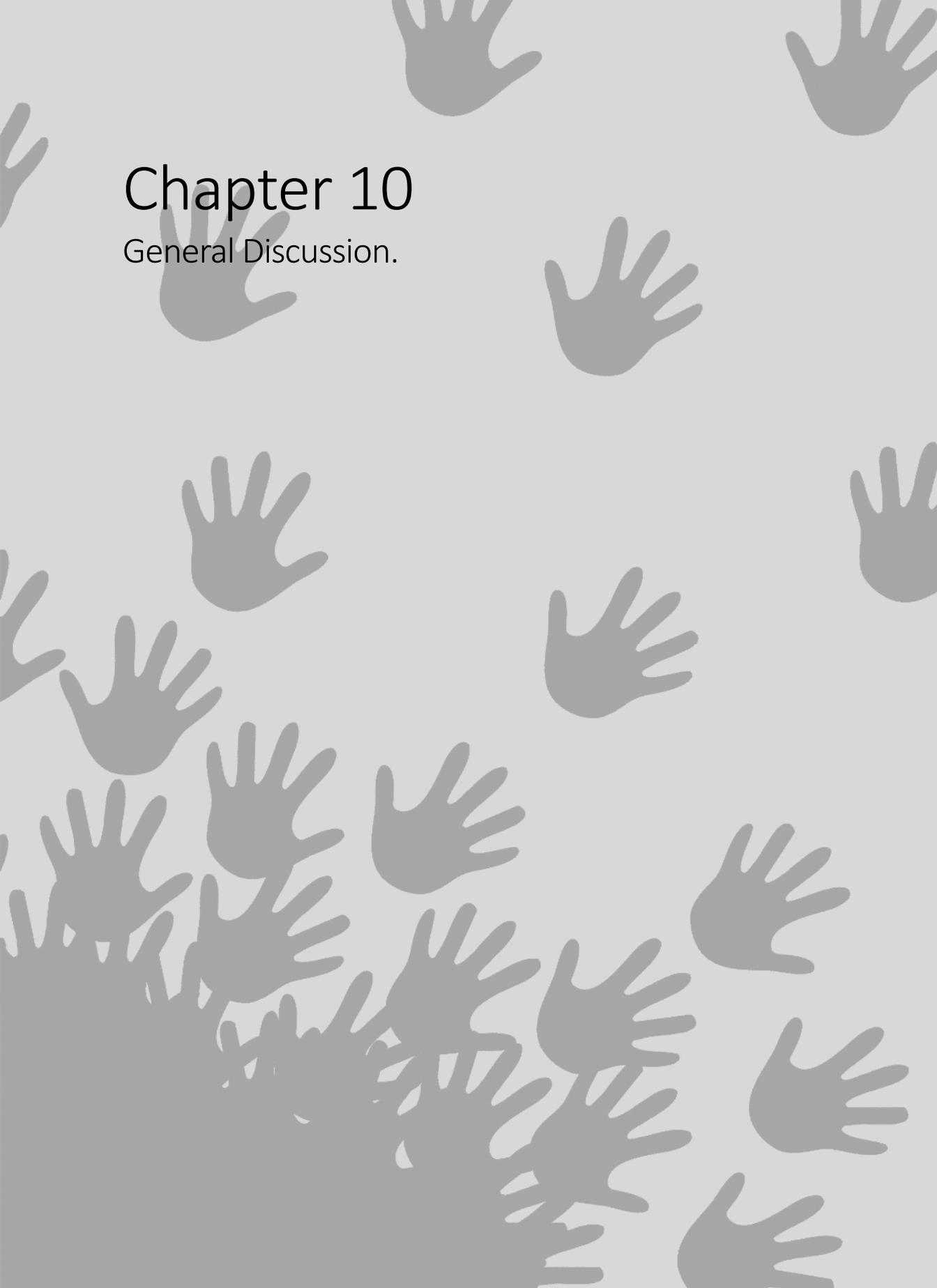


Chapter 10

General Discussion.



