

Evidence-based training as primary prevention of hand eczema in a population of hospital cleaning workers

Kim K. B. Clemmensen¹, Ingelise Randbøll¹, Malene F. Ryborg¹, Niels E. Ebbelhøj² and Tove Agner¹

¹Department of Dermatology, Bispebjerg Hospital, Bispebjerg Bakke 23, 2400 Copenhagen NV, Denmark, and ²Department of Occupational and Environmental Medicine, Bispebjerg Hospital, Bispebjerg Bakke 23, 2400 Copenhagen NV, Denmark

doi:10.1111/cod.12304

Summary

Background. Skin disorders accounted for one third of all recognised occupational diseases in Denmark in 2010. Wet work is a risk factor for the development of occupational hand eczema. The consequences of occupational hand eczema include sick leave, loss of job and impaired quality of life.

Objectives. The aim of the present study was to investigate exposures related to cleaning and the effect of an evidence-based educational intervention on the prevention of hand eczema among hospital cleaners.

Patients/Materials/Methods. The intervention consisted of a 1 hr course in hand protective behaviour. All full-time cleaners working at Bispebjerg Hospital in January 2013 were invited to participate. The outcome measures were self-reported skin behaviour, exposures, knowledge of skin protection and hand eczema severity index (HECSI).

Results. One hundred and five cleaners were invited to participate, of these 86 (82%) were included. At follow-up after 3 months there was a shift towards fewer daily hand washings and hand disinfections ($p < 0.001$ and $p = 0.001$ respectively). The number of correct answers to the knowledge questions rose from 6.3 to 7.3 ($p = 0.006$). The mean HECSI score decreased from 2.8 to 1.8 at follow-up ($p = 0.002$).

Conclusions. Data indicates a positive effect of a low-cost on-site educational intervention for hospital cleaners.

Key words: education; occupational hand eczema; primary prevention; wet work.

Skin disorders accounted for one third of all recognised occupational diseases in Denmark in 2010 (1), and occupational contact dermatitis on the hands was the predominant form (2). Wet work is an important risk factor for the development of occupational hand eczema (3). Irritant contact dermatitis (ICD) accounts for about 70% of all cases of occupational contact dermatitis, and 68% of

ICD were caused by wet work (4). As a working group, cleaners are exposed to wet work and use of gloves and hospital cleaners, in particular, need to maintain a high level of hygiene and are exposed to frequent hand washing and hand disinfections.

A prevalence of hand dermatitis in hospital cleaning workers of 12% has been reported (5). In 2010 cleaners constituted the third largest occupational group with recognised occupational skin disease in Denmark, only exceeded in numbers by healthcare workers and kitchen personnel (2). The consequences of occupational hand eczema include sick leave, loss of job, and impaired quality of life, making prevention an important factor (6–8).

Several studies have shown a positive effect of evidence-based educational intervention as primary prevention with respect to occupational hand eczema in different

Correspondence: Kim K. B. Clemmensen, Department of Dermatology, Bispebjerg Hospital, University of Copenhagen, 2400 Copenhagen NV, Denmark. Tel: +45 29906384; Fax: +45 35316010.
E-mail: kimkatrine@gmail.com

Funding: No specific funding.

Conflicts of interests: The authors declare no conflict of interests.

Accepted for publication 13 August 2014

occupations, e.g. healthcare workers, hairdressing apprentices, gut cleaners and cheese dairy workers (9–15). An educational intervention for employees at old people's homes in a randomised controlled study created a significant change in hand protective behaviour and level of knowledge and led to fewer clinical skin symptoms in the intervention group (12). The educational programme was focused on frontline employees who passed on the information to other employees. The implementation method has been shown to be an important determinant for the overall results, and the importance of focusing on management as well as the operational level has been emphasised (16). An effect of educational interventions as secondary intervention has also been shown in several studies (17–19).

The aim of the present study was to investigate the effect of low cost, 'on-site', evidence-based training in the prevention of hand eczema among hospital cleaners. A second aim was to display exposures related to the job of hospital cleaners. To our knowledge no previous study has examined the effect of a primary intervention on hospital cleaners.

