

## Chapter 2

### **Effectiveness of prevention programmes for hand dermatitis: a systematic review of the literature**



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## Summary

Hand dermatitis is a prevalent disease with an episodic, chronic character. The use of medical resources is high and is often related to reduced (work) functioning. The burden is therefore high for patients and society. Management of hand dermatitis is often unsatisfactory, and for this reason prevention is important. The effectiveness of prevention programmes is, however, unknown. This study evaluates if comprehensive prevention programmes for hand dermatitis, that include worker education as an element, are effective on occurrence, adherence to preventive measures, clinical outcomes and costs compared to usual care or no intervention. The literature was systematically searched using PubMed and Embase, from the earliest to January 2010 for relevant citations. The methodological quality was assessed by two reviewers using the Cochrane criteria. The GRADE approach was used to determine the level of evidence. After reading the full text articles, 7 publications met our inclusion criteria. We found that there is moderate evidence for the effect of prevention programmes on lowering occurrence and improving adherence to preventive measures, and low evidence for the effect on improving clinical outcomes and self-reported outcomes. No studies reporting on costs were found. It can be concluded that there is moderate evidence for the effectiveness of prevention programmes of hand dermatitis versus usual care or no intervention. However, more high quality studies including cost-effectiveness are needed.

## **Background**

Hand dermatitis is a prevalent disease according to long-term registrations by general practitioners. The prevalence ranges from 25 to 66 cases per 1000 patient-years. The point prevalence varies from 5% to 10%, and incidence rates from 4% to 7% [1,2]. Hand dermatitis accounts for 90% of all occupational skin diseases [2,3]. The burden of hand dermatitis is high for individual patients. The physical and psychosocial burden for patients with skin diseases is comparable to that of patients with other chronic diseases, such as multiple sclerosis and migraine, and even higher than that of patients with diabetes mellitus [4]. The burden for society and employers is also high. The use of medical resources is high; 60% of patients visit their general practitioner at least once annually, and 20% visit a medical specialist yearly [5]. High costs are also related to productivity loss and sick leave [6]. In The Netherlands, annual costs of medical care, absenteeism and disability pensions attributable to occupational skin disease in employees are estimated to be €98.1 million [7].

Most studies focus on the treatment of hand dermatitis. Although different treatment options exist, the management of patients with chronic hand dermatitis is often unsatisfactory [8]. Because of this, primary and secondary prevention is of major importance, especially in professions known for an increased risk for hand dermatitis. For the prevention of work-related hand dermatitis, a two-way approach is usually followed: (i) Relevant contact factors at work are to be eliminated if possible; for example, hand dermatitis is strongly related to wet/dirty activities and/or wearing occlusive gloves for long periods; and (ii) Skin barrier function should be maintained and supported by preventive measures [e.g. (cotton under) gloves, pre-work creams] if avoidance of contact factors is not possible [9]. However, studies have reported difficulties in the use of individual preventive measures, such as hand washing procedures, protective gloves [10], and recommended high-fat skin care products [9]. To study workers' behaviour in using preventive measures for hand dermatitis, the attitude, social influence and self-efficacy (ASE) model is a useful theoretical framework [11]. The ASE model is based on the theory of planned behaviour [12]. According to this model, the intention regarding the behaviour of a person at risk for hand dermatitis is determined by three factors: (i) Attitude (awareness of risks and willingness to learn), which is important for the implementation of an intervention [13]; (ii) Social influence (e.g. the behaviour of colleagues and/or the lack of role models [14]) and self-efficacy (confidence of a person in performing learned behaviour); and (iii) Influence of barriers and resources, and knowledge and skills for the prevention of hand dermatitis.

In addition to the elimination of relevant contact factors at work, prevention programmes for hand dermatitis usually focus on skin care education and skin protection. An educational programme is expected to improve knowledge about skin care and – in line with the ASE model – to obtain a positive attitude towards using skin protection, followed by a change of behaviour in favour of skin protection.

Over the last few years, more studies have focused on the effects of prevention on hand dermatitis. However, there is no systematic review on the effectiveness of prevention programmes for hand dermatitis. In this review, we investigated whether comprehensive prevention programmes for hand dermatitis that include worker education as an element are effective for occurrence, improving adherence to preventive measures, clinical outcomes and self-reported outcomes, and reducing costs, as compared with usual care or no intervention.