Hand eczema is a problem prevalent among healthcare workers due to their exposure to irritants during their work, which can cause or aggravate this condition. Therefore, it is important to prevent hand eczema among these workers. In the Netherlands, a guideline exists for the prevention of hand eczema, namely the guideline 'Contact Dermatitis' from the NVAB (Netherlands Society of Occupational Medicine). Unfortunately, many new guidelines are not implemented and put into practice. As a result, the objectives of this thesis were:

1. To develop a multifaceted implementation strategy to prevent hand eczema among healthcare workers in the Netherlands;
2. To determine the prevalence of hand eczema among healthcare workers in the Netherlands, and the productivity losses associated with hand eczema;
3. To identify barriers and facilitators for the use of the multifaceted implementation strategy and the use of the NVAB guideline in a healthcare setting;
4. To evaluate the (cost) effectiveness of a multifaceted implementation strategy to prevent hand eczema among healthcare workers in the Netherlands

In the present chapter, the main findings are summarized, and recommendations for practice and/or research are given per objective. This thesis will close with lessons learned for research and practice, and a conclusion.

OBJECTIVE 1: DEVELOPMENT OF A MULTIFACETED IMPLEMENTATION STRATEGY

The selection method for the implementation strategy

In chapter 2, we described the design of the multifaceted implementation strategy. The goal of this strategy was to implement recommendations for the prevention of hand eczema. These recommendations were derived from the guideline 'Contact Dermatitis' of the Netherlands Society of Occupational Medicine (NVAB)¹. To accomplish this, several components were selected to be part of the multifaceted implementation strategy. The components consisted of: 1) a leaflet containing the NVAB recommendations; 2) a short educational session on (the prevention of) hand eczema; 3) participatory working groups that, identified problems with implementation of the recommendations, found solutions for these problems, and implemented these solutions within their departments; 4) role models who stimulated the use of the recommendations among their colleagues; and 5) reminders (posters) containing the NVAB recommendations. A trained occupational nurse carried out the intervention.

According to Bosch et al.², an implementation strategy must be chosen following a barrier and facilitator (problem) analysis which identifies the most important barriers and facilitators for implementation. The chosen strategies have to be in accordance with these specific barriers³. Without performing a problem analysis beforehand, a mismatch of the strategies with the barriers and facilitators for implementation might happen. Even effective strategies for implementation fail to achieve an effect

when they do not match with the barriers for implementation³. In our study, the problem analysis was based on literature on implementation, participatory ergonomics, and hand eczema prevention. In addition, we selected the components of the strategy based on the framework provided by Fleuren et al.⁴, who defined five levels to target implementation measures on (socio-political, organization, user, innovation, and facility). Each component of the strategy (education, participatory working groups, role models, reminders) targeted at least one of these levels (chapter 2). Using theories is a promising way to select implementation strategies, but evidence for the use of implementation strategies in healthcare workers is scarce, and it might be questionable whether the general implementation literature can be generalized to this group³. Therefore, we might have selected more appropriate implementation strategies – aimed at barriers and facilitators experienced by the healthcare workers – by performing our own problem analysis before the start of the study, and not relying solely on general literature. To tailor the strategy to this specific target group, the participatory working groups in the multifaceted implementation strategy ensured that barriers specific for the work environment of the healthcare workers were selected, and that the solutions they found for these barriers were a match. As a result, the problem analysis for healthcare workers was partly covered. However, in future research it would be advisable to perform a problem analysis in the target group before the start of the study to make sure that the selected implementation strategies are in accordance with the barriers and facilitators that are specific for the target group.

Discussion of the methodology and design of the effect evaluation of the multifaceted implementation strategy

To be able to evaluate the effects of the multifaceted implementation strategy, a randomized controlled trial (RCT) was designed. In this trial, 1649 healthcare workers were included, who performed wet work and who worked mainly at university medical hospitals (chapter 2). Below, we will reflect upon the design and methodology of the study, and we will give recommendations for future research.

Randomized controlled trial.

The study participants were randomly allocated to one of two groups: 1) the group receiving the multifaceted implementation strategy (intervention); and 2) the group receiving only a leaflet containing evidence-based recommendations from the NVAB guideline (control group). In total, 773 healthcare workers participated in the control group, and 876 in the intervention group.