Materials and Methods

This study has a prospective one-group pre-post-design. The intervention was a 1-hr long training course consisting of an oral presentation and practical training based on an evidence-based skin protection programme (20). The skin programme included 10 recommendations based on evidence from experimental and epidemiological studies (20), and was recently confirmed to be effective in an intervention study of healthcare personnel with hand eczema (19). The intervention was planned and effectuated as a partnership between the cleaning service unit and the dermatological department, Bispebjerg University Hospital. Data was assembled during the course (baseline) and at follow-up 3 months later. The outcome measures were self-reported skin protective behaviour, exposures, knowledge of skin protection and skin symptoms. The latter were assessed using the hand eczema severity index (HECSI) (21).

Study population

Permanent employees, working day time and full-time as cleaners at Bispebjerg University Hospital in January 2013. Participants were included in the study when they had participated in a course.

Intervention

The intervention consisted of a 1-hr course. Seven to 14 hospital cleaners attended each course, and two medical

Table 1. Skin care programme

Use protective gloves when performing wet-work tasks
Protective gloves should be used when necessary but for as short a time as possible
Protective gloves should be intact and clean and dry inside
When using protective gloves for more than 10 min wear a cotton glove underneath
Wash your hands in lukewarm water. Rinse and dry them thoroughly after washing
Hand wash may be substituted by use of disinfectant when the hands are not visibly dirty
Do not wear rings at work
Select a moisturiser, which is lipid-rich and fragrance-free
Apply moisturisers on the whole hand. Apply moisturiser on your hands during the workday or after work
Take care also when you do domestic work and use warm gloves when going outside in winter

personnel experienced in health education in relation to hand eczema, were teachers on the course. A wide variety of ethnic groups were represented among the hospital cleaners. All participants were able to understand and speak Danish, but in order to ensure understanding; participants with basic Danish skills were paired with participants with the same first language and better Danish skills. The course lasted for 60 min, and consisted of a lecture combined with practical exercises, during which the participants were instructed in how to use different moisturisers, hand disinfectants and different types of gloves. Information was kept simple and was based on the results of epidemiological and clinical studies (20), see Table 1. Illustrations were used to ensure understanding, and the hand protection advice also included information about early signs of hand eczema. The participants received a card with 10 evidence-based recommendations (Table 1), a small bag with free small samples of lipid rich and unscented moisturisers and a certificate of participation. To facilitate access to medical advice the participants received an e-mail address they could use if they experienced symptoms and wanted to book an appointment with a dermatologist.

To ensure management involvement and support, the management of the cleaning department was involved in the planning of the intervention, and a supervising hospital cleaner participated in each course.

Questionnaire

Workers invited to participate ($n = 105$) received a paper-based questionnaire in January 2013 before the first course (first questionnaire), and again 3 months after their participation in a course (follow-up questionnaire).

Both questionnaires had questions on knowledge of hand protection behaviour (22). The first questionnaire also had questions on past and present hand eczema, atopic eczema and demographic variables. Past or present hand eczema was assessed with the questions, 'Have you, or have you previously had hand eczema?' with the options, 'yes'/'no', and if yes, 'When did you last have hand eczema?' with the options, 'I have hand eczema now'/'I have had hand eczema in the past year'/'it has been more than a year since I have last had hand eczema'.

The second questionnaire had a question about which languages were spoken in the participants' home and some questions on evaluation of the course.

The behaviour part of the questionnaires was a modified and shorter version of a previously used questionnaire (23). The questions on knowledge of hand eczema were adapted to people without hand eczema from a questionnaire used in a previous study (22).

Clinical examination

At the beginning of each course, each participant was evaluated with the hand eczema severity index (HECSI) by one of the teachers responsible for the course that was either a trained dermatological nurse or a medical student trained in the use of HECSI. HECSI is a tool used for standardised clinical grading of hand eczema (21).

The participants were reassessed with HECSI approximately 3 months after their participation in the course. HECSI has previously been found useful with respect to evaluation of skin symptoms in a primary prevention programme (9).

Statistical analysis

The Wilcoxon signed rank test was used for paired data on ordinal scale and quantitative data. McNemar's test was used for paired data on nominal scale. Data was analysed with SPSS™ 20. All tests applied were two-tailed, and a significance level of 0.05 was chosen. Two of the knowledge questions had two correct answers. These are in the data analysis processed as two separate questions.

In Tables 3 and 4 only participants that returned both questionnaires are included, because only these can be included in the paired analysis.

