as cleaning personnel. With respect to eczema parameters and job change leaving the profession had a positive effect on hand eczema healing and improvement. For participants who had changed profession, however, no positive effect on HR-QoL, was found, and for participants outside the labour market the HR-QoL was significantly lower than for those who stayed in the same profession.

Staying in the same profession with changed work procedures had a positive effect on the improvement of hand eczema, and did not negatively influence HR-QoL. In workers exposed to wet work a clear positive effect of job change was found on hand eczema parameters, and even a minor decrease in amount of time spent with wet hands was associated with healing and improvement of hand eczema.

Comparison with relevant findings from other studies

Factors associated with job change

It is to the best of our knowledge not previously shown that persons with allergic sensitisation change jobs more often than those without. On the contrary, Petersen et al 2014 found that hand eczema patients with a positive contact allergy had a lower rate of job change due to hand eczema than those without a contact allergy (75), however this study differs from the present study by not selecting participants with recognised occupational hand eczema. Some studies have previously argued that having a contact allergy is associated with a poorer prognosis (5,18,23) and it is possible that patients whit a contact allergy are more often advised to change job.

The fact that participants with severe hand eczema 'at its worst' left the profession more often in the present study may reflect the fact that they are more motivated due to symptoms from the eczema or are perhaps forced by the employer to leave the profession. It is known that young workers change jobs more frequently than older individuals (76), which was also confirmed in the present study. The finding that lower educational level is associated with a higher rate of job change in the present study in agreement with previously reported findings (77,78). Cleaning personnel were more likely to leave the profession, while healthcare workers more often stayed in the same job in the present study. This may be due to the fact that it is easier to change work procedures for healthcare workers than for cleaning personnel. However, even within the group of healthcare workers a difference was observed. Participants with higher education were less prone to change.

Some previous studies have found a correlation between job change and atopic dermatitis (19,79,80). However not all studies (78), supported this correlation and, indeed this was not confirmed by the present study (68). Patients with atopic dermatitis alongside their occupational hand eczema may because of their atopic dermatitis bee more aware of the symptoms and solutions and so seek to change their situation by changing profession. On the other hand, it is possible that they tend to ignore their hand eczema because they see it as part of their atopic dermatitis that comes and goes without any relation to the work environment. It is also a possibility that counselling of young atopic patients in career options is more effective supporting individuals in choosing a dry and clean working environment.

Effect of leaving the profession

The finding that job change positively influenced eczema parameters (healing and improvement) is in line with the findings in some studies (8,16,17,19,22,26,81) but not with others (23–25).

Earlier studies have shown that severe eczema at baseline is more often associated with poor prognosis of the eczema (75,77) which may explain why in spite of a positive influence of change of profession on healing and improvement of the hand

eczema, a significant reduction in number of severe cases at follow-up was not found in the present study. However, change of profession had a markedly more positive effect on improvement of severe hand eczema 'at its worst', which suggests that participants with severe hand eczema can benefit the most from change of profession (71). Several studies discuss the risk of persistent post-occupational dermatitis (PPOD) (6–8) and conclude that even when the exposure ends, some patients continue to have severe hand eczema symptoms (PPOD). Other studies support the poor prognosis of occupational hand eczema (5,75,82,83) In the present study poor healing and improvement of the occupational hand eczema after 4-5 years were found in spite of change of profession (71,74). The fact that the positive influence on healing and improvement of eczema was not reflected by an increase in HR-QoL is interesting, as correlation between improvement of eczema parameters has previously been reported (84). HR-QoL is a complex parameter and may be influenced by several other factors including demographic variables (85). In our study, mental stress accompanying change of profession or being outside the labour market may have influenced the HR-QoL negatively. The same applies to reduced social status which may be related to job change. However, although our results are statistically significant, the differences in DLQI were rather small and beneath the level indicated to be of Minimal Clinical Important Difference (MICD) (86). The data should therefore be interpreted with caution (71).

Previous studies have argued that there are a different prognosis for OICD and OACD (16,20,23,26,28,29,77,87) but they have not looked into differences after job change. The present study did not find any significant difference between the two subgroups with respect to benefit from leaving the profession. This may be partly due to the categorising of the diagnoses OICD and OACD in the present study, leading to a certain overlap between the groups.

Change of work procedures may also influence hand eczema status, and in the present study a positive effect is confirmed on hand eczema after changed work procedures with respect to improvement, although not with respect to healing. Significant increase in healing-rate after change of work duties has been reported in

an earlier study (26). A possible explanation as to why a positive effect was not found on healing could be the more strict definition used in the present study. Rosen et al (26) defined healing as 'healing of eczema' and in the present study healing was defined as 'no eczema within the last 12 months'.

Wet work changes

Now other studies appear to have covered the dose-response relationship between wet work (hand washing, wet hands and occlusive gloves) in general and the beneficial effect of job change among wet workers with occupational hand eczema. The present study (74) confirms earlier finding that job change has a positive effect on eczema parameters in wet workers (cleaners) (22) and even though previous studies have shown a relationship between wet work and hand eczema (35,37,41–45,48) only few studies have looked into the dose-dependent relationship between wet work and hand eczema (35,43,48). These studies all demonstrated a dose-dependent association between hand washing at work and the development of hand eczema in healthcare workers (35,43,48).

With respect to gloves, an inverse dose-dependent association was found for hours spent with occlusive gloves and improvement but not for healing of the hand eczema. This may be caused by the fact that glove usage is primarily a protective measure, which may in itself impair skin barrier function. Less time spent using occlusive gloves may indicate both that the participants do not use protective measures when exposed to water at work, that they have changed work procedures or that they changed to a job without water exposure (74). Earlier studies have shown that prolonged usage of occlusive gloves does not pose a hazard to healthy skin when applied onto clean skin without prior skin contact with irritant substances (88,89). Another study states that occlusive gloves are an important irritant (90). Further studies have shown that skin hydration by occlusion has a different biological effect than water, thus it seems less harmful to the skin than water, but that it may enhance the negative effect on the skin barrier from detergents and soap

(50,57). This partly explains our finding that decreased use of occlusive gloves is not associated with healing (74).

A moderate correlation between frequency of hand washing during work and leisure time were also found, indicating that participants exposed to wet work during working hours are also more exposed to wet work during leisure time. Similar findings has been reported previously (22,35,53,54), and may be a consequence of deeply incorporated routines which extends into leisure time (74) or, indeed due to social factors (e.g. cleaners rarely hire other cleaners to clean their own house). Meding et al 2013 indicated that leisure time exposure may represent an even larger concern than work-hour exposure (54), however, in the present study changes during working hours was found to make a difference to the eczema parameters and the amount of wet work during working hours exceeded the amount of wet work during leisure time (74). Educational programmes targeting patients with occupational hand eczema and aimed at reducing wet work exposures are widely used. Previous studies investigating this topic suggest a positive effect of educational programmes on hand eczema (79,91,92). Our study supports the positive association between reduced water exposure (largely recommended in the educational programmes) during working hours and healing and improvement of the occupational hand eczema (74).

Strengths and limitations

The present study explores a field of major economic concern to society, which has previously been scantily covered by the literature.

The cohort comprises all patients with recognised occupational hand eczema (over 18 years of age) in 2010 and 2011 and thereby also a large variety of professions. A strict definition of change of profession (the occupational coding system) was used and a subdivision into participants being in and out of the labour market at follow-up, thereby contributing to a more nuanced picture.

Randomised controlled trials (RCT) are the 'gold standard' however in the present study it was not possible to carry out a RCT study which could mimic real life. Multiple factors are involved when people change profession, or happen to end up being outside labour market. A cohort design based on a large sample was therefore chosen. One advantage of a cohort study is the possibility of evaluating the exposure independently of the outcome, in the present study job change (exposure) and change in eczema parameters (outcome). As with all observational studies, cohort studies may be subject to bias and confounding.

The use of a questionnaire instead of investigator assessed rating of the eczema is a limitation to the present study. However by making a questionnaire-based study a large number of participants could be included, thereby providing more strength to the study. Many factors, other than the eczema, can influence the answers given in the questionnaire. The question on the presence of eczema during the last 12 month (healing) requires that the participants can recall their eczema status one year ago. Improvement (better, the same or worse) may to some degree be affected by the circumstances surrounding the participants. The question on improvement has previously been used in an questionnaire study and found suitable (9). The question on severity was taken from NOSQ 2002 questionnaire (72), which is a widely used questionnaire for examining hand eczema. The decision to use the scale as a nominal scale and not as a continuous scale was based on its resemblance to the VAS scale. The VAS scale has been found to be just as valid when used as a verbal scale as when it is used on a continuous visual scale (93). Because the severity questions were placed right beside each other in the questionnaire they may have been influenced by one another. Participants with a mild hand eczema at follow-up may have a tendency to report a less severe hand eczema 'at its worst' than participants with severe hand eczema at follow-up. This has formerly been reported by Mollerup et al 2015 (94). Data on HR-QoL (DLQI) is from a validated questionnaire (73), often used in dermatological studies. However DLQI is a tool used to asses HR-QoL for various dermatological diseases and is not directed towards hand eczema per se. A new instrument to evaluate HR-QoL for hand eczema patients, Quality of Life in Hand

Eczema Questionnaire (QoLHEQ) has been developed recently (95,96), and this offers a more precise evaluation of HR-QoL in relation to hand eczema. However the questionnaire was not available when the study was planned, and the DLQI instrument has been validated and found useful for hand eczema studies (97).
With respect to the association between eczema related outcomes and wet work previously defined questions from the NOSQ 2002 questionnaire were used to assess time spent with wet hands, frequency of hand washing and use of occlusive gloves. Jungbauer et al 2004 showed that the self-reported duration of wet work exposure was overestimated by a factor 2, and conversely that the frequency of exposure was underestimated by a factor 2 (37). It is possible that participants with severe eczema at follow-up in the present study tended to report a more pronounced exposure to wet work (duration and frequency). However this is merely speculations.
A limitation of the present study is that even though the participants all had their hand eczema recognised due to wet work, the quantification of wet work was not clearly defined in the files from the Danish Labour Market Insurance and therefore the amount of wet work at baseline was not usable as a point of comparison to exposure at follow-up. A cross-sectional assessment of wet work and eczema severity were therefore chosen instead.

Hand eczema patients often have multiple diagnoses (98), and combined diagnoses occur in about 7.4 % of cases (14). A limit of the present study is the categorisation of participants with a combined diagnosis of OICD and OACD as OACD and patients with OCU in combination with another diagnose (OACD and or OICD) as OCU. However, this was found to be the best solution in order to avoid too many unhelpfully (small) subgroups.

When changing to new working procedures in the same profession or when changing to a new profession, new exposures (irritant and allergic) may appear that can contribute to continuation or even aggravation of the hand eczema. It was not

possible to take this into account in the present study. However, it mimics real life and parallels to real life can be drawn.

Bias and confounding

A follow-up period of 4-5 years was a reasonable trade-off between duration of follow-up (the longer the better) and time to recall (the shorter the better). Non-responders were primarily young (68). This is also shown in other studies (87). However it is not to say if the finding of a higher response rate among older age groups may have influenced the results. In the present study recognised cases of occupational hand eczema were used. The number of cases should therefore reflect the general population in Denmark. However from earlier studies it is known that although physicians in Denmark are obliged by law to report an occupational disease when suspected it does not reflect the actual number of cases with occupational hand eczema and may merely be the tip of the iceberg (99,100). It is possible that patients with severe hand eczema are more likely to have their case recognised and that patients with mild hand eczema tend not to have their occupational hand eczema notified, however participants with mild hand eczema constituted a large group in the present study.

The question on severity 'at its worst' is taken from the questionnaire and poses a risk of recall bias. It is possible that participants that have changed job are more prone to recall the hand eczema severity 'at its worst' as being better than participants that are still in the same job at follow-up.

To avoid different interpretations of what job change implies the Danish classification system was used to asses if change of profession had been made.

Confounders are of great concern in cohort studies, and therefore the present study was adjusted for the pre-defined confounder's age, gender, atopic dermatitis, diagnosis and severity.

An objective assessment of the hand eczema at baseline and again at follow-up would have been ideal due to the fact that previous studies have shown that severe hand eczema at baseline is associated with a poor prognosis (75,101). However, it could also have been interpreted as an intervention and thereby have influenced the course of the disease. The present study reflects the natural course of change of profession.

Generalisability

Participants with recognised occupational hand eczema can benefit from leaving the profession in which the hand eczema originated or was aggravated though; the positive effect of this is modest, representing an additional 3.7% for healing and 11.8% for improvement. However the positive effect of change of working procedures on improvement was found to be an additional 17.5% as compared to no change of work procedures and it is therefore to be considered as first choice before change of profession (71).

Finally a convincing dose-response relationship between amount of wet work and hand eczema parameters at follow-up indicates that minor changes in the amount of wet work during working hours may influence the severity of hand eczema positively. This may be taken into consideration in the clinic when advising patients who are unable to avoid wet work or do not have the resources to change profession to make minor adjustments in work procedures instead (74).

9. Conclusion

Eczema parameters associated with job change were identified as the presence of contact allergy, and the severity of hand eczema. The fact that contact allergy – either occupational or not occupational – is associated with leaving the profession indicates that patch testing at an early stage is important, and that positive patch tests should be taken seriously and the work place as well as the domestic environment should be

thoroughly reviewed regarding ongoing exposure. The association between severity and leaving the profession is not surprising, however it illustrates that special attention should be paid to severe cases of hand eczema.

Consequences of change of working procedures were found to be of great importance since even minor changes can lead to significant improvement of the hand eczema illustrated by the close dose-response relationship between wet work and severity of hand eczema found in the present study. Thorough examination of workplaces for irritant and allergen exposures accompanied by professional guidance on how to minimize these is recommended, since even minor changes can lead to improvement of hand eczema.

The fact that leaving the profession, had a significantly positive effect, although modest and not reflected in HR-QoL, with respect to healing and improvement of the hand eczema implies that job change could be considered when changes made to the work environment do not elicit a sufficient effect.

