

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

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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

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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

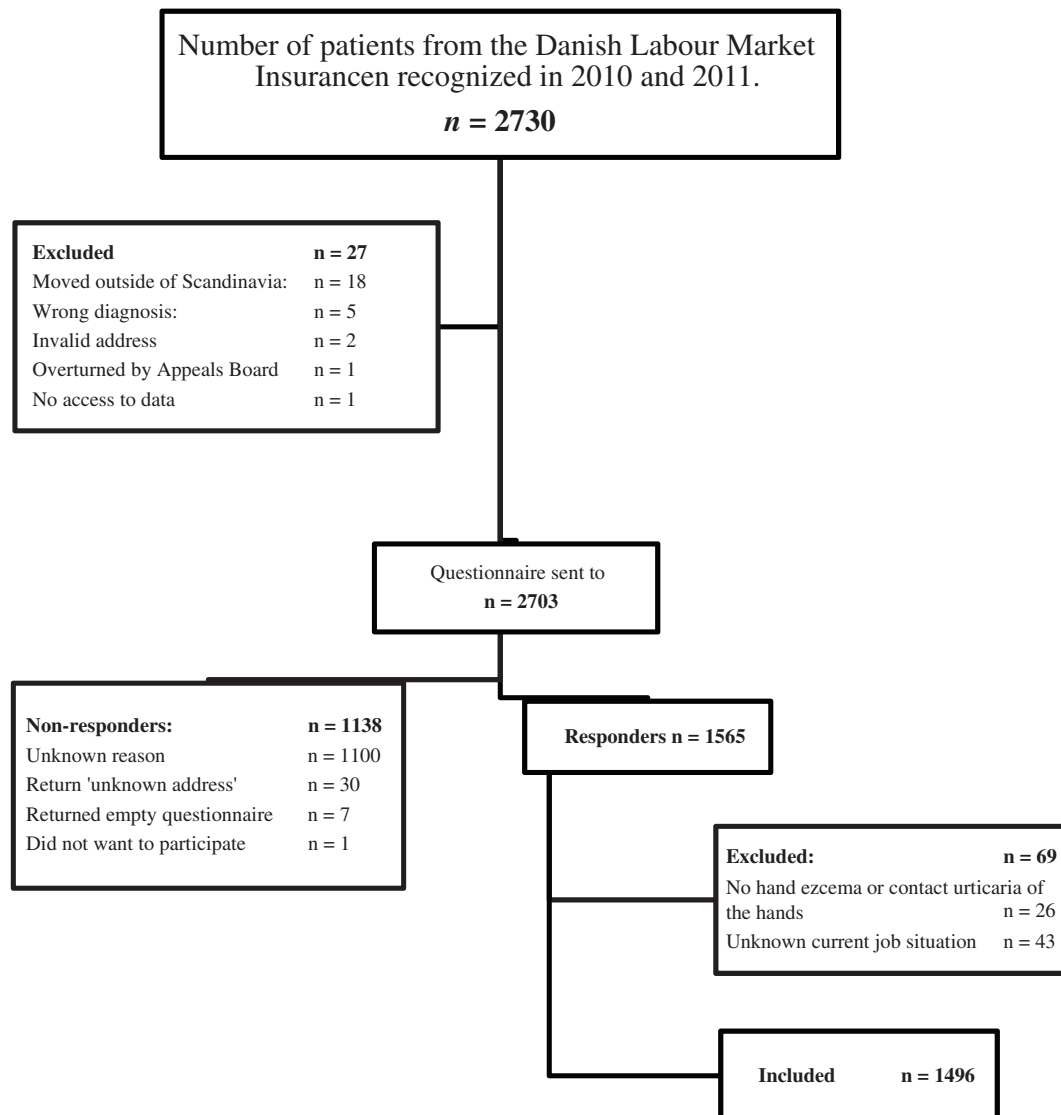


Fig. 1. Flow chart: structure diagram of the responders (included and excluded) and of the non-responders. Response rate: 58%.

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.

^aThe 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)).

^bLogistic regression.

^cLogistic regression. Adjusted for sex, atopic dermatitis, age group, diagnosis, educational level, and severity 'when it is at its worst'. *n* = 1309.

^dAge at the time of recognition of the occupational eczema.

^ePositive patch test reaction: no assessment of occupational or non-occupational relevance.

^fOICD: occupational irritant contact dermatitis as the only diagnosis.

^gOACD: occupational allergic contact dermatitis. Included are cases with both OACD and OICD. Does not include cases with OCU.

^hOCU: occupational contact urticaria. Included are cases with OCU and OACD, and OCU and OICD.

ⁱEducational level is based on job titles. There is one missing educational level (job title: self-employed).

^jHigher education 1–3 years, for example clinical dental technician.

^kHigher education 3–4.5 years, for example nurse.

^lHigher 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.

^aThe 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)).

^bLogistic regression.

^cLogistic 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.

^aThe 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)).

^bLogistic regression.

^cLogistic 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.

^dMechanical 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.