The study was approved by the Danish Data Protection agency.

Results

One hundred and five cleaners were invited to participate in the study. Of these 86 (82%) participated in a course and were included in the study. Of the 86 included participants, 75 responded to the first questionnaire, 79

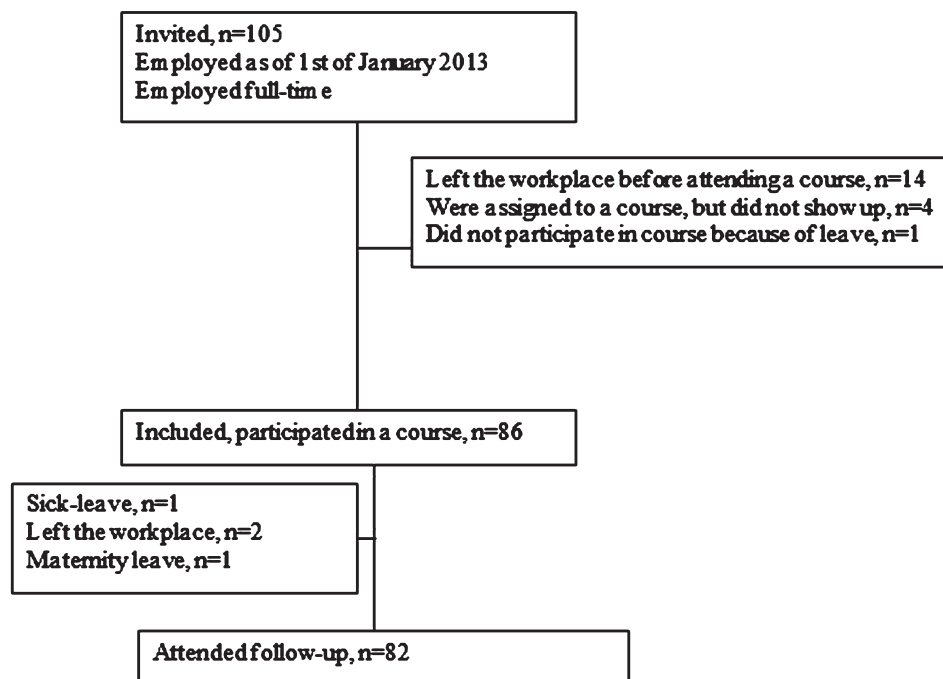


Fig. 1. Flow-diagram.

Table 2. Demographic data

Age* (n = 84) years	Median (range)	44 (27–64)
Sex (n = 86)	Men n (%)	27 (31.4)
	Female n (%)	59 (68.6)
Self-reported hand eczema at baseline† (n = 75)	Present n (%)	8 (10.7)
	Past n (%)	9 (12.0)

*It was not possible to get the age for two participants.

†Only respondents to the first questionnaire.

to the second questionnaire, 4 did not receive the second questionnaire, either because they were no longer employed at the workplace (n = 2), or on maternity leave (n = 1) or sick leave (n = 1). Sixty nine (80%) responded to both questionnaires. All participants were evaluated according to the hand eczema severity index (HECSI) at the course and 82 (95%) at follow-up, see Fig. 1.

The mean follow-up time was 111 days (median 115 days, range 64–195). None of the participants used the opportunity to be seen by a dermatologist without having to go through the commonly used referral system going through the patient's general practitioner.

Demographic data can be seen in Table 2. At baseline 11% (n = 8) had self-reported hand eczema and 12% (n = 9) had a self-reported history of hand eczema.

Exposures

Answers to the exposure questions in the two questionnaires are shown in Table 3. There was a significant shift towards fewer daily hand washings as well as hand disinfections, from baseline to follow-up ($p < 0.001$ and $p = 0.001$, respectively). There was no significant change in hours exposed to wet work overall, however, fewer participants reported that they were exposed to wet work more than 5 hr/day at follow-up than at baseline ($p = 0.021$), see Table 3. No significant change from baseline to follow up was found with respect to use of protective gloves (hours/day), type of protective gloves used, availability of hand moisturiser at work and use of hand moisturiser at work (Table 3). There was no significant change in number of daily hand washes outside work from baseline to follow-up.

Knowledge

The percentage of correct answers to the knowledge questions for the participants that responded to both questionnaires is given in Table 4. Overall the mean number of correct answers (not including the last question

addressing use of corticosteroids) rose from 6.3 to 7.3 ($p = 0.006$).