Occurrence is defined as an episode of contact dermatitis on the hands, wrists or forearms during follow-up measurement. We made no distinction between primary and secondary prevention. Many people in the included studies already suffered from hand dermatitis at baseline.

## Methods

We performed a systematic review of the literature.

### Inclusion criteria

#### *Types of study.*

Randomized controlled trials (RCTs) and controlled trials (CTs) were included in this review.

#### *Types of participant.*

Studies wherein the intervention was aimed at patients who are at high risk for or have self-reported or investigator-assessed symptoms of dermatitis of the hand(s) were included regardless of the underlying aetiology. The terms 'eczema', 'dermatitis', 'skin problems' and 'skin lesions' were accepted whenever they referred to the hands.

#### *Types of intervention.*

Studies comparing primary and/or secondary prevention with usual dermatological care or no intervention were considered. On the basis of the components of the ASE model, the following types of intervention were considered:

- (1) Skin protection measures.
- (2) Skin care education.
- (3) Rehabilitation.
- (4) Nurse-led care, physician assistant-led care, coordinated care.
- (5) Occupational intervention, including modified work.

*Types of outcome measured.*

Studies that reported on at least one of the following outcomes were included:

- (1) Occurrence of hand eczema or hand dermatitis.
- (2) Adherence to preventive measures.
- (3) Clinical examination (severity scores).
- (4) Self-assessment outcomes.
- (5) Costs.

*Language.*

Included studies were restricted to the English language.

**Search strategy**

Publications were retrieved by a search of the following electronic databases:

- PubMed (US National Library of Medicine, NCBI), earliest to 27 January 2010
- Embase (Elsevier, EMBASE and MEDLINE combined), earliest to 27 January 2010

Detailed search strategies are presented in Appendix 1. Different combinations of sensitive and specific search terms for population and publication type were used. For the search question in this systematic review, it was considered to be not efficient to apply search terms for the intervention, control, and outcome. For this reason, we searched only on terms for population, combined with search terms for study design. The search terms for population were based on the search terms used in the review conducted in the framework of the Cochrane Skin Group [15]. Methodological search terms were selected from both indexing systems (MeSH and Emtree) to limit the search result of the population search terms to clinical studies in both databases. In addition, we scanned the reference lists of selected articles for relevant references.

**Study identification and data abstraction**

Titles and abstracts (if available) of all identified studies were stored in a database in REFERENCE MANAGER. A bibliography was generated after removing the double references, which included the title, keywords and abstract of each reference found. The study selection was completed in two steps. In step 1, two reviewers (RG and PG) independently screened the titles, keywords and abstracts of the studies obtained by the search strategy to determine whether they met the inclusion criteria. In step 2, all full text articles from publications that met the inclusion criteria in step 1 were read by two reviewers (RG and PG). The reviewers independently determined whether a study should be included. In cases of different opinions, a decision on including or excluding a study was made through discussion until consensus was reached. Two reviewers (RG and JA) independently extracted the data of the included studies onto a data extraction form that included: information on study design, population, and follow-up period, description of the intervention(s) and control group intervention, and data on relevant outcomes.

**Table 1.** Quality assessment for randomized controlled trials/controlled trials/crossover studies (Furlan [16])

	A1	B2	C3	C4	C5	D6	D7	E8	F9	F10	F11	F12	Total score	Quality
Loffler[17]	?	?	-	N/A	+	-	-	+	+	?	+	+	5/11	Low
Flyvholm[9]	+	?	-	N/A	-	+	+	+	+	?	+	+	7/11	High
Arbogast[18]	?	?	-	N/A	-	?	?	-	?	?	?	+	1/11	Low
Held 2002[19]	?	?	-	N/A	+	+	+	+	+	?	+	+	7/11	High
Schurer[20]	N/A	-	-	N/A	-	?	+	+	?	?	?	+	3/10	Low
Held 2001[21]	N/A	?	-	N/A	-	+	+	+	?	?	+	+	5/10	High
Dulon[22]	?	?	-	N/A	-	+	+	+	+	?	+	+	6/11	High

NA, not applicable; +, yes; -, no; ?, don't know.