10. Perspectives and future research

Change of profession is a significant consequence of occupational hand eczema and it is therefore of importance to be aware of the factors associated with, as well as the consequences of job change when guiding patients with occupational hand eczema. Future studies should explore the effects of job change within specific occupations and related to different exposures, and should also look into the effects of changed working procedures. Dose-response relationship to wet work for individuals more sensitive to wet work should be explored, in particular in atopic individuals and/or individuals with filaggrin mutations.

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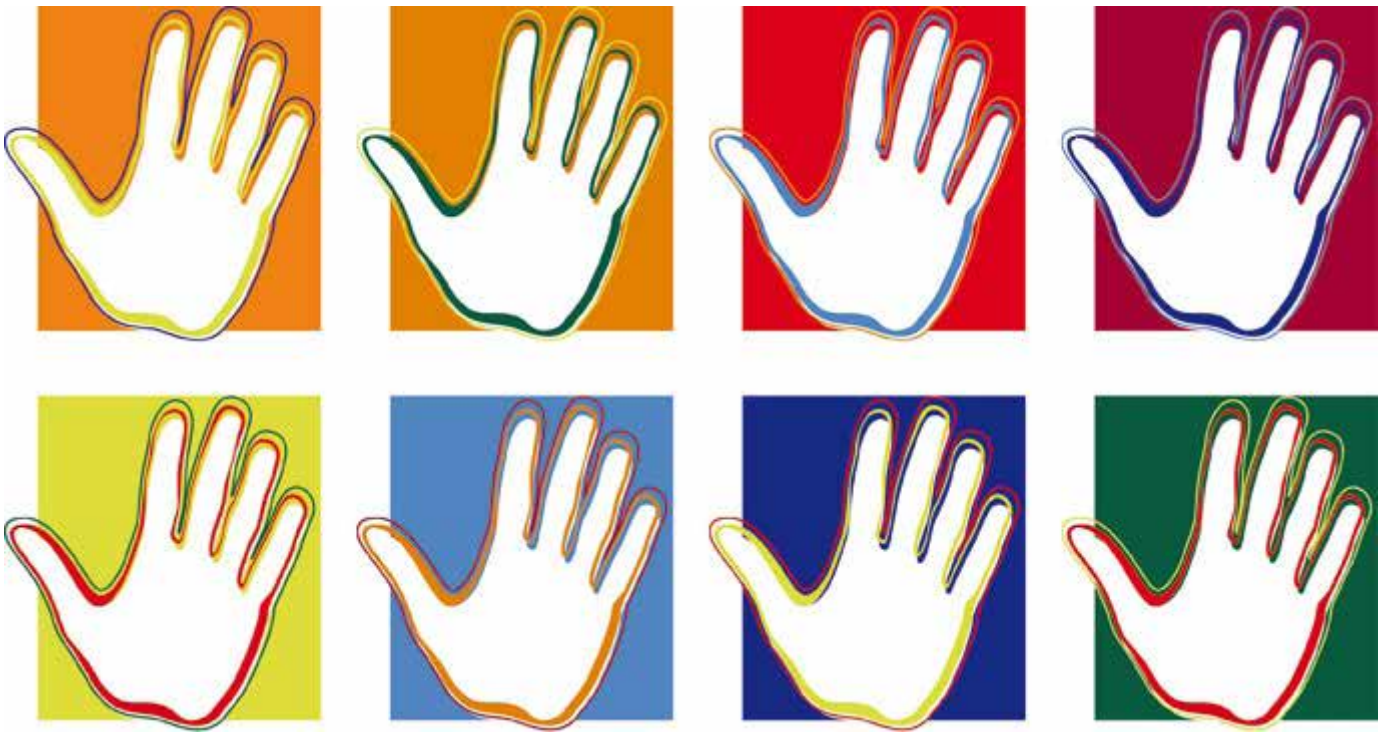
SPØRGESKEMA

Til dig der har fået anerkendt en arbejdsskadesag om eksem



REGION H Bispebjerg Hospital

1234567890

Udfyld skemaet med sort eller blå kuglepen.

Vi vil bede dig om at udfylde alle spørgsmål og sende skemaet samt samtykkeerklæringen tilbage i vedlagte svarkuvert. Retur-adressen er påtrykt og portoen er betalt. Der skal kun sættes *et* kryds i hvert spørgsmål, medmindre der bliver bedt om andet. Vær venlig at udfylde skemaet tydeligt. Svarene bliver scannet ind så alle tal og kryds skal være nemme at tolke.

Ved eventuelle spørgsmål kontakt Tanja Carøe på e-mail: **Tanja.Korfitsen.Caroee@regionh.dk**

Eller tlf. nr.: **35 31 60 67**

	Rigtigt	Forkert
Sæt et tydeligt **kryds**	☐ ☒	☐ ☐√
Hvis et felt er udfyldt forkert, skraveres den pågældende kasse og krydset sættes i den rigtige kasse.	▩ ☒	☒ → ☒
Tal skrives i felterne.	|1|2|	|2|
Tal rettes ved at sætte en streg igennem det forkerte tal og skrive det rigtige tal ovenover.	|1|4 2|	|1|2 4|

Spørgsmål om dit arbejdsbetingede eksem

Her kommer nogle spørgsmål om det eksem du fik anerkendt som arbejdsskade.
(Spørgsmålene gælder således ikke anden form for eksem end det, der blev anerkendt som arbejdsskade)

1. **Har du haft symptomer på dit eksem siden du fik den anerkendt i 2010 eller 2011?**

☐ Ja ☐ Nej – ***gå til spørgsmål 5***

2. **Hvordan vil du beskrive dit arbejdsbetingede eksem i forhold til i 2010/2011, da din arbejdsskadesag blev anerkendt?**

☐ Bedre ☐ Det samme ☐ Værre ☐ Ved ikke

3. **Hvor på kroppen er dit eksem, når det er i udbrud?** *(sæt et eller flere krydser)*

☐ Ansigtet ☐ Hænder ☐ Fødder ☐ Hals

☐ Andre steder
(skriv hvor): _____

4. **Hvordan vurderer du graden af dit eksem på en skala fra 0-10?**

I dag: *(sæt ét kryds svarende til sværhedsgraden)*

0	1	2	3	4	5	6	7	8	9	10
Ingen eksem										Voldsomt eksem
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

Når det er værst: *(sæt ét kryds svarende til sværhedsgraden)*

0	1	2	3	4	5	6	7	8	9	10
Ingen eksem										Voldsomt eksem
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

5. **Hvornår havde du sidst dit arbejdsbetingede eksem** *(kun ét kryds)*

☐ Jeg har det i øjeblikket

☐ Ikke i øjeblikket, men inden for de sidste 3 måneder

☐ Ikke i øjeblikket, men for mellem 3-12 måneder siden

☐ Ikke i øjeblikket, men for mere end 12 måneder siden

Hvilket år var sidste gang? *(giv dit bedste skøn)* ☐☐☐☐ *(årstal)*

6. **Har du modtaget rådgivning om eksem-forebyggelse på din arbejdsplads?**

☐ Ja ☐ Nej

7. **Har du modtaget råd og vejledning om dit eksem?**

☐ Aldrig

☐ Hos egen læge

☐ I speciallægepraksis

☐ På hospitalsafdeling

☐ Andet, beskriv: _____

_____

Spørgsmål om arbejde

Her kommer nogle spørgsmål om din nuværende arbejdssituation.

8. **Hvad er din aktuelle erhvervsstatus?**

☐ I arbejde

☐ Flexjob

☐ I aktivering (arbejdsprøvning, jobtilbud, revalidering)

☐ Midlertidig fraværende på grund af sygdom/sygemeldt

☐ Midlertidigt fraværende på grund af orlov (barsel, forældre, uddannelse, andet)

☐ Arbejdsløs

☐ Studerende/elev/lærling

☐ Pensionist

☐ Andet
(skriv hvad): _____

9. **Er du førtidspensionist/arbejdsledig/sygemeldt på grund af eksem?**

☐ Ja ☐ Nej

Er du ikke i arbejde (Hjemmegående, barselsorlov/forældreorlov, arbejdsledig, pensioneret, efterlønsmodtager)
gå til spørgsmål 16 side 6.

10. **Er du i samme arbejde, som da du fik anerkendt dit arbejdsbetingede eksem**

☐ Ja ☐ Nej

Hvis ja – har du samme arbejdsrutiner?

☐ Ja ☐ Nej

11. **Hvad er din stilling?** *(nøjagtig angivelse: eksempelvis pædagog i børnehave (ikke blot pædagog), sygeplejerske på børneafdeling (ikke blot sygeplejerske)*

_____

12. **Hvilken slags virksomhed arbejder du i?**
(f.eks. kommunekontor, supermarked, møbelfabrik. Hvis du er studerende skriv uddannelsens navn)

Skriv her: _____

13. **Hvor mange timer om ugen arbejder du i dit hovedjob (i gennemsnit)?** |__|__| *(timer/uge)*

14. **Hvor mange arbejdsdage har du været sygemeldt indenfor de sidste 12 måneder?** *(giv dit bedste skøn)*

I alt |__|__|__| *(antal dage)*

På grund af dit eksem |__|__|__| *(antal dage)*

Hvis du har været sygemeldt på grund af dit eksem har det så været:

☐ Heltidssygemeldt ☐ Deltidssygemeldt ☐ Begge dele

15. **Hvad er du i øjeblikket udsat for på dit arbejde?** *(sæt ét kryds ud for hver linje)*

	Timer per dag *(i gennemsnit)*			
	Ingen udsættelse	Mindre end ½	½ til 2	Mere end 2
Våde hænder	☐	☐	☐	☐
Tilberedning af måltider /håndtering af fødevarer	☐	☐	☐	☐
Planter	☐	☐	☐	☐
Levende dyr	☐	☐	☐	☐
Rengøringsmidler	☐	☐	☐	☐
Organiske opløsningsmidler	☐	☐	☐	☐
Køle-smøremidler	☐	☐	☐	☐
Maling, lak, polermidler	☐	☐	☐	☐
Lim, tapetklister	☐	☐	☐	☐
Cement, beton, mørtel	☐	☐	☐	☐
Støv (træstøv, slibestøv, papirstøv, glasfiberstøv osv.)	☐	☐	☐	☐
Frisørkemikalier	☐	☐	☐	☐
Papir/pap	☐	☐	☐	☐
Andet:		☐	☐	☐

(Skriv hvad "Andet" du er udsat for) _____

_____

De følgende spørgsmål omhandler både fritid og arbejde.

(Hvis du ikke er i arbejde set da kun kryds i kolonnen "Hjemme/i fritiden")

16. Hvor mange gange vasker du dine hænder på en normal dag?

	På arbejdet	Hjemme/i fritiden
0-5 gange om dagen	☐	☐
6-10 gange om dagen	☐	☐
11-15 gange om dagen	☐	☐
16-20 gange om dagen	☐	☐
Mere end 20 gange om dagen	☐	☐

17. Hvor ofte anvender du hånddesinfektionsmidler på en normal dag?

	På arbejdet	Hjemme/i fritiden
Anvender ikke	☐	☐
Ikke hver dag	☐	☐
0-5 gange daglig	☐	☐
11-15 gange daglig	☐	☐
16-20 gange daglig	☐	☐
Mere end 20 gange om dagen	☐	☐

18. Hvor ofte anvender du fugtighedscreme på en normal dag?

	På arbejdet	Hjemme/i fritiden
Anvender ikke	☐	☐
Ikke hver dag	☐	☐
1-2 gange daglig	☐	☐
3-4 gange daglig	☐	☐
5 gange eller mere daglig	☐	☐

19. Hvor ofte anvender du beskyttelseshandsker (gummi, nitril, vinyl) på en normal dag?

	På arbejdet	Hjemme/i fritiden
Anvender ikke	☐	☐
Under ½ time dagligt	☐	☐
½-1 time dagligt	☐	☐
1-2 timer dagligt	☐	☐
2-3 timer dagligt	☐	☐
3-5 timer dagligt	☐	☐
Over 5 timer dagligt	☐	☐

20. **Bruger du bomuldshandsker under gummihandskerne?**

	På arbejdet	Hjemme/i fritiden
Ja	☐	☐
Nej	☐	☐
Ikke relevant/bruger ikke gummihandsker	☐	☐

21. **Hvilke typer handsker bruger du på arbejdet?** *(sæt gerne flere krydser i hver kolonne)*

	På arbejdet	Hjemme/i fritiden
Naturgummi/latex	☐	☐
Syntetisk gummi (f.eks. nitril, neopren osv.)	☐	☐
Plastik (f.eks. vinyl, PVC, polyethylen)	☐	☐
Andet, Hvad? _____	☐	☐
Ved ikke	☐	☐
Ikke relevant/bruger ikke gummihandsker	☐	☐

Spørgsmål om dit helbred

Her kommer nogle spørgsmål om allergi og andre sygdomme.