There was a significant increase in the frequency of correct answers from baseline to follow-up with respect to the question, 'Which of the following statements concerning moisturisers do you believe is correct?' from 52 to 69% ($p = 0.041$), the same was found for the question, 'When should you use cotton gloves under protective gloves? (rubber or plastic gloves)', (39% vs. 66%, $p = 0.027$). Also more participants at follow-up correctly identified that it is important to use a moisturiser with a high content of fat to prevent hand eczema (54% vs. 73%, $p = 0.017$). No significant changes were seen with respect to the other questions.

HECSI

The mean HECSI score decreased from 2.8 at baseline to 1.8 at follow-up for the 82 participants that participated in both the course and in follow-up, ($p = 0.002$, Table 5).

In total 86 participants were assessed with HECSI at baseline. Of these 42% had a score of 0, 42% a score of 1–5, and 16% a score above 5, with the maximum score being 16. Of the 75 participants who returned the first questionnaire, 8 (10.7%) reported present hand eczema; half of these had a score over 5, while 9 (12.0%) participants reporting no present hand eczema had a score above 5. Eighty two participants were assessed with HECSI at follow-up. Here 62% had a score of 0, 28% a score of 1–5, and 10% a score of more than 5 with a maximum of 24.

Discussion

In the present one-group, pre-post design study the effect of a low-cost 'on-site' educational intervention was investigated. The intervention focused on the operational level as well as management. The results show a significant improvement in behaviour, increase in knowledge, and decrease in skin symptoms when re-investigated after 3 months. The study also shows that cleaning staff have a high degree of exposure to wet work.

Exposure and knowledge

Overall, the participants had a high degree of exposure to hand damaging work, with 32.8% reporting exposure to wet work for more than 5 hr a day at baseline and almost a fifth at follow-up. A previous study by Jungbauer et al. showed that healthcare workers over-reported wet work in the questionnaire when compared to observation, which showed less than half the duration of wet work

Table 3. Exposure and hand protective behaviour. Only those who have replied to both questionnaires (n = 69)

		Baseline		Follow-up		p-value (Wilcoxon signed ranks test)
		N	% *	N	% *	
Work related	No of hand disinfections daily at work					
	None	3	4.3	1	1.4	–
	1–5	9	13.0	12	17.4	–
	6–10	13	18.8	25	36.2	–
	11–15	10	14.5	8	11.6	–
	16–20	13	18.8	8	11.6	–
	>20	19	27.5	8	11.6	0.001
	Missing answers	2	2.9	7	10.1	–
	No of hand washings daily at work					
	None	0	0	1	1.4	–
	1–5	10	14.5	19	27.5	–
	6–10	15	21.7	20	29.0	–
	11–15	9	13.0	5	7.2	–
	16–20	13	18.8	6	8.7	–
	>20	16	23.2	5	7.2	<0.001
	Missing answers	6	8.7	13	18.6	–
	Hours exposed to wet work during a work day (hr/day)					
	None	3	4.3	2	2.9	–
	<0.5	10	14.5	13	18.8	–
	0.5–2	12	17.4	12	17.4	–
	2–3	11	15.9	12	17.4	–
	3–5	9	13.0	16	23.2	–
	More than 5	22	31.9	12	17.4	0.183
	Missing answers	2	2.9	2	2.9	–
	Use of protective gloves during work (hr/day)					
	None	1	1.4	1	1.4	–
	<0.5	3	4.3	4	5.8	–
	0.5–2	2	2.9	4	5.8	–
	2–3	5	7.2	9	13.0	–
	3–5	22	31.9	28	40.6	–
	More than 5	34	49.3	23	33.3	0.050
	Missing answers	2	2.9	0	0.0	–
	Type of protective gloves used (several types could be ticked)					
	Latex (unpowdered)	33	47.9	44	63.8	–
	Synthetic rubber	20	28.9	18	26.1	–
	Plastic	23	33.3	16	23.2	–
	Cotton under rubber gloves	7	10.1	11	15.9	–
	Do not know	6	8.7	0	0.0	–
	Do not use gloves	1	1.4	0	0.0	0.716
	Missing answers	2	2.9	2	2.9	–
	Is there hand moisturiser available at your workplace?					
	No	6	8.7	2	2.9	–
	Yes	62	89.9	65	94.2	0.375†
	Missing answers	1	1.4	2	2.9	–
	How often do you use moisturiser on your hands while at work?					
	Do not use	3	4.3	1	1.4	–
	Not every day	6	8.7	7	10.1	–
	1–2 times per day	19	27.5	22	31.9	–
	More than 2 times per day	40	58.0	37	53.6	0.873
	Missing answers	1	1.4	2	2.9	–
Outside work	No of hand washings daily outside work					
	1–5	21	30.4	21	30.4	–
	6–10	24	34.8	27	39.1	–
	11–15	10	14.5	13	18.8	–
	16–20	5	7.2	4	5.8	–
	>20	8	11.6	4	5.8	0.393
	Missing answers	1	1.4	0	0.0	–