A1. Was the method of randomization adequate?

B2. Was the treatment allocation concealed?

C3. Was the patient blinded to the intervention?

C4. Was the care provider blinded to the intervention?

C5. Was the outcome assessor blinded to the intervention?

D6. Was the drop-out rate described and acceptable?

D7. Were all randomized participants analysed in the group to which they were allocated?

E8. Are reports of the study free of suggestion of selective outcome reporting?

F9. Were the groups similar at baseline regarding the most important prognostic indicators?

F10. Were co-interventions avoided or similar?

F11. Was the compliance acceptable in all groups?

F12. Was the timing of the outcome assessment similar in all groups?

### **Quality assessment**

The methodological quality of the included studies was evaluated with the Cochrane Criteria (16). The quality assessment consists of an evaluation of the following 12 components:

- (1) Randomization procedure.
- (2) Concealed treatment allocation.
- (3) Blinding of patient.
- (4) Blinding of care provider.
- (5) Blinding of outcome assessor.
- (6) Drop-out rate.
- (7) Intention-to-treat analysis.
- (8) Free of suggestion of selective outcome reporting.
- (9) Baseline characteristics.
- (10) Co-interventions.
- (11) Compliance.
- (12) Outcome assessment.

Each component was characterized as 'Positive', 'Unclear', 'Negative', or 'Non-applicable'. At least two of three reviewers (RG, PG, and JA) independently assessed each item for the quality of the included studies (Table 1). A consensus method was used to resolve disagreement. A study was considered to be of high quality if 50% or more of the criteria were scored 'Positive', and of low quality if less than 50% of the criteria were scored 'Positive'.

### **Data analysis and the Grading of Recommendations Assessment, Development and Evaluation (GRADE) approach**

As recommended by the Cochrane Handbook for Systematic Reviews of Interventions [23], because of its many advantages [24] we present the overall outcome of the evidence using the GRADE approach. For each specific outcome, the quality of the evidence was based on five factors:

- (1) Limitations of the study design or the potential for bias across all studies that measure that particular outcome.
- (2) Consistency of results.
- (3) Directness (generalizability).
- (4) Precision (sufficient data).
- (5) The potential for publication bias.

The overall quality was considered to be high if multiple RCTs with a low risk of bias provided consistent, generalizable results for the outcome. The quality of evidence was downgraded by one level if one of the factors described above was not present. Likewise, if two or three

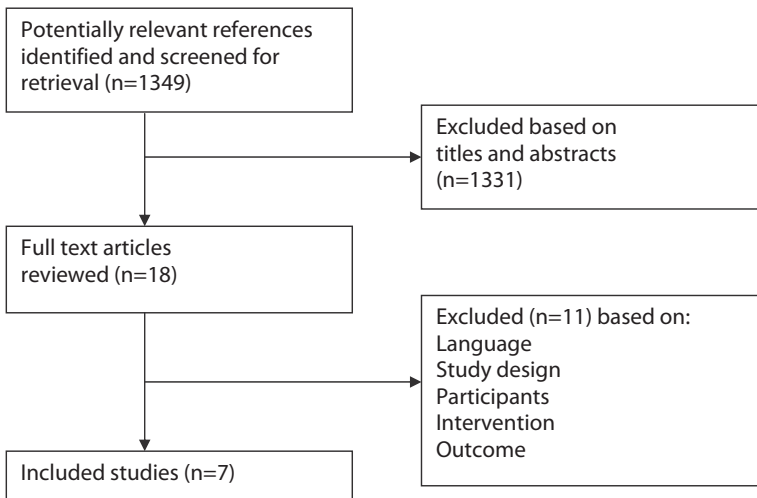
factors were not present, we downgraded the level of evidence by two or three levels, respectively. Thus, the GRADE approach resulted in four levels of quality of evidence: high, moderate, low, and very low. A high grading means that 'further research is very unlikely to change the confidence in the estimate of effect'; a moderate grading means that 'further research is likely to have an important impact on the confidence in the estimate of effect and may change the estimate'; a low grading means that 'further research is very likely to have an important impact on the confidence in the estimate of effect and is likely to change the estimate'; and a very low grading means that 'any estimate of effect is very uncertain' as defined by the GRADE working group [24]. In the case of only one study measuring an outcome, the data were considered to be 'sparse', and the evidence was subsequently labelled 'low quality evidence'.