^aGrouping by the first two digits in the Danish Occupational Classification System, version 2, 1986 (14).

^bThe 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).

^cLogistic regression.

^dLogistic 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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References

- 1 Arbejdsmarkedets Erhvervsforsikring (Labour Market Insurance). Arbejdsskadestatistik 2016. Available at: <http://www.aes.dk/da/Statistik/Arbejdsskader/Erhvervssygdomme-fordelt-pAa-diagnoser.aspx>. 10-6-0016. (last accessed 18 August 2017).
- 2 Clemmensen K K B, Carøe T K, Thomsen S F et al. Two-year follow-up survey of patients with allergic contact dermatitis from an occupational cohort: is the prognosis dependent on the omnipresence of the allergen? *Br J Dermatol* 2014; **170**: 1100–1105.
- 3 Cvetkovski R, Zachariae R, Jensen H et al. Prognosis of occupational hand eczema: a follow-up study. *Arch Dermatol* 2006; **142**: 305–311.
- 4 Cvetkovski R S, Rothman K J, Olsen J et al. Relation between diagnoses on severity, sick leave and loss of job among patients with occupational hand eczema. *Br J Dermatol* 2005; **152**: 93–98.
- 5 Lysdal S H, Søstede H, Andersen K E, Johansen J D. Hand eczema in hairdressers: a Danish register-based study of the prevalence of hand eczema and its career consequences. *Contact Dermatitis* 2011; **65**: 151–158.
- 6 Apfelbacher C J, Soder S, Diepgen T L, Weisshaar E. The impact of measures for secondary individual prevention of work-related skin diseases in health care workers: 1-year follow-up study. *Contact Dermatitis* 2009; **60**: 144–149.
- 7 Mäklönen T, Jolanki R, Alanko K et al. A 6-month follow-up study of 1048 patients diagnosed with an occupational skin disease. *Contact Dermatitis* 2009; **61**: 261–268.
- 8 Thyssen J P, Johansen J D, Linneberg A, Menné T. The epidemiology of hand eczema in the general population – prevalence and main findings. *Contact Dermatitis* 2010; **62**: 75–87.
- 9 Vester L, Thyssen J P, Menné T, Johansen J D. Consequences of occupational food-related hand dermatoses with a focus on protein contact dermatitis. *Contact Dermatitis* 2012; **67**: 328–333.
- 10 Iblær K S, Jemec G B E, Diepgen T L et al. Skin care education and individual counselling versus treatment as usual in healthcare workers with hand eczema: randomised clinical trial. *BMJ* 2012; **345**: e7822.
- 11 Carøe T K, Ebbelhøj N, Agner T. A survey of exposures related to recognized occupational contact dermatitis in Denmark in 2010. *Contact Dermatitis* 2014; **70**: 56–62.
- 12 Johansen J D, Frosch P J, J P J Lepoittevin (eds). International comparison of legal aspects of workers compensation for occupational contact dermatitis. In: *Contact Dermatitis*, 5th edition: Berlin Heidelberg, Springer, 2011: pp. 1029–1051.
- 13 Stahl Skov P, Norn S, Weeke B. A new method for detecting histamine release. *Agents Actions* 1984; **14**: 414–416.
- 14 Arbejdsdirektoratet. Dansk Fagkode, 2. udgave, 1986 (Danish occupational classification system, version 2, 1986).
- 15 Susitaival P, Flyvholm M, Meding B et al. (NOSQ-2002): a new tool for surveying occupational skin diseases and exposure. *Contact Dermatitis* 2003; **49**: 70–76.
- 16 Meding B, Lantto R, Lindahl G et al. Occupational skin disease in Sweden – a 12-year follow-up. *Contact Dermatitis* 2005; **53**: 308–313.
- 17 Beskæftigelsesministeriet (Ministry of Employment). Retsinformation (legal information). Arbejde med epoxyharpikser og isocyanater. Available at: <https://www.retsinformation.dk/Forms/R0710.aspx?id=176593#id48ebc362-1dc7-4afa-9bff-8db01ddf7e9e>. 23 December 2015. (last accessed 23 October 2017).
- 18 Petersen A H, Johansen J D, Hald M. Hand eczema – prognosis and consequences: a 7-year follow-up study. *Br J Dermatol* 2014; **171**: 1428–1433.
- 19 Rystedt I. Atopic background in patients with occupational hand eczema. *Contact Dermatitis* 1985; **12**: 247–254.
- 20 Arbejderbevægelsens Erhvervsråd. Data obtained from The Economic Council of the Labour Movement (Arbejderbevægelsens Erhvervsråd). October 2016.
- 21 Loon A, Tjihuis H, Picavet H S et al. Survey non-responders in the Netherlands: effect on prevalence estimates and associations. *Ann Epidemiol* 2003; **13**: 105–110.
- 22 Meding B, Lindahl G, Alderling M et al. Is skin exposure to water mainly occupational or nonoccupational? A population-based study. *Br J Dermatol* 2013; **168**: 1281–1286.