*Who responded to both questionnaires.

†McNemer's test.

Table 4. Knowledge questions (n = 69)

Questions	Answers (correct answers are in <i>italic</i>)	Baseline		Follow-up		p-value (McNemer's test)
		n	% *	N	% *	
Which of the following statements concerning moisturisers do you believe is correct?	<i>Moisturiser must be used frequently by individuals suffering from hand eczema, because it is an important treatment of hand eczema.</i> Other answer options: It is important not to use moisturiser too frequently because it inhibits the skins natural moisture ability Moisturiser must not be applied on eczema.	34	49.3	42	60.9	0.041
When should you use protection gloves (rubber or plastic gloves) when you suffer from hand eczema? (more options)	<i>When you do wet work</i>	48	69.6	55	79.7	0.189
	<i>When cooking/handling of food</i>	26	37.7	29	42.0	1.000
	Other answer options: Never The whole time					
Is it important whether you wear your finger rings or not when you have hand eczema?	Yes	40	58.0	53	76.8	0.143
	Other answer option: No					
What temperature should the water be when you wash your hands?	<i>Cold/lukewarm</i>	54	78.3	58	84.1	1.000
	Other answer options: Warm It does not matter					
When should you use hand disinfection instead of soap and water?	<i>When the hands are not visibly dirty</i>	26	37.7	36	52.2	0.189
	Other answer options: Always When the hands are visibly dirty					
	Never					
When should you use cotton gloves under protection gloves? (rubber or plastic gloves)	<i>When you use protection gloves for more than 10 min.</i>	23	33.3	42	60.9	0.027
	Other answer options: Always when you use protection gloves					
	Never					
Which of the following statements do you believe is correct?	<i>You should use gloves outside in cool weather to protect the hands against becoming dry</i>	47	68.1	44	63.8	1.000
	Other answer option: You should not necessarily use gloves in cool weather, as fresh air and sun are important					
Which moisturiser should you use for the hands to prevent or treat hand eczema? (more options)	<i>A moisturiser with a high amount of fat</i>	37	53.6	48	69.6	0.017
	<i>A moisturiser without perfume</i>	44	63.8	35	50.7	0.230
	Other answer options: A moisturiser with a high amount of water					
Where on the hands should the moisturiser be applied?	<i>On the whole hand</i>	59	85.5	60	87.0	1.000
	Other answer options: Only at the site of eczema					
	Only on the palm of the hand and the fingers					
	Only on the back of the hand and the fingers					
Where on the hands should steroid cream be applied? [†]	<i>Only at the site of eczema</i>	11	68.8	9	69.2	1.000
	Other answer options: Only on the palm of the hand and the fingers					
	Only on the back of the hand and the fingers					
	On the whole hand					

*Who responded to both questionnaires.

[†]Question to patients with past or present hand eczema only.

Table 5. HECSI (n = 82)

	Baseline	Follow-up	<i>p</i> for difference *
HECSI (mean score/SD)	2.8/4.0	1.8/4.4	0.002

SD, standard deviation.

*Related samples Wilcoxon signed ranked test.

(24). Therefore, the self-report of exposure to hand damaging work must be considered with caution, but even with the risk of over-reporting in mind the data indicates that the cleaning personnel in this study is highly exposed. In a study by the same group, office cleaning workers were observed, and it was found that wet work made up 50% of the cleaning time confirming that cleaning work is a wet work occupation (25).