22. **Har en læge nogensinde fortalt dig, at du har eller har haft en eller flere af følgende kroniske sygdomme?**

- ☐ Depression
- ☐ Anden psykisk sygdom
- ☐ Astma
- ☐ Høfeber eller andre tegn på allergi i næsen (f.eks. fra pollen eller dyr)
- ☐ Allergi i øjnene (f.eks. fra pollen eller dyr)
- ☐ Kronisk bronkitis
- ☐ Leddegigt/bindevævssygdom
- ☐ Slidgigt
- ☐ Sukkersyge
- ☐ Stofskiftesygdom
- ☐ Blodprop i hjertet
- ☐ Forhøjet blodtryk
- ☐ Migræne
- ☐ Blodprop i hjernen eller hjerneblødning
- ☐ Kræft
- ☐ Mavesår
- ☐ Psoriasis
- ☐ Anden hudsygdom (ikke eksem), **hvilken**? _____
- ☐ Nervesygdom (f.eks. epilepsi, sclerose)
- ☐ Anden langvarig sygdom, **hvilken**? _____
- ☐ Jeg har/har ikke haft nogen kroniske sygdomme

23. **Har en læge <u>nogensinde</u> konstateret, at dit eksem skyldes allergi?**

☐ Ja ☐ Nej – ***gå til spørgsmål 26*** ☐ Ved ikke – ***gå til spørgsmål 26***

24. **Hvilken allergi har du fået konstateret** *(Sæt venligst et kryds i enten ja eller nej rubrikken ud for hvert stof. Kender du det specifikke navn på din allergi sæt da venligst også kryds i underrubrikken ude til højre. Hvis din allergi ikke er nævnt skriv da navnet under "Andet".)*

	Nej	Ja
Nikkel	☐	☐
Kobolt	☐	☐
Krom	☐	☐
Parfume	☐	☐

	Nej	Ja	
Kolofonium	☐	☐	
Epoxy	☐	☐	
Frisørkemikalier	☐	☐	
Gummikemikalier	☐	☐	**Hvis ja, ved du hvilke(t)?**

☐ Thiuram-mix
☐ Mercaptobenzothiazol
☐ Mercapto-mix
☐ Carba-mix
☐ Black rubber-mix (PPD-mix)

	Nej	Ja	
Konserveringsmidler	☐	☐	**Hvis ja, ved du hvilke(t)?**

☐ Paraben-mix
☐ Formaldehyd
☐ Ethylendiamin
☐ Thiomersal
☐ CI+me-Isothiazolinon (Kathon CG)
☐ Quaternium-15
☐ Diazolidinyl urea (Germall II)
☐ Imidazolidinyl urea (Germall 115)

	Nej	Ja	
Lægemidler	☐	☐	**Hvis ja, ved du hvilke(t)?**

☐ Neomycinsulfat
☐ Budesonid
☐ Cain-mix
☐ Quinolin-mix
☐ Tixocortol-21-pivalat
☐ Hydrocortison-17-butyrat

	Nej	Ja	
Latex	☐	☐	
Andet	☐	☐	**Hvis ja, ved du hvilke(t)?**

☐ p-t Butylphenol-formaldehydresin
☐ Lanolinalkohol

Hvis andet som ikke fremgår af listen
(skriv navnet på stoffet på linjen herunder)

_____

☐ Ved ikke

25. **Prøver du aktivt at undgå de stoffer, som du er allergisk overfor?**

	På arbejdet	Hjemme/i fritiden
Ja	☐	☐
Nej	☐	☐
Ikke muligt	☐	☐

Hvis du har eller har haft håndeksem

26. **Hvis du har eller har haft håndeksem indenfor den sidste uge.**
Hvordan vurderer du sværhedsgraden af dit håndeksem?

Her er 5 sæt billeder (gruppe A, B, C, D, E) med håndeksem i forskellige sværhedsgrader. Hver gruppe består af 4 billeder af hænder med håndeksem af samme sværhedsgrad.

Du skal sætte ét kryds i enten Gruppe A, B, C, D eller E for hvordan dit håndeksem er "nu" (inden for den sidste uge) og hvordan det så ud "da det var værst". Det vil sige kun to krydser i alt.

Gruppe A:

☐ Nu (inden for den sidste uge)

☐ "Da det var værst"

Gruppe B:

☐ Nu (inden for den sidste uge)

☐ "Da det var værst"




Gruppe C:

☐ Nu (inden for den sidste uge)

☐ "Da det var værst"




Gruppe D:

☐ Nu (inden for den sidste uge)

☐ "Da det var værst"

Gruppe E:

☐ Nu (inden for den sidste uge)

☐ "Da det var værst"

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Eksemforebyggelse

Her kommer nogle spørgsmål som skal teste din viden om forebyggelse af håndeksem.

27. **Viden om forebyggelse:**

A **Hvilke af følgende udsagn om håndeksem tror du er korrekt?**

- ☐ Fugtighedscremen skal bruges hyppigt, da det er en vigtig behandling af håndeksemet
- ☐ Det er vigtigt ikke at bruge fugtighedscreme for hyppigt, da det ødelægger hudens egen evne til at danne fugt
- ☐ Fugtighedscreme må ikke anvendes på eksem

B **Hvilke af følgende udsagn om beskyttelseshandsker (gummi, nitril eller plastikhandsker) tror du er korrekt, når man har håndeksem?**

- ☐ Man bør bruge beskyttelseshandsker, som man ikke er allergisk for hele tiden på arbejdet, da det holder eksemet i ro
- ☐ Man bør ikke bruge beskyttelseshandsker på arbejdet selvom man ikke er allergisk for dem, da det forværrer eksemet og øger risikoen for at udvikle allergi
- ☐ Man bør bruge beskyttelseshandsker, som man ikke er allergisk for, ved vådt eller snavset arbejde og ved håndtering af fødevarer (madlavning).

C **Må man gerne genbruge engangshandsker?**

- ☐ Ja, når de ikke er synligt beskidte, eller i stykker
- ☐ Ja, når de bruges til samme opgave
- ☐ Nej, aldrig

D **Har det nogen negativ betydning, at man har sine fingerringe på, hvis man har håndeksem?**

- ☐ Ja
- ☐ Nej

E **Når man vasker hænder, hvilken temperatur bør vandet da have?**

- ☐ Koldt/lunkent
- ☐ Varmt
- ☐ Det er ligegyldigt

F **Hvornår bør man anvende hånddesinfektionsmiddel (håndsprit) fremfor sæbe og vand?**

- ☐ Altid
- ☐ Når der er synligt snavs på hænderne.
- ☐ Når der ikke er synligt snavs på hænderne
- ☐ Aldrig

G **Hvornår bør man anvende bomuldshandsker under beskyttelseshandsker (gummi, nitril eller plastikhandsker)?**

- ☐ Altid, når man anvender beskyttelseshandsker
- ☐ Når man anvender beskyttelseshandsker i mere end 10 minutter
- ☐ Aldrig

H **Hvilket af følgende udsagn tror du er korrekt?**

- ☐ Man bør bruge stofhandsker udendørs i køligt vejr for at beskytte hænderne mod udtørring
- ☐ Man bør ikke nødvendigvis bruge stofhandsker udendørs i køligt vejr, da det er vigtigt med frisk luft og sol

I **Hvilken fugtighedscreme eller salve bør du benytte til hænderne for at forebygge eller behandle håndeksem?**

- ☐ En creme med parfume og med højt indhold af vand
- ☐ En creme med parfume og med højt indhold af fedt
- ☐ En creme uden parfume med højt indhold af vand
- ☐ En creme uden parfume med højt indhold af fedt

J **Hvor på hænderne skal fugtighedscremen smøres?**

- ☐ Kun på eksemet
- ☐ Kun på håndryggen og fingre
- ☐ Kun på håndfladen og fingre
- ☐ På hele hånden

Behandling af eksemet

Her kommer nogle spørgsmål om den behandling, som du har fået for dit eksem.

28. **Har du brugt/modtaget nogle af følgende behandlinger for dit håndeksem?** *Sæt mindst ét kryds i hver række*

☐ Ingen behandling (ud over fugtighedscreme) hverken nu eller da det var værst
(Hvis kryds i 'Ingen behandling' gå til spørgsmål 31)

	Ja, da eksemet var værst	Ja, i øjeblikket	Aldrig
Steroidcreme/binyrebarkhormoncreme	☐	☐	☐
Protopic eller Elidel	☐	☐	☐
Lysbehandling	☐	☐	☐
Antihistamin	☐	☐	☐
Langvarig tabletbehandling mod eksem			
Methotrexat	☐	☐	☐
Azathioprin/Immunoprin/ Imural	☐	☐	☐
A-vitamin/Neotigason/Toctino	☐	☐	☐

☐ Andet
(Skriv navnet på behandlingen)

_____

_____

_____

29. **Bekymrer du dig for bivirkninger ved den behandling/de behandlinger, som lægen har ordineret?**

☐ Slet ikke ☐ Nogen gange ☐ Meget

30. **Følger du behandlingen som lægen har ordineret?**

☐ Jeg følger behandlingen

☐ Jeg følger behandlingen det meste af tiden

☐ Jeg behandler mig som regel mindre

☐ Jeg følger slet ikke behandlingen

31. **Har du inden for det sidste år fået alternativ behandling af dit eksem?**

☐ Nej

☐ Ja *(Hvis ja, hvilken af nedenstående?)*

☐ Akupunktur

☐ Homøopati

☐ Zoneterapi

☐ Andet, hvad?

_____

(skriv navnet på terapiformen/behandlingen)

Dig selv og din hverdag

32. **Er du:**

☐ Mand ☐ Kvinde

33. **Hvor gammel er du?** |__|__| *år*

34. **Hvor mange mennesker bor i din husstand, medregnet dig selv?**

|__|__| *(Antal personer)*

Hvor mange af dem er børn under 4 år |__|__| *(Antal personer)*

35. **Har du opvaskemaskine?**

☐ Nej ☐ Ja

36. **Hvor høj er du?** |__|__|__| *cm*

37. **Hvor meget vejer du?** |__|__|__| *kg*

38. **Hvor mange penge bruger du på behandling af dit eksem (fugtighedscreme, hormoncreme, anden eksem-medicin, alternativ behandling og handsker) om måneden?**

☐ Mindre end 100 kr ☐ Mellem 100-500 kr ☐ Mere end 500 kr

39. **Vågner du om natten på grund af kløe fra eksemet?**

☐ Ja ☐ Nej

40. **Hvordan vurdere du samlet din søvnkvalitet?**

☐ Fremragende

☐ Vældig god

☐ God

☐ Mindre god

☐ Dårlig

41. **Hvis du skal anføre dine fysiske aktiviteter i fritiden, herunder transport til og fra arbejde indenfor det sidste år, i hvilken gruppe mener du så, du skal placeres?** *(sæt kun ét kryds)*

☐ Næsten helt fysisk passiv eller let fysisk aktiv i mindre end 2 timer pr uge

☐ Let fysisk aktivitet fra 2-3 timer pr uge

☐ Let fysisk aktivitet i mere end 4 timer pr uge eller mere anstrengende fysisk aktivitet i 2-4 timer pr uge

☐ Mere anstrengende fysisk aktivitet i mere end 4 timer eller regelmæssig hård træning og evt. konkurrencer flere gange pr. uge

42. **Ryger du?**

☐ Ja

☐ Nej, men har røget

I hvor mange år har du røget ⌊__|__⌋ *år*

☐ Nej, har aldrig røget

43. **Hvor meget ryger du – eller røg du – om dagen i gennemsnit?**

Antal cigaretter pr. dag ⌊__|__⌋ *stk.*

Antal cerutter pr. dag ⌊__|__⌋ *stk.*

Antal pibestop pr. dag ⌊__|__⌋ *stk.*

44. **Hvor mange genstande drikker du i løbet af en normal uge?** *(skriv antal)*

⌊__|__⌋ antal genstande *(inklusiv weekend)*

45. **Hvor ofte føler du dig stresset?**

☐ Få gange om året

☐ Ca. en gang om måneden

☐ Ugentligt

☐ Et par gange om ugen

☐ De fleste dage

46. **Hvor meget påvirker eksemet dit liv?**
Formålet med dette spørgsmål er at måle, i hvor høj grad dit hudproblem har påvirket dit liv **I DEN FORLØBNE UGE** (inkl. dagen i dag). Sæt venligst et kryds i den boks, der passer til din oplevelse.

A Hvor **kløende, øm, smertende** eller **sviende** har din hud været i den forløbne uge?

- ☐ Særdeles meget
- ☐ Meget
- ☐ En smule
- ☐ Slet ikke

B Hvor **flov** eller **generet** har du været pga. din hud i den forløbne uge?

- ☐ Særdeles meget
- ☐ Meget
- ☐ En smule
- ☐ Slet ikke

C I hvor høj grad har din hud generet dig i forbindelse med **indkøb** eller **pasning af dit hus** eller **have** i den forløbne uge?

- ☐ Særdeles meget
- ☐ Meget
- ☐ En smule
- ☐ Slet ikke ☐ Ikke relevant

D I hvor høj grad har din hud påvirket dit **valg af påklædning** i den forløbne uge?

- ☐ Særdeles meget
- ☐ Meget
- ☐ En smule
- ☐ Slet ikke ☐ Ikke relevant

E I hvor høj grad har din hud påvirket dine **sociale aktiviteter** eller **fritidsaktiviteter** i den forløbne uge?

- ☐ Særdeles meget
- ☐ Meget
- ☐ En smule
- ☐ Slet ikke ☐ Ikke relevant

F I hvor høj grad har din hud besværliggjort dine muligheder for at dyrke **sport** i den forløbne uge?

- ☐ Særdeles meget
- ☐ Meget
- ☐ En smule
- ☐ Slet ikke
- ☐ Ikke relevant

G Har din hud forhindret dig i at **arbejde** eller **studere** i den forløbne uge?

- ☐ Særdeles meget
- ☐ Meget
- ☐ En smule
- ☐ Slet ikke
- ☐ Ikke relevant

H I hvor høj grad har din hud skabt problemer i forholdet til din **partner, nære venner** eller **slægtninge** i den forløbne uge?

- ☐ Særdeles meget
- ☐ Meget
- ☐ En smule
- ☐ Slet ikke
- ☐ Ikke relevant

I I hvor høj grad har din hud skabt **seksuelle problemer** i den forløbne uge?

- ☐ Særdeles meget
- ☐ Meget
- ☐ En smule
- ☐ Slet ikke
- ☐ Ikke relevant

J I hvor høj grad i den forløbne uge har **behandlingen** af dit hudproblem givet problemer, f.eks. ved at gøre hjemmet rodet eller snavset, eller ved at være tidskrævende?

- ☐ Særdeles meget
- ☐ Meget
- ☐ En smule
- ☐ Slet ikke
- ☐ Ikke relevant

Mange tak fordi du ville deltage!

Venligst send spørgeskemaet tilbage i den vedlagte svarkuvert.