## Results

### Study selection

From the two databases, we identified 1477 titles: 1112 in Embase and 365 in PubMed. After deletion of duplicate references, two reviewers (RG and PG) read 1349 titles and abstracts. Figure 1 shows a flow diagram of the processing of search results. We selected 18 references for retrieval of full text versions. After the full text articles had been read, seven publications met our inclusion criteria. The included studies were heterogeneous with regard to populations, interventions, control groups, and outcome measures. As a result, statistical pooling was considered to be inappropriate.

**Figure 1. Flow diagram**





### **Effectiveness for occurrence of hand dermatitis**

Four studies evaluated the effect of prevention on the occurrence of hand dermatitis. All studies reported a reduction in the number of patients with hand dermatitis in the intervention group (IG). Flyvholm et al. [9] and Held et al. [19] found a significant decrease in the number of patients with symptoms within the IG as compared with the control group (CG). Loffler et al. [17] and Schurer et al. [20] also reported positive results on the occurrence of hand dermatitis in the IG at follow-up as compared with the CG. For exact outcomes see Table 2. According to the GRADE guidelines, we downgraded the level of evidence by one level on the basis of studies' limitations. Thus, there is moderate-quality evidence from four studies that skin care education and skin protection measures have a significant positive effect on the occurrence of hand dermatitis (Table 3).

### **Effectiveness for adherence to preventive measures**

Five studies evaluated the effect of the prevention programmes on adherence to preventive measures. Three studies (Flyvholm et al. [9], Loffler et al. [17], and Held et al. [19]) found an increase in the use of protective gloves within the IG as compared with the CG, some effects of which were significant (Table 2). Dulong et al. [22] found no significant difference in the use of protective gloves. Both studies of Held et al. [19,21] found a significant decrease in the use of disinfectants in the IG as compared with the CG, although Loffler et al. [17] found no change (Table 2). The level of evidence was downgraded by one level, on the basis of studies' limitations. Thus, there is moderate-quality evidence from five studies that skin care education and skin protection measures have a significant positive effect on adherence to preventive measures (Table 3).

### **Effects on clinical outcomes and skin condition**

Five studies reported clinical outcomes and/or biological outcomes. Arbogast et al. [18] found significant improvements in the skin condition in the IG as compared with the CG in four different professions. Held et al. [19] found significant improvements in the severity of hand dermatitis in the IG as compared with the CG. However, other studies of Held et al. [21] and Dulong et al. [22] both found no significant difference between both groups at follow-up. Three studies measured the condition of the skin by determining transepidermal water loss (TEWL). Arbogast et al. [18] and Held et al. [21] found a significant difference in TEWL between the IG and the CG at follow up. Schurer et al. [20] found a decrease in TEWL values within the IG. However, this effect was not significant (Table 2). The level of evidence was downgraded by two levels, on the basis of studies' limitations (-1) and inconsistency in results (-1). Thus, there is low-quality evidence from five studies that skin care education and skin protection measures have a significant positive effect on clinical outcomes and skin condition (Table 3).

Table 2. Outcomes of the included studies.