The decrease in the number of hours spent with wet hands, following the intervention, is seen as a positive outcome of the intervention. The change is a combination of less hours with occlusive gloves (included in the wet work parameter), as well as a decrease in numbers of hand washings. Other studies have also shown increased hand protective behaviour in groups who received an educational intervention (9–15). A study of employees in old peoples' homes also showed a decrease in hand washing (12). In the same study the intervention group had a significantly higher score in the study's knowledge quiz than the control group, which is in agreement with our findings (12). But it is important that this decrease in hand washes do not lead to a poorer hygiene and that the cleaning personnel wash their hands in the right situations, which would be interesting to explore in future studies. A shift towards better hand protective behaviour was also seen in a study of hairdressing apprentices, who were given a hand protective training programme at their school (9). In that study 68% of the control group did wet work for more than 2 hr/day compared to 50% of the intervention group (9). In our study we found a small decrease only in participants who reported more than 2 hr of wet work per day, but a larger decrease in those reporting more than 5 hr of wet work per day from 33 to 18%. This difference may be due to an even higher degree of wet work in cleaning than in hairdressing.

With respect to the answers on knowledge and behaviour questions in our questionnaire it is interesting that an increased number of correct answers on the question about use of moisturisers is not reflected in behaviour. Also improved behaviour with respect to hand washing is not reflected by an increased knowledge about this. This highlights that knowledge is not always enough and that behaviour perhaps can be changed without understanding the rationale for this change.

Clinical examination

The ultimate goal for prevention programmes is the prevention of the disease in question. We find that the participants had a significantly lower HECSI score at follow-up than when on the course. In previous studies of student auxiliary nurses and hairdressing apprentices, respectively, similar positive effects of educational interventions were reported (9, 13). In these studies the intervention was offered to students and apprentices as opposed to the present study where the intervention was directed at workers on site. Our focus has been to illustrate the effect of the intervention, using a modification of methods that have already been assessed as positive in different set-ups. We find that 12% of the participants reporting no present hand eczema in the baseline questionnaire had a HECSI score above 5 at baseline. This could perhaps be explained by an acceptance of hand eczema symptoms as being normal.

A limitation of this study was the lack of a control group and another limitation was that it was not blinded. It is also a limitation that the study was carried out over only half a year as this make it impossible to control for a seasonal effect on the severity of hand eczema. The strength of our study is the high level of participation in the educational programme and in the response rate to the questionnaires. Another important aspect is that it is a low cost intervention in real life settings, directed at both workers and management.

In this study the management was involved in the planning and encouragement of the study to ensure that there was an overall organisational involvement and acceptance of the importance of hand eczema prevention. The management had a positive attitude towards the intervention, and took responsibility to encourage workers to participate in the course. Previous studies have shown that a combination of a top-down and a bottom-up implementation method, is effective when trying to reduce work-related skin problems (16). Cleaners are a group who normally do not receive much attention. It is a group with a low level of influence on their work and low level of education, which often is a predictor of higher morbidity, and we assume that it is of particular importance for this group that management is involved in the preventive programme.

In conclusion, our data indicates a positive effect of a low-cost on-site educational intervention for hospital cleaners. The effect is seen on behaviour, knowledge and skin symptoms. The study also confirms that hospital cleaning workers have a high degree of exposure to hand damaging work. In the present study the management was involved in planning and promotion of the study. This might have had a positive effect on the outcome, however, this needs to be evaluated in future studies.