Profession: title and job code

Gruppe 06, Sundhedspersonale (Læger sygeplejersker m.fl)

Fagtitel	Fagkode	Antal
social og sundhedshjælper	6285	136
sygeplejerske	6220	128
social og sundhedsassistent	6280	102
klinikassistent	6430	22
sygehjælper	6270	21
læger	6120	19
sygeplejeelev	6298	10
tandlæge	6320	10
fysioterapeut	6620	7
tandklinikassistentelev/tandplejeelev	6498	4
omsorgsmedarbejder	6265	3
radiograf	6230	3
økonoma/økonomaassistent	6820	3
apoteksmedhjælper	6930	2
plejeassistent	6260	2
jordmoder	6520	2
tandplejer	6420	2
ergoterapeut	6630	1
fodterapeut	6960	1
laboratorietandtekniker	6450	1
hospitalsassistent	6290	1
hospitalsbetjent	6990	1
jordmoderelev	6598	1
optiker	6940	1
værkstedsmedarbejder	6650	1
tandlægestuderende	6398	1
total		485

Gruppe 51, Restauration og hotel (restaurant-, hotel- og husholdningspersonale)

Fagtitel	Fagkode	Antal
kok	51120	50
køkkenassistent/kantineleder;	51150	48
kantinemedhjælper	51155	35
cafeassistent/medhjælper	51925	20
hjemmehjælper	51970	15
kantinemedhjælperelev/kogejomfruelev mf.	51198	12
smørrebrødsjomfru	51140	7
tjener	51230	7
afrydder	51990	5
husassistent	51965	4
restaurantledere	51000	2
restaurantchef	51020	2
oldfrue	51955	1
receptionistassistent	51330	1

bartender	51240	1
stuepige	51960	1
total		211

Gruppe 59, Frisør m.fl.(øvrige indenfor service)

Fagtitel	Fagkode	Antal
fodplejer	59340	1
frisør	59290	69
fodplejeelev/frisørelev	59298	17
kosmetolog	59230	5
massør	59255	2
vaskeriarbejder	59390	1
total		95

Gruppe 52, rengøringspersonale (Ejendomsfunktionær)

Fagtitel	Fagkode	Antal
rengøringsassistent	52920	88
pedel	52140	2
ejendomsfunktionær	52120	1
total		91

Gruppe 07, Socialarbejdere m.fl.

Fagtitel	Fagkode	Antal
pædagog	7110	46
pædagog-/døgninstitutionsmedhjælper	7150	24
dagplejemoder	7170	14
barneplejerske	7190	1
omsorgsassistent	7140	1
pædagogstuderende	7198	1
personalekonsulent/familievejleder	7990	1
total		88

Gruppe 41, salgspersonale (handelspersonale)

Fagtitel	Fagkode	Antal
butiksassistent/bagerjumfru mfl.	41120	39
konsulent, repræsentant	41920	4
kasseassistent	41130	4
butiksindehaver	41101	3
serviceassistent på tankstation	41190	2
butiksmedhjælper	41185	1
handelsassistent/salgskonsulent	41990	1
total		54

Gruppe 83, Maskinarbejdere (Smede, maskinarbejdere mfl.)

Fagtitel	Fagkode	Antal
maskinarbejder	83310	24
smede	83100	15
maskinoperatør	83390	7

værktøjsmagere	83210	7
total		53

Gruppe 84, Maskinmontør, mekanikere m.fl.

Fagtitel	Fagkode	Antal
automekaniker	84320	28
montør, maskiner	84120	8
montør	84190	5
mekaniker, fly traktor landbrugsmaskiner		
mekanikerelev	84398	2
cykelsmed	84355	2
lastvognsmekaniker	84325	2
maskinreparatør	84920	1
flytekniker	84360	1
montør, motor	84130	1
total		50

Gruppe 77, Nærings- og nydelsesmiddelarbejdere

Fagtitel	Fagkode	Antal
bagerelev	77698	13
slagteriarbejder/slagter	77310	10
bager	77620	9
konditor	77630	5
slagterelev	77398	2
bageriarbejder	77640	2
butiksslagter	77335	1
filetskærer	77430	1
operatør ved anlæg	77990	1
majerist	77520	1
tarmrenser	77345	1
total		46

Gruppe 95, Bygningsarbejder (Bygge- og anlægsarbejdere)

murer	95120	11
tømrer	95420	8
jord og betonarbejder	95920	4
montagearbejder	95240	3
betonarbejder	95210	2
bygningsarbejder	95910	2
isoleringsarbejder	95520	2
glarmager	95690	1
anlægsarbejder	95925	1
gravemaskinefører	95950	1
murerarbejdsmand	95150	1
bådebygger	95435	1
total		37

Andre

Fagtitel	Fagkode	Antal
fabriksarbejder	94990	22
grafiker og produktionsmedarbejder	19120	21
laborant	01620	18
gartner	61250	15
altmuligmand/specialarbejder	99920	14
lagerarbejder/transportarbejder	97220	12
postmedarbejder	34920	12
bygningsmaler	93020	10
elektriker	85510	9
tekniker/planlægningsassistent	03990	7
vvs/blikkenslager	87110	5
kommunalassistent	31010	5
landmand/landbrugsarbejder	61120	5
operatør ved kemiindustri	74020	5
sprøjtelakerer/lakere	93090	5
biolog	1410	4
chauffør	97510	4
industrilakere	93040	4
pakker	97120	4
laboratoriearbejder	01630	3
landbrugselev	61198	3
landbrugsmedhjælper	61140	3
blikkenslager	87120	3
formbygger	72520	3
maskinchef	96020	3
svejser	87210	3
bibliotekar	15220	2
garver	76120	2
maskinsnedker/opstiller	81020	2
montrice, elektronik	85330	2
bankansat	32220	2
dyrepasser	5990	2
entreprenør	20090	2
fængselsbetjent	53420	2
kabelmontør	85590	2
lagerekspedient	39120	2
livredder	53190	2
plastarbejder	90310	2
rørlægger	87140	2
skolebibliotekar	13040	2
specialarbejder, vandforsyning	93030	2
tekniskassistent	3920	2
vvs montører	87100	2
adjunkt	13090	1
ambulancemand	53140	1
ansat ved DSB	34120	1

bundtner	97190	1
bygningskonstruktør	3230	1
edb projektleder	8320	1
fotograf	19210	1
gartnerimedhjælper	61260	1
guldarbejder	88110	1
havemand/kirkegårdsinspektør	61240	1
ingeniør	2990	1
elevatormontør	85540	1
lokomotivførere	97600	1
møbelsnedker	81220	1
selvstændig erhvervsdrivende	99940	1
teglarbejder	89910	1
betonvarearbejder	94920	1
bogholder	32130	1
dyrlæger	5120	1
farmakolog	1550	1
fiskeriassistent	53950	1
fornikler	72820	1
gulvlægger	93055	1
kemiker	1120	1
kontorelev	31098	1
kranfører	97410	1
lægesekretær	31040	1
maskinføre	61150	1
montør, stålkonstruktioner	85320	1
opstiller, sprøjtestøbning	90325	1
pladesmed	87440	1
skibsværftsarbejder	87470	1
skovtekniker	5940	1
syerske	79590	1
trykker	92210	1
træindustriarbejder	81110	1
vagtmand	53960	1
ventilationsmontør	87190	1
vvstekniker	3250	1
regnskabsmedarbejder	32190	1
støberiarbejder	72420	1
landbrugskonsulent/agronom/hygiejnekonsulent	5220	1
baneingeniør/elektroingeniør/medicoingeniør	2390	1
edb-medhjælper	33290	1
elektroniktekniker	3320	1
cand.merc konsulent	9130	1
landbrugstekniker	5920	1
kontroltekniker	3975	1
reddere m.fl.	53100	1
trykkeriarbejder	92270	1
total		286

Occupational hand eczema and/or contact urticaria: factors associated with change of profession or not remaining in the workforce

Tanja K. Carøe[1], Niels E. Ebbehøj[2], Jens P. Bonde[2] and Tove Agner[1]

[1] *Department of Dermatology, Bispebjerg University Hospital, 2400 Copenhagen, Denmark and* [2] *Department of Occupational and Environmental Medicine, Bispebjerg University Hospital, 2400 Copenhagen, Denmark*

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Summary

Background. Occupational hand eczema and/or contact urticaria may have social consequences such as change of profession or not remaining in the workforce.
Objectives. To identify factors associated with job change in a cohort of participants with recognised occupational hand eczema/contact urticaria
Methods. A registry-based study including 2703 employees with recognised occupational hand eczema/contact urticaria in Denmark in 2010/2011. Four to five years later the participants received a follow-up questionnaire, comprising questions on current job situation (response rate 58.0%).
Results. At follow-up, 51.3% of the participants were no longer in the same profession. 32.5% had changed profession and 18.8% were no longer in employment. Change of profession was associated with young age, positive patch test, low educational level and severity of hand eczema/contact urticaria. With regard to specific professions, cleaning personnel changed profession significantly more often than other workers [71.4% (OR = 2.26)], health care workers significantly less often than other workers [34.0% (OR = 0.36)].
Conclusion. Job change occurs frequently during the first years after recognition of occupational hand eczema/contact urticaria and more often among patients with positive patch test reactions, with severe hand eczema/contact urticaria. Whether job changes improve the prognosis of occupational hand eczema/contact urticaria remains to be established.

Key words: change of profession; contact allergy; contact dermatitis; irritants; job change; occupational contact eczema; positive patch test.

Occupational contact dermatitis is the most frequently recognized occupational disease in Denmark (1). It has a negative impact on quality of life (2–5), and may have social consequences such as change of profession or not remaining in the workforce (3–6). Occupational hand eczema and/or contact urticaria are, by definition, either caused or aggravated by exposures in the workplace, leading to irritant or allergic contact dermatitis and contact urticaria, respectively. Identification of the causative exposure, followed by intervention, is necessary for secondary prevention. Information on skin protection and personal protective equipment may sometimes improve the situation sufficiently, but, in other cases, reassignment to new tasks or change of profession may be the ultimate consequence of occupational contact dermatitis (4–10).

The reasons for a change of profession because of occupational hand eczema and/or contact urticaria could be speculated to comprise discomfort in relation to job tasks, induction of flares when at work, a requirement to have presentable and delicate hands, and not being allowed

Correspondence to: MD Tanja K. Carøe, Department of Dermatology, Bispebjerg University Hospital Bispebjerg Bakke 23, 2400 Copenhagen NV, Denmark. Tel: +45 3863 6172. Email: tanja.korfitsen@dadlnet.dk

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to stay in the job, owing to the risk of transferring diseases or for cosmetic reasons, handling food and the risk of contamination, and for legal reasons. Loss of job is a threatening negative consequence of occupational hand eczema and/or contact urticaria, and change of profession, although sometimes necessary to induce healing, may also have an intermediate or long-term negative impact on quality of life. The median age of individuals with recognized occupational hand eczema and/or contact urticaria is 36 years (11), which is a long way from retirement age, and remaining on the labour market is of major importance in this age group. Literature on change of profession because of eczema is scarce, with respect to factors leading to change of profession as well as with respect to effects of change of profession. It has been reported that hairdressers frequently change career because of hand eczema and/or contact urticaria (5), and Cvetkovski et al. found a strong association between job-related food exposure and loss of job (4). In some countries, change of profession or cessation of work is required by law for patients with recognized occupational contact dermatitis, whereas in other countries, such as Denmark, change of profession is optional. In Denmark, it is voluntary for patients with recognized occupational contact dermatitis and/or contact urticaria to change profession or not; however, change of profession is sometimes advised by the healthcare system (12), and the decision is often influenced by social circumstances, such as loss of job.

The aim of the present study was to identify factors associated with change of profession/not remaining in the workforce in a cohort of participants with recognized occupational hand eczema and/or contact urticaria.

Methods

The study is a descriptive, registry-based study including all individuals with recognized occupational eczema in Denmark within a 2-year period starting in January 2010 and ending in December 2011. Baseline data were obtained from the Labour Market Insurance in Denmark (known as the National Board of Industrial Injuries until 2016). The data include demographic information (age at onset and sex), information on previous and/or current atopic dermatitis, diagnosis (irritant or allergic contact dermatitis or contact urticaria), any contact allergy(ies) (occupational and non-occupational), and job/profession at the time of notification. The health-related information was based on medical specialist statements and/or medical files from dermatological departments or departments of occupational and environmental medicine.

All participants had been initially patch tested with the European baseline series, supplemented with relevant special allergens or series. Information on sensitization (any positive patch test reaction) and relevance to occupational exposure was obtained from the specialist statements/medical files in records, and the final diagnosis (1) (irritant, allergic or contact urticaria) was based on the legal decision reached by the Danish Labour Market Insurance. Cases with combined diagnoses (i.e. allergic and irritant) were classified as allergic. When protein contact dermatitis/contact urticaria was suspected, a prick test, radioallergosorbent test for specific IgE or a histamine release test [*in vitro* diagnostic test for measuring allergen-induced histamine release (13)] had been performed. Contact urticaria cases with combined diagnoses (i.e. contact urticaria and allergic or irritant contact dermatitis) were classified as contact urticaria. Participants were classified as having atopic dermatitis if they had a current or previous medical history of atopic dermatitis recorded in the specialist statements or medical files. Educational level was graded according to baseline information on profession. Educational level was divided into five groups: unskilled profession, skilled profession, higher education for 1–3 years, higher education for 3–4.5 years, and higher education for ≥5 years. Classification of profession at baseline was according to the files in the Labour Market Insurance, and was based on the Danish Occupational Classification System (14), which uses a 5-digit code. Grouping of the professions was performed according to the first two digits in the 5-digit job code, according to the Danish Occupational Classification System (14).