	Occurrence	Adherence to preventive measures	Clinical / Biomedical outcomes	Self-reported outcomes
Flyvhold et al., 2005	significant relative reduction of dermatitis on hands or forearms in IG vs CG.	significant relative increase in use of cotton gloves worn underneath in IG vs CG. No significant changes in use of skin care products in both groups.	-	significant relative reduction of dermatitis on hands or forearms in IG vs CG.
Arbogast et al., 2004	-	-	FHE: Significant improvement of skin conditions using bioengineering techniques and chromatography in IG vs CG. AM: Significantly better skin condition in IG vs CG in terms of transepidermal water loss (TEWL) and skin hydration measures. PI: Significant improvement in skin hydration and expert visual grading in IG vs CG. MWI: Significant improvement of skin condition in IG vs CG.	FHF: Increase of subjective ratings on own skin in IG vs CG. PI: Increase of subjective ratings on own skin in IG vs CG.
Loffler et al., 2006	A decrease of hand dermatitis of 1.3% in IG vs an increase of 21.3% in CG	Reduction of hand washing and increased use of gloves in IG vs CG. No changes in use of hand disinfection with alcoholic preparations between groups.	-	-
Schurer et al., 2005	Decrease from 61% moderate to severe HE at baseline to 8% after 6 months in IG	-	Decrease in $\Delta$ TEWL values in IG.	Significant self-assessed improvement on skin lesions (-36%) in IG vs CG (-8%).
Held et al., 2002	Significant increase of patients without symptoms in IG after 6 months compared to baseline and in IG vs CG	Significant increase in use of cotton gloves in IG vs CG. Significant decrease in use of disinfectants in IG vs CG Significant decrease in hours of wet work in IG vs CG	Significant improvement on severity in IG vs CG.	No significant differences in self-reported skin problems between IG and CG.
Held et al., 2001	-	Significant difference in use of disinfectants between IG and CG.	Significant increase in severity (clinical examination) in both groups. Significant increase in TEWL in CG, but not in IG.	Non-significant increase in self-reported skin problems in both groups.
Dulon et al., 2009	-	No significant difference in use of protective gloves between IG and CG	No significant difference between IG and CG in frequency of symptoms	-

IG: Intervention group; CG: Control group; FHF: Fibreglass handling facility; AM: Automobile mechanics; PI: Petroleum industry; MWI: Metalworking industry

### **Effects on self-reported outcomes**

Five studies included patients' self-assessment in their studies. Flyvholm et al. [9] found a significant difference in dermatitis on the hands or forearms between the IG and the CG at follow-up, using the Nordic Occupational Skin Questionnaire (NOSQ-2002). A significant improvement in skin lesions was found by Schurer et al. [20]. No differences between the IG and the CG were found by Held et al. [19]. The other study of Held [21] found a non-significant increase in self-reported skin problems in both the IG and the CG (Table 2). We downgraded the level of evidence by two levels on the basis of limitations (-1) and inconsistency (-1). Thus, there is low-quality evidence from four studies that skin care education and skin protection measures have a significant positive effect on self-reported outcomes (Table 3).

### **Study characteristics and methodological quality**

Of the studies that met our inclusion criteria, five were RCTs and two were CTs. In one study [20], a medical history of hand dermatitis was an inclusion criterion. Three studies were of low quality, and four studies were of high quality. For detailed information on study characteristics and methodological quality, see Tables 1 and 4.

**Table 3. Effectiveness of primary and / or secondary prevention and level of evidence**

<b>Outcome measure</b>	<b>Effect</b>	<b>Level of evidence</b>
Occurrence	Significant positive	Moderate
Adherence to preventive measures	Significant positive	Moderate
Clinical outcomes and skin condition	Significant positive	Low
Self-reported outcomes	Significant positive	Low