References

- 1 Arbejdsskadestyrelsen. Arbejdsskadestatistik 2011, 2012. Available at: <http://www.ask.dk/da/Statistik/Arbejdsskadestatistik/~media/ASK/pdf/statistik/Statistik%202011/Arbejdsskadestatistik2011%20endelig2011besk.pdf.ashx> (last accessed 01 September 2013).
- 2 Carøe T, Ebbelhøj N, Agner T. Arbejdsbetinget eksem. Report, 2012.
- 3 Diepgen T L, Coenraads P J. The epidemiology of occupational contact dermatitis. *Int Arch Occup Environ Health* 1999; **72**: 496–506.
- 4 Carøe T, Ebbelhøj N, Agner T. A survey of exposures related to recognized occupational contact dermatitis in Denmark in 2010. *Contact Dermatitis* 2014; **70**: 56–62.
- 5 Gawkrödger D J, Lloyd M H, Hunter J A. Occupational skin disease in hospital cleaning and kitchen workers. *Contact Dermatitis* 1986; **15**: 132–135.
- 6 Boehm D, Schmid-Ott G, Finkeldey F et al. Anxiety, depression and impaired health-related quality of life in patients with occupational hand eczema. *Contact Dermatitis* 2012; **67**: 184–192.
- 7 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**: 93–8.
- 8 Diepgen T L, Scheidt R, Weisshaar E, John S M, Hieke K. Cost of illness from occupational hand eczema in Germany. *Contact Dermatitis* 2013; **69**: 99–106.
- 9 Bregnhøj A, Menné T, Johansen J D, Søstede H. Prevention of hand eczema among Danish hairdressing apprentices: an intervention study. *Occup Environ Med* 2012; **69**: 310–6.
- 10 Dulon M, Pohrt U, Skudlik C, Nienhaus A. Prevention of occupational skin disease: a workplace intervention study in geriatric nurses. *Br J Dermatol* 2009; **161**: 337–44.
- 11 Flyvholm M A, Mygind K, Sell L, Jensen A, Jepsen K F. A randomised controlled intervention study on prevention of work related skin problems among gut cleaners in swine slaughterhouses. *Occup Environ Med* 2005; **62**: 642–9.
- 12 Held E, Mygind K, Wolff C, Gyntelberg F, Agner T. Prevention of work related skin problems: an intervention study in wet work employees. *Occup Environ Med* 2002; **59**: 556–61.
- 13 Held E, Wolff C, Gyntelberg F, Agner T. Prevention of work-related skin problems in student auxiliary nurses. *Contact Dermatitis* 2001; **44**: 297–303.
- 14 Löffler H, Bruckner T, Diepgen T, Effendy I. Primary prevention in health care employees: a prospective intervention study with a 3-year training period. *Contact Dermatitis* 2006; **54**: 202–9.
- 15 Sell L, Flyvholm M A, Lindhard G, Mygind K. Implementation of an occupational skin disease prevention programme in Danish cheese dairies. *Contact Dermatitis* 2005; **53**: 155–61.
- 16 Mygind K, Borg V, Flyvholm M A, Sell L, Jepsen K. A study of the implementation process of an intervention to prevent work-related skin problems in wet-work occupations. *Int Arch Occup Environ Health* 2006; **79**: 66–74.
- 17 Skudlik C, Weisshaar E, Scheidt R et al. First results from the multicentre study rehabilitation of occupational skin diseases – optimization and quality assurance of inpatient management (ROQ). *Contact Dermatitis* 2012; **66**: 140–7.
- 18 Wilke A, Gediga G, Schlesinger T, John S M, Wulfhorst B. Sustainability of interdisciplinary secondary prevention in patients with occupational hand eczema: a 5-year follow-up survey. *Contact Dermatitis* 2012; **67**: 208–16.
- 19 Ibler K S, Jemec G B, 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.
- 20 Agner T. Hand eczema. In: *Contact Dermatitis*, 5th edition, Johansen J D, Frosch P J, Liepöitterin J P (eds): Berlin, Heidelberg, Springer Verlag, 2011: pp. 395–406.
- 21 Held E, Skoet R, Johansen J D, Agner T. The hand eczema severity index (HECSI): a scoring system for clinical assessment of hand eczema. A study of inter- and intraobserver reliability. *Br J Dermatol* 2005; **152**: 302–7.
- 22 Fisker M H, Ebbelhøj N E, Jungersted J M, Agner T. What do patients with occupational hand eczema know about skin care? *Contact Dermatitis* 2013; **69**: 93–8.
- 23 Ibler K S, Jemec G B, Flyvholm M A, Diepgen T L, Jensen A, Agner T. Hand eczema: prevalence and risk factors of hand eczema in a population of 2274 healthcare workers. *Contact Dermatitis* 2012; **67**: 200–7.
- 24 Jungbauer F H, Lensen G J, Groothoff J W, Coenraads P J. Exposure of the hands to wet work in nurses. *Contact Dermatitis* 2004; **50**: 225–9.
- 25 Jungbauer F H, Van Der Harst J J, Schuttelaar M L, Groothoff J W, Coenraads P J. Characteristics of wet work in the cleaning industry. *Contact Dermatitis* 2004; **51**: 131–4.