Follow-up data were obtained from a questionnaire sent to participants in the year 2015, that is, 4–5 years after recognition of occupational disease. The questionnaire comprised the following questions relevant to the current study: (i) what is your current profession, and (ii) are you available for the labour market? Answers were compared with the profession at baseline. Change of profession was registered as having occurred if any change had occurred in the five-digit code from baseline to follow-up. This group also included participants who were no longer active in the labour market (participants who were on leave or out of a job, students not in a job, participants who stayed at home, and participants who had retired from the labour market). Participants who were in training/education at baseline, and who were working in the particular profession at which their training was directed at follow-up, were coded as being in the same profession. Self-rated severity was assessed from the questionnaire, in which the participants were asked to rate the severity of hand eczema and/or contact urticaria of the hands 'at its worst' (ever) on a scale from 0 (clear) to 10 (worst). The severity scale was taken

from NOSQ 2002 question D12 and translated into Danish. Instead of a horizontal axis, we used a cross of scale from 0 to 10, with 0 being clear of eczema and 10 being very severe eczema (15). Severity data (scale 0–10) were dichotomized as mild/moderate eczema (0–8) and as severe eczema (9, 10). Severity 'at its worst' was used as a measure for more general severity of the hand eczema. The trial was approved by the Danish Data Protection Agency (BHH-2014-032).

Logistic regression analysis was used to examine the associations between demographic, medical and professional characteristics at baseline and change of profession/not remaining in the workforce at follow-up 5 years later. Odds ratios (ORs) are given as crude ORs, as well as ORs adjusted for age group (18–25, 26–35, 36–45, 46–55 and ≥56 years), sex, atopic dermatitis, diagnosis (irritant or allergic contact dermatitis or contact urticaria), educational level as detailed above, and severity as illustrated above. The Wilcoxon rank-sum test was used to test for difference in age between responders and non-responders. Statistical analysis was performed with SAS ENTERPRISE GUIDE 7.1 (SAS, Cary, NC, USA).

Results

The source population comprised 2730 persons with recognized occupational eczema. Twenty-seven cases were excluded: 18 participants had moved outside of Scandinavia, 5 participants did not have eczema but suffered from another skin disease, 2 participants lacked an updated address, for 1 participant the decision on recognition was later revised, and for 1 participant there was no access to data (Fig. 1). The questionnaire was therefore sent to 2703 participants (1866 women and 837 men), and 1565 returned the questionnaire (response rate 58.0%); see Fig. 1. The median age of the respondents was 38 years (quartiles 27–48), and the sex distribution was 1135 (72.5%) women and 430 (27.5%) men. For non-respondents, the median age was 34 years (quartiles 25–45), significantly lower than that for respondents ($p < 0.001$), and there was a lower proportion of women in the non-respondent group, namely 64.3% ($p < 0.001$). No difference was found with respect to atopic dermatitis, diagnosis, or contact allergies (occupational and non-occupational). Patients with an unskilled profession or skilled education were less likely to answer the questionnaire than patients with a higher educational level ($p < 0.0001$). Twenty-six patients did not have occupational hand eczema and/or contact urticaria, but eczema located elsewhere, and were therefore excluded. For another 43 patients, answers in the questionnaire regarding current job situation were imprecise or unavailable, and they were therefore excluded. For 1496 participants, information on profession was available both at baseline and at follow-up (Fig. 1).

Baseline data, stratified with respect to being in the same profession or change of profession/not remaining in the workforce, are shown in Table 1. A total of 768 (51.3%) participants had changed their professions/lost their jobs since their cases had been notified to the Labour Market Insurance; 487 (32.5%) had changed profession, and 281 (18.8%) were no longer active in the labour market. Change of profession was significantly more prevalent among the younger age groups, and there was a downwards trend in terms of changing profession with increasing age, except for the group aged ≥56 (Table 1), which also included persons retired from work. Women changed job less frequently than men; however, after adjustment for other factors, no significant difference regarding sex was found (Table 1).

The prevalence of atopic dermatitis was not significantly different among participants who had changed profession compared to participants still in the same profession (Table 1). Significantly more participants with positive patch test reactions, with no assessment of occupational or non-occupational relevance, changed profession than participants without positive patch test reactions [OR 1.38 (95%CI: 1.02–1.87)] (Table 1), whereas no relevance was found for participants with occupational allergic hand eczema compared to participants with no occupational allergic hand eczema (Table 1). Educational level was significantly associated with change of profession. Participants with unskilled and skilled professions were more likely to change profession than participants with a higher educational level [OR 5.51 (95%CI: 3.65–8.31), and OR 2.45 (95%CI: 1.68–3.56), respectively] (Table 1). Self-assessed severity of hand eczema and/or contact urticaria was significantly associated with change of profession. Participants with severe hand eczema and/or contact urticaria changed profession significantly more often than participants rating their eczema as less severe [OR 1.44 (95%CI: 1.11–1.87)] (Table 1).

A total of 370 (24.7%) participants had their cases recognized as occupational allergic contact dermatitis (diagnosis provided by the Labour Market Insurance). In Table 2, the frequency of change of profession for participants with the 7 most frequent specific occupational contact allergies is compared with that of participants without this specific allergy. Occupational contact allergy to epoxy resins was related to increased frequency of change of profession [OR 3.98 (95%CI: 1.40–11.30)] (Table 2). There were no significant differences with

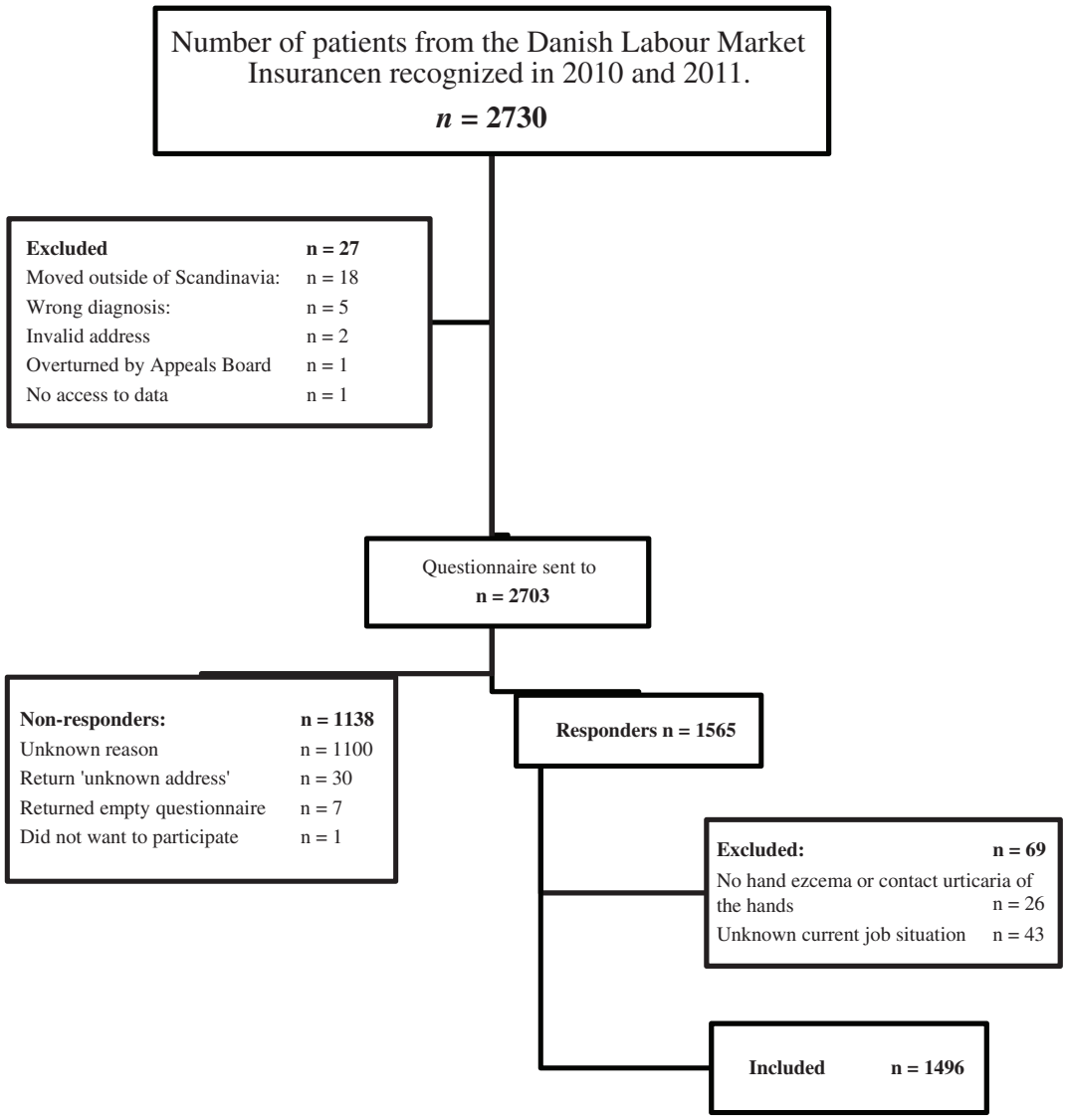

Fig. 1. Flow chart: structure diagram of the responders (included and excluded) and of the non-responders. Response rate: 58%.

regard to change of profession for the other six frequent allergies (Table 2). A total of 1067 (71.3%) participants had their cases recognized as occupational irritant contact dermatitis (diagnosis provided by the Labour Market Insurance). Participants with occupational irritant contact dermatitis caused by oil changed their profession less often [OR 0.58 (95%CI: 0.35–0.96)]. There were no significant differences between the other four most frequent irritant exposures with regard to change of profession (Table 3). Contact urticaria was diagnosed in 59 (3.9%) participants, and natural rubber latex allergy accounted for 38 of these. Natural rubber latex allergy was not found to be associated with change of profession [adjusted OR 0.61 (95%CI: 0.29–1.28)].

Data on occupational groups in relation to change of profession are given in Table 4. A total of 71.4% of cleaning personnel changed profession, which was significantly more than other occupational groups in the cohort [OR 2.26 (95%CI: 1.12–4.21)] (Table 4). In the group of nutrition and beverage workers, 76.1% had changed profession; however, after adjustment for other variables, this was no longer significant [OR 1.97 (95%CI: 0.84–4.59)]. Healthcare workers were markedly more likely to stay in the same job, with 34.0% changing profession [OR 0.36 (95%CI: 0.24–0.53)] (Table 4). Finally, 94.7% of physicians and 75.8% of nurses stayed in the same profession, as compared with 64.7% and 57.4% of social and healthcare assistants and helpers, respectively.

Table 1. The possibility of changing to a new profession according to age, sex, atopic dermatitis, positive patch test, diagnosis, educational level and eczema severity

	Total	Same profession, n (%)	Changed profession[a], n (%)	Crude odds ratio (95%CI)[b]	Adjusted odds ratio (95%CI)[c]
Number of included patients	1496	728 (48.7)	768 (51.3)	–	–
Age group (years)[d]					
18–25	312	88 (28.2)	224 (71.8)	1	1
26–35	385	185 (48.1)	200 (51.9)	**0.43 (0.31–0.58)**	**0.53 (0.37–0.75)**
36–45	336	195 (58.0)	141 (42.0)	**0.28 (0.21–0.39)**	**0.27 (0.19–0.40)**
46–55	294	205 (69.7)	89 (30.3)	**0.17 (0.12–0.24)**	**0.16 (0.11–0.25)**
≥56	169	55 (32.5)	114 (67.5)	0.81 (0.54–1.22)	0.79 (0.49–1.26)
Sex					
Men	407	180 (44.2)	227 (55.8)	1	1
Women	1089	548 (50.3)	541 (49.7)	**0.78 (0.62–0.98)**	0.91 (0.69–1.20)
Atopic dermatitis					
No	1135	558 (49.2)	577 (50.8)	**1**	1
Yes	361	170 (47.1)	191 (52.9)	1.09 (0.86–1.38)	0.88 (0.66–1.18)
Patch test[e]					
Negative	695	340 (48.9)	355 (51.1)	1	1
Positive	801	388 (48.4)	413 (51.6)	1.02 (0.83–1.25)	**1.38 (1.02–1.87)**
Diagnoses					
OICD[f]	1067	516 (48.4)	551 (51.6)	1	1
OACD[g]	370	180 (48.6)	190 (51.4)	0.99 (0.78–1.25)	0.91 (0.65–1.29)
OCU[h]	59	32 (54.2)	27 (45.8)	0.79 (0.47–1.34)	0.73 (0.39–1.36)
Educational level[i]					
Unskilled profession	435	141 (32.4)	294 (67.6)	**5.99 (4.14–8.66)**	**5.51 (3.65–8.31)**
Skilled profession	784	386 (49.2)	398 (50.8)	**2.96 (2.11–4.16)**	**2.45 (1.68–3.56)**
Higher education 1–3 years[j]	25	17 (68.0)	8 (32.0)	1.35 (0.55–3.31)	1.39 (0.52–3.76)
Higher education 3–4.5 years[k]	209	155 (74.2)	54 (25.8)	1	1
Higher education ≥ 5 years[l]	42	28 (66.7)	14 (33.3)	1.44 (0.70–2.93)	1.23 (0.57–2.68)
Severity ('when it is at its worst')	1309	642 (49.0)	667 (51.0)		
Mild–moderate	933	477 (51.1)	456 (48.9)	1	1
Severe	376	165 (43.9)	211 (56.1)	**1.34 (1.05–1.70)**	**1.44 (1.11–1.87)**

Estimates with *p*-values <0.05 are highlighted in bold.

[a]The group 'change of profession' consists of all participants not in the same profession at follow-up, including participants without a job (such as participants on leave, participants out of a job, students not in a job, participants staying at home, and participants who have retired from the labour market (281 participants)).

[b]Logistic regression.

[c]Logistic regression. Adjusted for sex, atopic dermatitis, age group, diagnosis, educational level, and severity 'when it is at its worst'. n = 1309.

[d]Age at the time of recognition of the occupational eczema.

[e]Positive patch test reaction: no assessment of occupational or non-occupational relevance.

[f]OICD: occupational irritant contact dermatitis as the only diagnosis.

[g]OACD: occupational allergic contact dermatitis. Included are cases with both OACD and OCID. Does not include cases with OCU.