Table 4. Summary of included studies

Author	Population and design	Intervention	Follow up	Outcome measures
Flyvholm et al., 2005	Gut cleaners in swine slaughterhouses, Denmark, RCT	Educational activities and evidence based recommendations: Protective gloves in general and the use of cotton gloves worn underneath rubber and plastic gloves. Use of high fat skin care products. The educational programme consisted of two full working days with one month in between. Control: No intervention.	1 year	Nordic occupational skin questionnaire (NOSO-2002) with modified and additional questions on exposure
Arbogast et al., 2004	Workers in multiple manufacturing environments, USA, RCT	Comprehensive skin care programme including skin conditioning lotion; 30 minutes one-to-one verbal overview about importance of skin care and coaching to apply moisturizer 3 times a day during work. Control: Only hand cleanser use	2 weeks	Skin bioengineering measurements, visual grading, self-assessment questionnaires
Loffler et al., 2006	Nurse trainees at nursing schools, Germany, RCT	Regular teaching protocol regarding all aspects of primary prevention: in the first year 3 times, in the following twice a year an educational lecture with practical parts. First contents of this training were facts about the structure and function of the skin which should be recognized as an organ by their aimed occupation. On the basis of these, skin protection measures were worked out in the group. Special training regarding care were practiced; skin care cream for the regular use. Control: Without any further teaching skin care cream for the regular use.	3 years	Interviews, dermatological examination, use of hand care creams and knowledge regarding skin care
Schurer et al., 2005	Geriatric nurses, Germany, controlled trial	Secondary prevention programme of occupational skin disease: 6 months programme of seminars, one-on-one consultation, hands-on training in skin protection and dermatological intervention. Control: one-on-one consultation, therapeutic strategies including corticosteroids, consulting a dermatologist on demand	9 months	Dermatological examination, a modified scoring system of Meding [1, 2], Uter [1, 3], questionnaires about skin lesions, use of gloves
Held et al., 2002	Employees (nurses, kitchen and cleaning) in old people's homes, Denmark, RCT	Evidence based skin care programme: proper glove use, correct hand washing procedures, use of disinfectants and moisturizers. Moisturizers and cotton gloves were freely available for all employees Control: No intervention	5 months	Self administered questionnaires, clinical examination
Held et al., 2001	Student auxiliary nurses, Denmark, controlled trial	Educational skin care prevention programme: proper glove use, correct hand washing procedures, use of disinfectants and moisturizers. The educational programme included an informative video and a booklet, 2 teaching sessions. Control: Regular teaching about skin care in control classes	10 weeks	Questionnaires, clinical examination, scoring system of Meding (REF), Uter (REF)
Dulon et al., 2009	Geriatric nurses, RCT	For senior nurses: 1-day seminar; followed by training in skin protection measures. For nurses: 3-5 sessions; information about risk factors; instructions for skin care, encouragement to develop a facility-related skin policy Control: Lifting techniques and use of assistance devices (no intervention)	1 year	Skin symptoms, behaviour, provision of skin protection

## **Discussion**

Over the last few years, an increasing number of studies have focused on studying the effectiveness of interventions for hand dermatitis. With this systematic review, we intended to gain more insights into the effectiveness of these prevention programmes for occurrence, adherence to preventive measures, clinical outcomes, and reducing costs.

### **Main findings**

From the results of this review, one can conclude that there is moderate evidence for the effectiveness of skin care education and skin protection measures in reducing occurrence and improving adherence. There is a low level of evidence for the effect in improving clinical outcomes. No studies measured the cost-effectiveness of prevention. Five RCTs and two CTs were included in this systematic review. The included studies were heterogeneous with regard to populations, interventions, control groups, and outcome measures.

### **Comparison with other reviews**

There have been few reviews on the treatment and/or prevention of hand dermatitis. In 2005, Saary et al. reviewed treatment and prevention options for contact dermatitis [26]. They concluded that a limited number of interventions effectively prevent or treat irritant and allergic contact dermatitis. However, their review mostly focused on topical treatment. As, over the last few years, more studies have been focusing on prevention programmes, a review on prevention options was necessary. A review by Moore et al. [27] discussed the effectiveness of clinical management of atopic eczema, and studied the benefits of nurse-led clinics in the management of patients with chronic illnesses. They concluded that the most effective way to manage atopic eczema is to provide adequate time for education and demonstration of intervention, which resulted in greater adherence to intervention and increased patient satisfaction with care. Cahill et al. [28] included 15 studies in their review regarding the prognosis of hand dermatitis, including cohort studies. They found that improved patient knowledge and early diagnosis may be associated with improved prognosis, whereas job change does not make a significant difference. Skudlik et al. [29] recently confirmed this last finding in their study.