[h]OCU: occupational contact urticaria. Included are cases with OCU and OACD, and OCU and OICD.

[i]Educational level is based on job titles. There is one missing educational level (job title: self-employed).

[j]Higher education 1–3 years, for example clinical dental technician.

[k]Higher education 3–4.5 years, for example nurse.

[l]Higher education ≥5 years, for example physician

Discussion

Change of profession or loss of job may be adverse consequences of occupational hand eczema and/or contact urticaria. The main findings of this study include the observation that contact sensitization (with a positive patch test reaction) and severity of hand eczema and/or contact urticaria are disease-related factors associated with an increased frequency of change of profession or not remaining in the workforce. Other factors associated with change of profession/not remaining in the workforce were young age and low educational level. With respect to specific professions, cleaning personnel changed profession significantly more often than other workers, whereas healthcare workers changed profession significantly less often than other workers.

Table 2. Top seven allergens

	Total	Same job, n (%)	Changed profession[a], n (%)	Crude odds ratio (95%CI)[b]	Adjusted odds ratio (95%CI)[c]
Number of included patients	1496	728 (48.7)	768 (51.3)	–	–
Rubber additives					
Allergic	143	73 (51.0)	70 (49.0)	0.90 (0.64–1.27)	1.07 (0.68–1.69)
Not allergic	1353	655 (48.4)	698 (51.6)	1	1
Biocides					
Allergic	56	29 (51.8)	27 (48.2)	0.88 (0.52–1.50)	0.86 (0.47–1.59)
Not allergic	1440	699 (48.5)	741 (51.5)	1	1
Hairdressing chemicals					
Allergic	40	15 (37.5)	25 (62.5)	1.60 (0.84–3.06)	1.34 (0.64–2.83)
Not allergic	1456	713 (49.0)	743 (51.0)	1	1
Nickel sulfate					
Allergic	38	20 (52.6)	18 (47.4)	0.85 (0.45–1.62)	0.76 (0.36–1.60)
Not allergic	1458	708 (48.6)	750 (51.4)	1	1
Epoxy					
Allergic	29	10 (34.5)	19 (65.5)	1.82 (0.84–3.94)	**3.98 (1.40–11.30)**
Not allergic	1467	718 (48.9)	749 (51.1)	1	1
Fragrances					
Allergic	28	12 (42.9)	16 (57.1)	1.27 (0.60–2.70)	1.02 (0.45–2.32)
Not allergic	1468	716 (48.8)	752 (51.2)	1	1
Potassium dichromate					
Allergic	17	5 (29.4)	12 (70.6)	2.29 (0.80–6.54)	2.27 (0.74–6.98)
Not allergic	1479	723 (48.9)	756 (51.1)	1	1

One person can have more than one allergy and therefore be represented in more than one group.
Estimates with p-values <0.05 are highlighted in bold.
[a]The group 'change of profession' consists of all participants not in the same profession at follow-up, including participants without a job (participants on leave, participants out of a job, students not in a job, participants staying at home, and participants who have retired from the labour market (281 participants)).
[b]Logistic regression.
[c]Logistic regression, adjusted odds ratio for sex, atopic dermatitis, age group, educational level and severity 'when it is at its worst'. n = 1309.
For each specific allergen, association with change of profession is compared with participants without this specific allergy.

In the present study, 51.3% of the participants with occupational hand eczema and/or contact urticaria had changed their profession at follow-up. The definition of change of profession varies between publications, which hampers direct comparison of data. In the present study, we used the Danish Occupational Classification System (14) for registration of change of profession, ensuring a strict definition and that only a change to a different profession, or not remaining in the workforce, was actually counted as a change. The follow-up period likewise differs, but comparable data have been reported in other studies (3, 16).

Interestingly, the presence of one or more contact allergies (with a positive patch test reaction, regardless of relevance) was found to be associated with an increase in the frequency of change of profession. This indicates that a well-defined contact allergy may increase the motivation or need for change of profession to avoid further exposure. Even though the contact allergy may not be related to occupation, the eczema may be taken more seriously by patients with contact allergies (occupational or not), thereby facilitating change of profession. The lack of an association between a diagnosis of allergic contact dermatitis and a change of profession in the present study is probably explained by a significant overlap of the diagnostic groups, as participants with combined allergic/irritant hand eczema were categorized as having allergic hand eczema. The finding that participants with contact allergy to epoxy resins are more likely to change profession was previously reported (2). In Denmark, persons with contact allergy to epoxy resins are, by law, not allowed to work with epoxy resins, which may naturally explain the increased frequency of change of profession in this group (17). The finding that change of profession was more rare in participants with occupational irritant contact dermatitis caused by exposure to oil has, to our knowledge, not previously been reported in the literature.

Cvetkovski et al. previously reported that handling of food was a risk factor for job change (4). However, an increased frequency of change of profession for this group was not confirmed in the present study, which may be

Table 3. Five most common irritant exposures

	Total	Same profession, n (%)	Changed profession[a], n (%)	Crude odds ratio (95%CI)[b]	Adjusted odds ratio (95%CI)[c]
Number of included patients	1496	728 (48.7)	768 (51.3)	–	–
Wet work					
Yes	954	479 (50.2)	475 (49.8)	0.84 (0.68–1.04)	0.91 (0.68–1.21)
No	542	249 (45.9)	293 (54.1)	1	1
Oil					
Yes	103	52 (50.5)	51 (49.5)	0.93 (0.62–1.38)	**0.58 (0.35–0.96)**
No	1393	676 (48.5)	717 (51.5)	1	1
Foods					
Yes	129	52 (40.3)	77 (59.7)	**1.45 (1.00–2.09)**	1.10 (0.73–1.65)
No	1367	676 (49.5)	691 (50.5)	1	1
Gloves (not wet work)					
Yes	49	27 (55.1)	22 (44.9)	0.77 (0.43–1.36)	0.72 (0.37–1.42)
No	1447	701 (48.4)	746 (51.6)	1	1
Mechanical irritation[d]					
Yes	47	18 (38.3)	29 (61.7)	1.55 (0.85–2.81)	1.56 (0.77–3.14)
No	1449	710 (49.0)	739 (51.0)	1	1

Estimates with p-values < 0.05 are highlighted in bold.
[a]The group 'change of profession' consists of all participants not in the same profession at follow-up, including participants without a job (participants on leave, participants out of a job, students not in a job, participants staying at home, and participants who have retired from the labour market (281 participants)).
[b]Logistic regression.
[c]Logistic regression, adjusted odds ratio for sex, atopic dermatitis, positive patch test reaction, age group, educational level, and severity 'when it is at its worst'. n = 1309.
[d]Mechanical irritation, including handling paper and cardboard.
For each specific irritant exposure, association with change of profession is compared with participants without this specific exposure.

explained by some overlaps between the groups, and by the fact that we used a more exact method (an occupational coding system) to register the change of profession. Severity of hand eczema and/or contact urticaria seems to play a significant and motivating role in the decision to change profession. Previous studies have identified severe hand eczema and/or contact urticaria at onset as a risk factor for a poor prognosis (18), indicating that severity of hand eczema and/or contact urticaria may be a relatively constant factor. Participants with severe symptoms are naturally more affected by their hand eczema and/or contact urticaria, and are thereby more motivated to change jobs. With respect to a possible association between atopic dermatitis and job change, Rystedt et al. found that participants with occupational hand eczema and/or contact urticaria and with current or previous atopic dermatitis changed jobs more frequently than participants without atopic dermatitis (19). This finding was later supported by another study (5); however, it was not confirmed in the present study. The difference in age between atopics and non-atopics may have influenced the results in one of the studies (19), the atopic group being markedly younger, and the difference from our findings, with adjustment for age, may partly be explained by this. In the other study (5), the population included only hairdressers who graduated from hairdressing vocational schools in 1985–2007, thereby only concerning this trade; furthermore, no distinction was made between occupational hand eczema and/or contact urticaria and other types of hand eczema and/or contact urticaria. Therefore, the results are not directly comparable with those of our study. Age is an important factor in this context, as atopic dermatitis is found more often in younger age groups, that is, the groups in which the frequency of change of profession is high (20). Another explanation may be that today, as opposed to the period in which previous studies were performed, patients with atopic dermatitis have received information and acquired knowledge that keeps them from entering professions with a high risk of development of hand eczema and/or contact urticaria, such as wet work occupations.

Higher educational level was found to be associated with a lower frequency of change of profession. This is not surprising, as this group has invested time and effort in their education. It may also indicate that management position and a certain degree of autonomy facilitate modification of working routines and thereby reduce exposure, resulting in less frequent change of profession. This notion is further supported by the finding that cleaning personnel changed profession markedly more often

Table 4. Number of participants in the 10 most frequent occupational groups stratified with respect to change of profession or no change of profession. n = 1496

Group	Danish Occupational Classification System – two digits[a]	Total (1496)	Same profession[b], n (%)	Changed profession, n (%)	Crude odds ratio (95%CI)[c]	Adjusted odds ratio (95%CI)[d]
Healthcare workers (doctors, nurses, etc.)	06	485	320 (66.0)	165 (34.0)	**0.40 (0.30–0.54)**	**0.36 (0.24–0.53)**
Restaurant, hotel and housekeeping staff	51	211	79 (37.4)	132 (62.6)	1.30 (0.90–1.87)	1.06 (0.68–1.65)
Beauty industry workers	59	95	34 (35.8)	61 (64.2)	1.39 (0.86–2.25)	0.84 (0.47–1.49)
Cleaning personnel (property administrators, etc.)	52	91	26 (28.6)	65 (71.4)	**1.94 (1.16–3.24)**	**2.26 (1.21–4.21)**
Child care workers/social workers	07	88	48 (54.5)	40 (45.5)	0.65 (0.40–1.05)	0.73 (0.42–1.28)
Sales personnel	41	54	18 (33.3)	36 (66.7)	1.55 (0.84–2.86)	1.46 (0.74–2.90)
Blacksmiths, machine workers, etc.	83	53	27 (50.9)	26 (49.1)	0.75 (0.42–1.35)	0.52 (0.26–1.06)
Machine fitters, mechanics, etc.	84	50	20 (40.0)	30 (60.0)	1.17 (0.63–2.15)	1.08 (0.54–2.18)
Nutrition and beverage workers	77	46	11 (23.9)	35 (76.1)	**2.47 (1.21–5.06)**	1.97 (0.84–4.59)
Craftsmen (others in manufacturing companies)	95	37	20 (54.1)	17 (45.9)	0.66 (0.33-1.31)	0.83 (0.38-1.81)
Others	The rest of the groups	286	125 (43.7)	161 (56.3)	1	1

Estimates with p-values <0.05 are highlighted in bold.

[a]Grouping by the first two digits in the Danish Occupational Classification System, version 2, 1986 (14).

[b]The group 'change of profession' consists of all participants not in the same profession at follow-up, including participants without a job (participants on leave, participants out of a job, students not in a job, participants staying at home, and participants who have retired from the labour market (281 participants).

[c]Logistic regression.

[d]Logistic regression, adjusted odds ratio for sex, atopic dermatitis, age group, diagnosis, and severity 'when it is at its worst'. n = 1309.

than other groups. The influence of planning of work routines and exposures is presumably low in the cleaning group, and, together with the high degree of exposure to wet work in this group, this may explain the frequent change of profession to some extent. Healthcare workers, on the other hand, were found to change profession less often than the other groups, in particular physicians and nurses, who are probably able to influence their own work routines, and cope with the situation by changing these, and by the use of protective measures.

Although change of profession and loss of job are severe consequences of occupational hand eczema and/or contact urticaria, the literature on this specific subject is sparse. Strengths of the present study are the large cohort, the well-defined population, and the relatively high response rate. Another major advantage is the precise definition of job change, based on the Danish Occupational Classification System (14), which ensures that change of job indicates a change of profession. Drawbacks are the use of retrospective data regarding hand eczema and/or contact urticaria severity and the lack of a comparable reference group without occupational hand eczema and/or urticaria. The finding that the non-responding group was younger and included more males is a common observation in questionnaire studies, and not surprising (21, 22). However, as change of job is related to young age, the higher response rate in the older age groups may have influenced the results in a conservative direction, and the fact that patients with an unskilled/skilled profession were less likely to answer the questionnaire than patients with a higher educational level follows a similar line, implying that the actual percentage of participants changing profession may be even higher than reported here.

In conclusion, important factors relating change of profession in patients with occupational hand eczema and/or contact urticaria are a positive patch test reaction, severe symptoms, and working in the cleaning sector. Demographic factors, such as young age and low educational level, are also of importance, whereas factors such as atopic dermatitis and diagnosis (allergic versus irritant dermatitis) did not show any marked association with change of profession. As change of profession is a significant consequence of occupational hand eczema and/or contact urticaria, it is important to be aware of the broad range of variables relating to this disease. Future research should include follow-up studies with a focus on the effects of change of profession.

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Running head: Occupational hand eczema and job change

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

TK Carøe[1], NE Ebbehøj[2,] JPE Bonde[2] SG Vejlstrup[2] and T Agner[1]

[1] Department of Dermatology, University of Copenhagen,

Bispebjerg Hospital, Bispebjerg Bakke 23, 2400 Copenhagen, Denmark

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

Bispebjerg Hospital, Bispebjerg Bakke 23, 2400 Copenhagen, Denmark

Correspondence:

Tanja Korfitsen Carøe

Department of Dermatology

Bispebjerg Hospital

2400 Copenhagen NV

Email: tanja.korfitsen@dadlnet.dk

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Conflicts of interest

None declared

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 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) to10 (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-variates were included in the model: age (continues 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 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 form 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.

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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

[a]Logistic regression. OR=odds ratio, CI=confidence interval.

[b]Variables adjusted for: sex, age, atopic dermatitis, diagnosis and severity

[c]Negative 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.

[a]Logistic regression. OR=odds ratio, CI=confidence interval.

[b]Variables adjusted for: sex, age, atopic dermatitis, diagnosis and severity.