### **Strengths and limitations**

The strength of this systematic review is that it focuses specifically on the effectiveness of prevention programmes for hand dermatitis. There are a number of limitations. The most important one is that the studies included differ substantially, for example in terminology and outcome measures used. As a consequence, the finding of this review that there is moderate evidence for the effectiveness of prevention of hand dermatitis should be interpreted with caution. Second, in all studies evaluating the effectiveness of preventive

programmes, it is difficult to distinguish the effects of the different components, as they are usually implemented as a composite programme. Because the contents of the programmes and interventions vary between the studies, it is not possible to draw conclusions about which aspects of prevention are effective. We made no distinction between primary and secondary prevention. Many people in the included studies already suffered from hand dermatitis. Third, not including cohort studies in this review could have biased the results. We do not think, however, that this caused a bias, because the results are in line with the review of Cahill et al. [28], who included cohort studies. Fourth, a validation of commonly used scoring systems for the clinical outcome or of simple global ratings using photographic anchors is lacking [30]. This could limit the relevance of our findings on the effectiveness on clinical outcomes. Finally, the conclusions drawn in this review are the result of a best evidence synthesis.

Ideally, outcomes of included studies are pooled to enable quantification of results. Owing to the heterogeneity of the included studies, this was not possible. Restricting inclusion to studies in the English language could have resulted in relevant articles published in other languages being missed.

### **Implications for practice**

This review provides evidence that preventive programmes including skin care education are effective for workers at risk for and with hand dermatitis. Preventive programmes are also effective for adherence to preventive measures. For this reason, we advise that, to prevent workers from developing hand dermatitis, skin care education and skin protection measures should be part of the training for people who (will) work in wet work or highrisk occupations. Working organizations should play an active role in providing opportunities for prevention, by organizing educational meetings and making protection measures available.

### **Implications for research**

The most important implication of this review for research is that there is a need for high-quality RCTs. Because of the high costs of hand dermatitis, there is an urgent need for cost-effectiveness evaluations. Studies report difficulties in the use of individual preventive measures, such as gloves and recommended high-fat skin care products [13]. Organizational measures are promoted in hospitals, because it has been shown that lack of support by senior role models and/or management support [13,14] are the main obstacles to adherence to preventive measures [14,31]. Because our review lacked studies evaluating the effectiveness of these organizational measures, more studies on the effect of such organizational measures are needed.

## **Conclusion**

On the basis of this systematic review, it can be concluded that there is moderate evidence for the effectiveness of prevention of hand dermatitis on reducing the occurrence of hand dermatitis and improving adherence to preventive measures versus usual care or no intervention. There is low-level evidence for the effect on improving clinical outcomes and self-reported outcomes. No studies investigated the cost-effectiveness of prevention.

## Appendix 1. Search strategies

**PubMed (through <http://www.ncbi.nlm.nih.gov/sites/entrez>, US NLM, NCBI)**

**(Hand dermatoses[mesh] OR (“Skin Diseases, Dermatitistous”[mesh] AND (hand[tiab] OR hands[tiab] OR palmoplantar[tiab] OR palm[tiab] OR palms[tiab] OR Hand[mesh]))) AND clinical trial[pt]**

**Embase (through <http://www.embase.com>, Elsevier)**

**(‘hand dermatitis’/exp OR ((‘dermatitis’/exp OR ‘contact dermatitis’/exp OR dermatitis/de OR ‘pompholyx’/exp OR ‘irritant dermatitis’/exp OR Contact allergy/de OR dermatitis:de OR dermatitis:ti OR dermatitis:ti) AND (‘hand disease’/de OR ‘hand’/exp))) AND ‘clinical study’/exp NOT ‘case report’/exp**

OR

**(‘dermatitis’/exp OR ‘contact dermatitis’/exp OR ‘pompholyx’/exp OR ‘irritant dermatitis’/exp OR Contact allergy/de OR dermatitis:de OR dermatitis:ti OR dermatitis:ti) AND (hand:ti,ab OR hands:ti,ab OR palmoplantar:ti,ab OR palm:ti,ab OR palms:ti,ab) AND (Controlled-study/exp OR ‘clinical trial’/exp)**

OR

**(‘dermatitis’/exp OR ‘contact dermatitis’/exp OR ‘pompholyx’/exp OR ‘irritant dermatitis’/exp OR Contact allergy/de OR dermatitis:de OR dermatitis:ti OR dermatitis:ti) AND (hand:ti OR hands:ti OR palmoplantar:ti OR palm:ti OR palms:ti) AND ‘clinical study’/exp NOT ‘case report’/exp**

OR

**Contact-allergy/de AND dermatitis:de AND ‘clinical study’/exp NOT ‘case report’/exp**



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