[c] Negative 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).

Running head: Hand eczema due to wet work

Hand eczema and wet work: dose-response relationship and effect of leaving the profession.

Tanja Korfitsen Carøe[1], Niels Erik Ebbehøj[2,] Jens Peter Ellekilde Bonde[2], Esben Meulengracht Flachs[2] and Tove Agner[1]

[1] Department of Dermatology, University of Copenhagen, Bispebjerg Hospital, 2400 Copenhagen, Denmark

[2] Department of Occupational and Environmental Medicine, University of Copenhagen, Bispebjerg Hospital, 2400 Copenhagen, Denmark

Correspondence:

Tanja Korfitsen Carøe

Department of Occupational and Environmental Medicine

Bispebjerg Hospital

Bispebjerg Bakke 23

2400 Copenhagen NV

Email: tanja.korfitsen@regionh.dk

Abstract

Background Wet work is an important risk factor for occupational hand eczema.

Objectives To examine the effect of job change in workers with occupational hand eczema caused by wet work, and to evaluate the dose-response relationship between intensity of wet work and eczema parameters.

Methods The study is based on a subgroup (n=954) from a descriptive, register-based study including all participants with occupational hand eczema due to wet work recognised by the Danish Labour Market Insurance Authority in 2010 and 2011. A follow-up questionnaire was sent out 4-5 years later, (response rate 58%).

Results Change of profession and being outside the labour market had a positive effect on healing and improvement of hand eczema.

An inverse dose-response relationship was found between amount of time spent with wet hands at work and healing ($p=0.001$) and improvement ($p<0.001$) and between frequency of hand washing at work and healing ($p=0.013$) and improvement ($p<0.001$).

Conclusion Leaving the profession has a positive effect on eczema parameters; however even minor changes in exposure to wet work was found associated with healing and improvement. This information has implications with respect to advice given to patients with occupational hand eczema due to wet work.

Wordcount

Keywords: wet work, wet hand, hand washing, healing of hand eczema, improvement of hand eczema, occupational hand eczema, change of job, change of profession.

Introduction

Wet work is frequently associated with the development of occupational hand eczema (1). Wet work occupations comprise among others health care workers, cleaning personnel and kitchen workers, which are all high risk occupations for the development of hand eczema (1,2). Wet work, and in particular frequent hand washing at home has also been reported to contribute to the development of hand eczema (3,4).

Development of irritant contact dermatitis (ICD) is a complex process, and involves susceptibility of the individual person, such as atopic dermatitis and/or filaggrin mutations (5), as well as external exposures, of which wet work is the most common. Occupational contact dermatitis due to wet work represents approximately 60% of recognised cases of occupational contact dermatitis in Denmark (1). Wet work has generally been defined as wet hands >2 hours per working day, or hand washing >20 times per working day or wearing occlusive gloves >2 hours per working day (6). In Germany regulations regarding duration and frequency of exposure to wet work have already been implemented (7). Although previous research has clearly identified wet work as a major culprit (4,6), and one of the most important players in relation to occupational hand eczema (1,8), there is little evidence to show how much wet work is needed to elicit hand eczema, and where the limits are for deterioration of already existing hand eczema. Earlier studies have discussed whether many short exposures to wet-work are more damaging than one single long exposure (9), and the irritant effect of (glove-)occlusion itself has been challenged (10). For workers engaged in wet work occupations we also need more information on the effect of decreased amount of wet work or change of profession on occupational hand eczema.

This study aims to examine the effect(s) of job change in a population of patients with occupational hand eczema recognised due to wet work exposure and to evaluate the dose-response relationship between intensity of wet work and symptoms of hand eczema.

Methods

Baseline data comprising age, gender, atopic eczema, work exposure causing the hand eczema (i.e. wet work) and profession at time of notification was obtained from the Danish Labour Market Insurance. The study is based on a subgroup from a larger descriptive, register-based study including all participants with recognised occupational hand eczema in the period Jan 2010 to end Dec 2011 (n=1496) (11). The subgroup comprises participants with occupational irritant hand eczema recognised due to wet work, who answered a follow-up questionnaire, including a question on current job situation (n=954) . The decision to recognise the hand eczema as being due to wet work was made by the Danish Labour Market Insurance based on medical specialist statements and/or medical files from Dermatological Departments or Departments of Occupational and Environmental Medicine. Recognition of occupational hand eczema due to wet work was based on a long standing, relevant exposure, liable to have caused the dermatitis, without any further specifications. In the legal assessment of the cases it is documented in which profession the participants were working when first seeking medical assistance for the occupational hand eczema, and this has been used as basis for the decision. Some patients may have had a pre-existing hand eczema and have had their case recognised due to occupational aggravation. 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 (13), where job titles are given a 5-digit code (11).

Follow-up data was obtained from a questionnaire sent to participants 4-5 years after recognition of occupational hand eczema, comprising questions on current profession and current exposure to wet work, eczema status, and Health-related quality of life (HR-Qol). Change of profession was assessed as any change in the 5-digit code from baseline to follow-up. Profession at follow-up was obtained by the question: *'What is your current profession?'* Participants that were no longer active in the labour market were grouped as 'out of the labour market'.

Eczema status at follow-up was assessed by the participants as healing of hand eczema or improvement of hand eczema since baseline. Healing of hand eczema was defined as being clear of hand eczema for the previous 12 month. Improvement of the hand eczema was rated according to the participants answer to the question, *'How will you describe your occupational eczema compared to status in 2010/2011 when your case was recognised?'* and divided into *'better' vs 'same or worse'*. If the participants had answered *'better'* the hand eczema was classified as *'improved'*. Participants who had 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'*. HR-QoL was analysed using the validated Dermatology Life Quality Index (DLQI)-questionnaire ranging from 0-30, where low values indicate little effect on HR-QoL (12).
Wet work exposure at follow-up was assessed from answers in the questionnaire regarding amount of time spent with wet hands and number of hand washes. Time spent with wet hands during working hours was divided into, *'no exposure, less than ½ hour per day, between ½-2 hours per day, and more than 2 hours per day. 'Number of hand washes'* during working hours and in leisure time was divided into *'0-5 times a day, 6-10 times a day, 11-15 times a day, 16 to 20 times a day and more than 20 times a day'*. Both questions are taken from the Nordic Occupational Skin Questionnaire 2002 (NOSQ 2002) (13) and altered to fit our study. In the question on wet hands we

added ‘no exposure’ and in the question on number of hand washes we added the interval 11-15 times a day and asked the same question for leisure time. The questions on hours spent with wet hands and number of hand washes have previously been validated (4).

Statistics

Logistic regression analysis was used to test for association between eczema parameters and change of profession/being out of the labour market at follow-up four to five years later.

Odds ratio (OR) is given as crude, as well as adjusted for age (continually), gender, atopic dermatitis and severity ‘at its worst’. Severity ‘at its worst’ was assessed from the questionnaire, where the participants were asked to rate hand eczema severity ‘at its worst’ on a scale from 0 (clear) to 10 (worst). We used the NOSQ 2002 question on severity ‘at worst’ to assess severity ‘at its wort’ during the follow-up period and adjusted for this in the adjusted regression analyses (13).

The DLQI-variable was applied as a continuous scale (12) 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 for participants with recognised occupational hand eczema due to wet work.

Cochrane-armitage trend test was used to test for linear trend in healing and improvement when exposed to either wet hands or hand washing in four categories. The outcomes healing and improvement were analysed using separate Poisson models to calculate relative risk (RR). The models were adjusted for age (continually), gender, atopic dermatitis and severity.

Correlation between exposure at work and at leisure time was tested by Pearson correlation analysis.

Statistical analyses were performed using SAS ENTERPRISE GUIDE 7.1 (SAS, Cary, NC, USA).

Results

Of the 1496 included participants with recognised occupational hand eczema who answered the questionnaire (response rate of 58%) (11), 954 (63.8%) were recognised as having occupational irritant hand eczema related to wet work, and were available for the present study. Demographic variables are given in Table 1. A total of 479 (50.2%) were still in the same profession, 299 (31.3%) had changed profession and 176 (18.5%) were outside the labour market.

Effect of change of profession or being outside the labour market

Healing was reported by 19.1% of the participants who had changed profession, 27.7% of the participants outside the labour market and 15.3% of the participants still in the same profession at follow-up. The chance of healing was markedly increased for participants who had left the profession. The adjusted OR was 1.46 (0.86-2.47) for participants who had changed profession and the adjusted OR was 3.15 (1.85-5.38)) for those outside the labour market, as compared to those still in the same profession (Table 2).

Improvement of their hand eczema at follow-up was reported in 66.6% of the participants who had changed profession, 60.5% of the participants outside labour market and 52.4% of the participants still in the same profession. The chance of improvement of their hand eczema was markedly increased for participants who had left the profession. The adjusted OR was 2.13 (1.49-3.05) for participants who had changed profession and adjusted OR of 1.79 (1.19-2.70) for those outside the labour market, as compared to those still in the same profession (Table 2).

With respect to HR-QoL, the median DLQI was 2 (1-5) for participants who had changed profession, 3 (1-6) for participants outside the labour marked and 2 (0-5) for participants still in the same profession. Participants who had changed profession and participants outside the labour market had increased risk of higher DLQI, indicating a negative effect on HR-QoL, as compared to

participants in the same profession (adjusted IRR=1.10 (0.92-1.32)) and (adjusted IRR=1.44 (1.17-1.77)), respectively (Table 2).

Wet work at follow-up

Calculations for wet work at follow-up were only made for the 778 participants still active in the labour market at follow-up. An inverse dose-response relation was found between hours spent with wet hands at work and healing ((p=0.001) and improvement (p<0.001) of hand eczema. For each step down to a lower category of time spent with wet hands at work, the chance of healing increased by 35% (adjusted RR= 1.35 (1.05-1.75) and for each step down to a lower category of wet hands at work the chance of improvement increased by 8%, adjusted RR = 1.08 (1.05-1.010) (Figure1).
An inverse dose-response relation was found between frequency of hand washing at work and healing (p=0.013) and improvement (p<0.001) of hand eczema. For each step down to a lower category of frequency of hand washing at work the chance of healing increased by 26% (adjusted RR= 1.26 (1.06-1.50) and for each step down to a lower category of frequency of hand washing at work the chance of improvement increased by 4%, adjusted RR= 1.04 (1.02-1.06) (Figure 2).
No significant dose-response relation was found between extents of glove usages and healing. An inverse dose-response relation was found between glove usage at work and improvement of hand eczema (p<0.0001). For each step down to a lower category of hours with occlusive gloves at work, the chance of improvement increased by 3% (adjusted RR= 1.03 (1.02-1.05) (Figure 3).
Frequency of hand washing during working hours and during leisure time is shown in Figure 4. A significantly positive correlation of 0.496 was found for frequency of hand washing at work and at home (p<0.001).

Discussion

We found that leaving the profession, in which the occupational hand eczema had started, had a markedly positive effect on eczema parameters at follow up for patients with occupational hand eczema caused by wet work, although not reflected by an increase in HR-QoL (Table 2). Another important finding was an inverse dose-response relationship between wet work exposures at follow up and healing/ improvement of eczema (Figure 1-2).

Our results confirm previous observations by Nielsen et al (14) in cleaners with hand eczema, that those who had left the profession during the 2 year follow-up period, had experienced a significant improvement with respect to eczema symptoms (redness, rough skin, cracks). Although leaving the wet work profession did not lead to healing of hand eczema for the majority of patients in our study, it is still clear that the chances of healing were markedly better for those who left the profession (Table 2). The relatively low number of cases with healed eczema is in agreement with the literature (8) and is probably partly due to the strict definition, only accepting eczema as healed if there had been no eruptions during the last year. It is possible that some participants who had left their profession had changed into another profession also involving some degree of wet work. Surprisingly, the impact of change of profession regarding HR-QoL was not in favour of job change (Table 2). HR-QoL was affected negatively, in particular for those being outside the labour market at follow up, and it is possible that the psychological stress related to change of profession and being outside the labour market may negatively influence HR-QoL. However, differences were small, and possibly below the minimal clinically important difference (MCID) (15). An earlier study have found a median DLQI at 5.5 for hand eczema patients indicating that hand eczema is a diagnosis that influences the quality of life (16). In our study the median DLQI was 2 at follow-up which might suggest that time had had a positive influence either due to acceptance or improvement of disease.

The positive effect of job change on eczema parameters was, as previously reported, also found for the total group of patients with recognised occupational hand eczema (17), and is not specific for wet-workers.

We found a clear dose-response relationship for the association between wet work exposures at follow-up and healing and improvement of hand eczema, respectively (Figure 1). A shorter period of time with wet hands and lower frequency of hand washing at work was related to a higher rate of healing and improvement. Other studies have investigated the effect of wet work in relation to hand eczema (4,18–21) and found that wet work exposure is a risk factor for hand eczema, however, our study is to our knowledge the first to show a dose-response relationship between amount of wet work and hand eczema on a population with occupational hand eczema due to wet work in general.

For glove usage a negative effect of prolonged use applied to self-reported improvement was found but not for healing of the hand eczema (Figure 3). This may be due to the fact that improvement is based on a subjective and often vague assessment and therefore more prone to bias, whereas healing, based on absence of hand eczema the previous year, is a more exact parameter. Data concerning glove exposure and effect on hand eczema is more complicated to interpret, since use of gloves may be part of protective measures. No glove usage may indicate that the participants do not protect themselves when preforming wet work or that they are not exposed to wet work. With respect to irritant effects from glove occlusion studies, have shown that skin hydration by occlusion has a different biological effect from that of water, thus it seems less harmful to the skin than water, but that glove usage worsens the negative effect on skin barrier function of soap and detergents (10,22). This supports our finding that it does not affect healing.

An earlier study indicates that leisure-hour exposure may be an even larger concern than work-hour exposure (3), however our findings clearly show that frequency of hand washing in this specific

population is highest during working hours (Figure 4).We also found a moderate correlation for frequency of hand washing at work and at home indicating that participants with a high frequency of hand washing during working hours are also more exposed to hand washing at home. This observation was also previously reported (4), and may be a consequence of deeply incorporated routines which extends into leisure time. Social factors may also play an important role, since higher social classes may be more likely to outsource wet work assignments at home (e.g. house cleaning).

Studies with educational programs targeting patients with occupational hand eczema and aiming at reducing wet work exposures suggest an effect of educational programs (23–25). Our study clearly supports this, and indicates a positive effect of diminished water exposure during working hours on occupational hand eczema.

The significant association between dose of wet work and symptoms of hand eczema (healing and improvement) at follow-up in our study is very convincing and indicates that minor changes in wet work during working hours may directly influence the symptoms of hand eczema. A practical implication of this is that patients can be advised that even minor adjustments in work procedures may be helpful.

An advantage of our study is that we present a large cohort of all patients with recognised occupational hand eczema due to wet work and that we have a relatively high response rate (58%). A limitation to the study is that even though all the included participants had a sufficient amount of wet work exposure at baseline to be evaluated as the cause of their hand eczema, it is not clearly defined in amount of time spent with wet hands and frequency of hand washing and we were therefore not able to conclude if their amount of wet work at follow-up had changed since the recognition, or if the increased healing and improvement was a direct effect of change in number of

working hours spent with wet hands (including hand washing). Another limitation of the study is that the improvement/healing of hand eczema was self-assessed by the participants and not confirmed by a clinical examination. However the participation rate would probably have been lower if the participants had had to show up for an examination. Moreover it would have given a momentarily picture of the hand eczema status and not the status throughout the last 12 months. Knowledge about the relationship between exposure to wet work and symptoms of hand eczema is important to increase understanding of the relation-ship, and to be able to influence regulations with respect to maximum hours with wet work exposure. Future research should also aim at exploring the effects of job change, as well as dose-response relationship, for individuals more sensitive to wet work, in particular atopic individuals and/or individuals with filaggrin mutations (5,26).

Conclusion: We here provide new and interesting data on the relationship between wet work exposure and hand eczema healing and improvement. The data clearly illustrates that leaving the profession has a positive effect on eczema-related parameters, but also indicates that even a minor decrease in exposure is associated with healing and improvement in hand eczema. Changes in working procedures in the direction of minimising wet hands, as well as job change, should be taken into consideration when guiding patients with occupational hand eczema due to wet work.

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Table 1. Demographic data for included participants (recognised occupational hand eczema due to wet work)

Recognised occupational hand eczema		**N=954**
Gender (%)	Women	823 (86.3)
	Men	131 (13.7)
Age (years), median (Q1-Q3)		35 (26-47)
Atopic dermatitis (%)	Yes	260 (26.3)
	No	694 (72.7)
Professions, top 5 (%)	Health care personnel (Doctors, Nurses etc.)	406 (42.5)
	Restaurant, Hotel and Housekeeping staff	178 (18.7)
	Beauty industry workers	75 (7.9)
	Child care workers/ caregivers	75 (7.9)
	Cleaning personnel (property administrators etc.)	71 (7.4)
	others	149 (15.6)

Q1: 25th percentile; Q3: 75th percentile.

Table 2. Course of hand eczema and quality of life (DLQI) after change of profession among participants with recognised occupational hand eczema due to wet work N=954.

Self-reported healing of hand eczema during the last 12 month (n=934, 20 missing)				
	Total	**Healed**	**Crude OR (95% CI)**[a]	**Adjusted OR (95% CI)**[ab]
Same profession	471 (50.4)	72 (15.3)	1	1
Change of profession	293 (31.4)	56 (19.1)	1.31 (0.89-1.92)	1.46 (0.86-2.47)
Outside labour market	170 (18.2)	47 (27.7)	**2.12 (1.39-3.22)**	**3.15 (1.85-5.38)**
Self-evaluated improvement at follow-up (n=934, 20 missing)				
	Total	**Better**	**Crude OR (95% CI)**[a]	**Adjusted OR (95% CI)**[ab]
Same profession	466 (49.9)	244 (52.4)	1	1
Change of profession	296 (31.7)	197 (66.6)	1.81 (1.34-2.45)	**2.13 (1.49-3.05)**
Outside labour market	172 (18.4)	104 (60.5)	1.39 (0.98-1.99)	**1.79 (1.19-2.70)**
Dermatology Life Quality Index (DLQI) (n=943, 11 missing), higher score indicates lower life quality				
	Total	**DLQI Median (Q1- Q3)**	**Crude IRR (95% CI)**[c]	**Adjusted IRR (95% CI)**[bc]
Same profession	474 (50.3)	2 (0-5)	1	1
Change of profession	299 (31.7)	2 (1-5)	1.08 (0.91-1.29)	1.10 (0.92-1.32)
Outside labour market	170 (18.0)	3 (1-6)	**1.43 (1.16-1.76)**	**1.44 (1.17-1.77)**

Participants with occupational irritant contact dermatitis due to wet work.

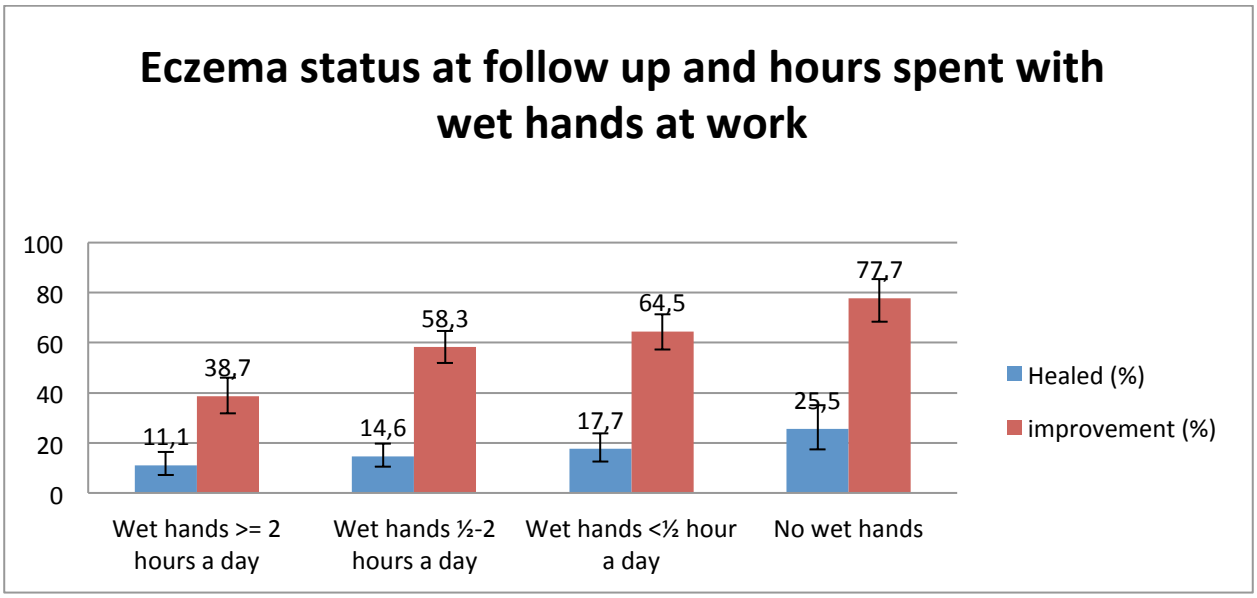
Values with p-values < 0.05 are highlighted in the table.

[a]Logistic regression. OR=odds ratio, CI=confidence interval.

[b]Variables adjusted for: gender, age, atopic dermatitis and severity

[c]General linear regression with DLQI from 0-30 as outcome. Incidence Rate Ratio (IRR). Estimates have been back-transformed using exponential function, and represent ratios (e.g: 1.44 = 44% increase).

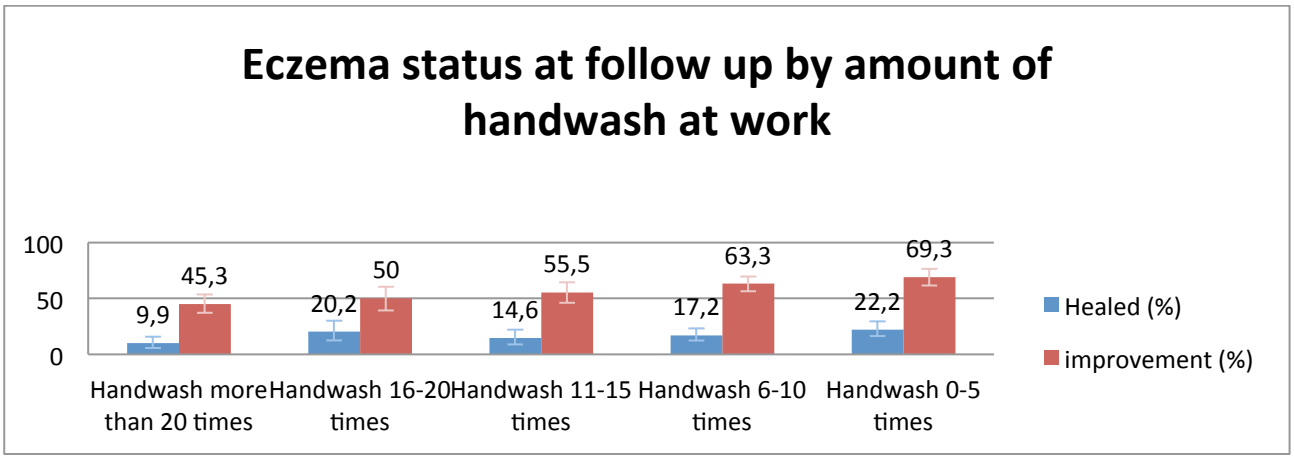
Figure 1.



Participants with recognised wet work at baseline and still active at the labour market at follow-up n=778. (excluded: 176 participants who were outside the labour market at follow-up).

Percentage of participants with healed (n= 726, missing 52) or improved (N=724, missing 54) hand eczema at follow up, related to self-reported wet hands exposure at work.

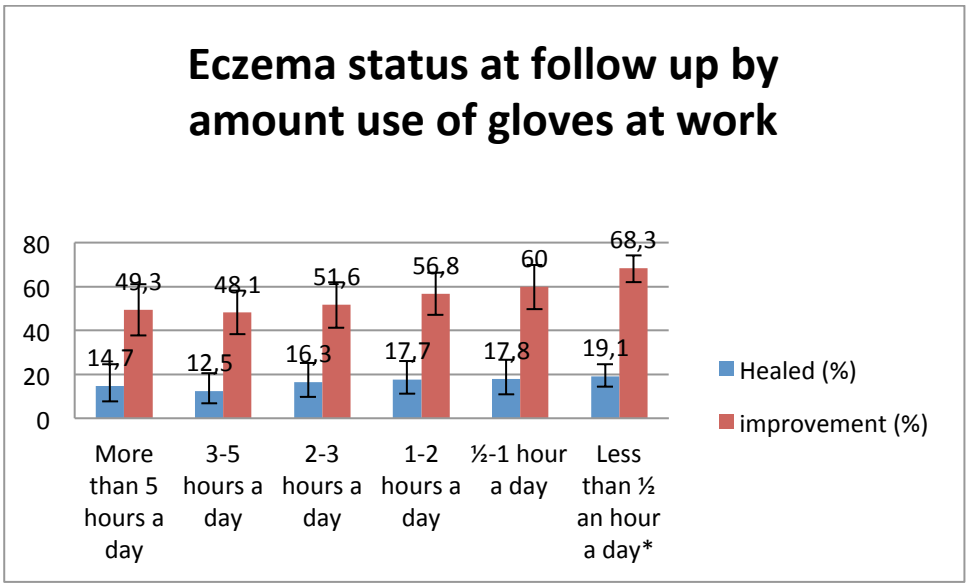
Figure 2



Participants with recognised wet work at baseline and still active at the labour market at follow-up n=778. (excluded: 176 participants who were outside the labour market at follow-up).

Percentage of participants with healed (n= 734, missing information on healing 44) or improved (N=732, missing information on improvement 46) hand eczema at follow up, related to number of hand washes during working hours.

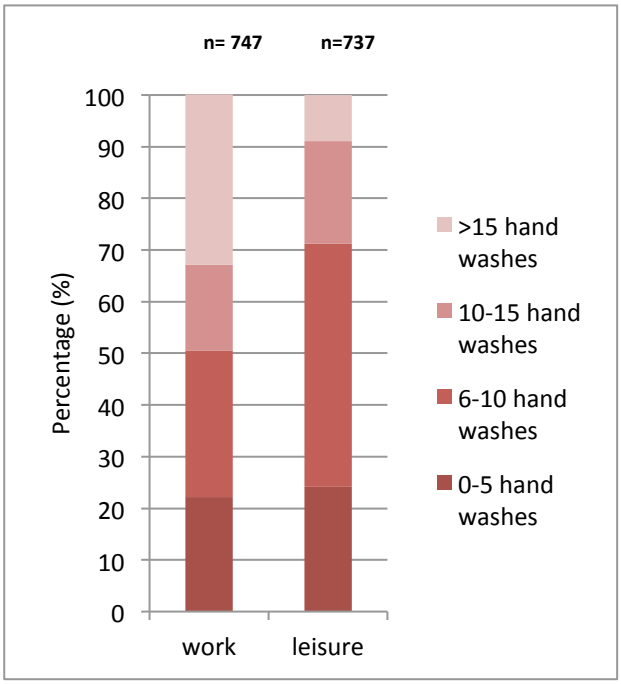
Figure 3.



Participants with recognised wet work at baseline and still active at the labour market at follow-up n=778. (excluded: 176 participants who were outside the labour market at follow-up).

Percentage of participants with healed (n= 732, missing 46) or improved (N=729, missing 49) hand eczema at follow up, related to glove exposure.

Figure 4. Number of hand washes per day at work and at home.



Number of hand washes (0->15) per day during working hours (work) and during leisure hours (leisure).