When properly performed, RCTs provide trustworthy evidence for the effectiveness of interventions⁵. In addition, due to the randomization procedure in RCTs, selection bias and confounding are largely avoided, and RCTs give insight into causality⁶. One threat to the design of our study was that the control group could be contaminated by the intervention group, as both conditions were performed within the same hospitals. To minimize the contamination of the control group, we used cluster randomization, so that randomization could take place at the level of departments (chapter 2). In addition, we used pre-stratification to establish equal groups within department level, concerning the risk for hand eczema (high versus medium/low), and whether the workers at the department had contact with patients. Unfortunately, the randomization coincidentally led to relevant differences in, among others, hand

eczema prevalence between the control and intervention group (chapter 7 & 8). To correct for these differences, we corrected for the baseline values of hand eczema in chapter 7 and 8 for all outcome measures.

Another point of consideration concerning the RCT, is the choice of employing a minimal implementation strategy, which in our study was delivered to the control group in the form of distributing a leaflet. Following the study of Grol et al.⁷ we assumed that the leaflet would not lead to any change in the behaviour of the healthcare workers, in terms of exploiting the NVAB guideline. However, a recent review showed that printed educational materials might in fact have a small effect on healthcare professionals' behaviour after all⁸. This might thus have minimized the contrast between the intervention and the control group. However, as the goal was to investigate how to implement the guideline, it was necessary to inform both groups about NVAB recommendations. Otherwise, we would not have known whether simply distributing the guideline would have been cost-effective or whether a more comprehensive multifaceted strategy was needed.

Outcome measures.

The primary outcome measure was defined as the self-reported 3-month prevalence of hand eczema. Secondary outcome measures were: behaviour in relation to the compliance to the NVAB recommendations, knowledge of the NVAB recommendations, awareness, behavioural determinants, and costs related to hand eczema. All outcome measures were assessed by means of a self-reported questionnaire (chapter 2). For behaviour related to hand eczema prevention (wet work in particular), Jungbauer et al. found that observations and self-reports do not correspond⁹. To overcome this problem, we decided to collect purchase data from the participating departments to have a more objective measure for behavioural change (chapter 2). Unfortunately, although we did collect the data, they could not be used for analyses or comparisons. Several hospitals underwent a change in registration of purchases during the study period, making the purchase data difficult to compare. In addition, many departments ordered products only once, at the start of a year for the whole year, making it unnecessary to order products during the year. This made it impossible to study a change in purchase data over time. As a result, only the self-reported outcome measures were used for the analyses. For self-reported hand eczema, this might have led to many problems, as an increased awareness toward hand eczema might have clouded the results. In addition, it might have resulted in a doubling of the prevalence rates of hand eczema within the intervention group (chapter 8). This so-called 'awareness-effect' will be discussed in more detail later in this chapter. For behaviour, the self-reports could have led to an overestimation of the effects, because the participants knew what behaviours were expected of them. On the other hand, the control group knew this as well, probably minimizing the effect of social desirability on the outcome measures for behaviour. However, due to the intervention group being reminded several times on how to enhance their behaviour, the effect of social desirability was probably larger in this group. Because of the size of this study (over 1500 participants), the only way to obtain objective data is to observe a small portion of the study population, by means of blinded assessors – for behaviour as well as hand eczema – and extrapolate these findings to the population as a whole.

Another limitation concerning the questionnaires is related to the measurement of medical costs. Medical costs were obtained only from participants who stated that they had (complaints related to) hand eczema. However, by making this choice, we were not able to measure medical costs made by participants for the prevention of hand eczema. It is very likely that participants purchased products to prevent hand eczema symptoms, like moisturizers, as the prevention of hand eczema was the goal of the study. Medical costs in the intervention group might thus have been higher than we now calculated. Incorporating the costs for medical products for preventive purposes would therefore have resulted in a more complete picture of the total medical costs. However, we expected medical costs to only be a small fraction of the total cost, as costs for productivity losses seem to be the main cost driver for hand eczema¹⁰. This was also demonstrated in chapter 9, where the medical costs were low compared to other cost categories (absenteeism and presenteeism). Including the medical costs for participants without hand eczema would probably have influenced the total costs only very minimally. Therefore, the decision not to include these costs was justifiable, especially because we tried to limit the amount of questions in the questionnaire considering the large amount of participants in our study.

Timing of follow-up measurements.

After baseline, participants who were included in the study received a follow-up questionnaire every three months, ending at twelve months of follow-up (chapter 2). The response rate for the primary outcome measure was 66% after 12 months (chapter 8). To encourage response to the questionnaire, the questionnaire was shortened after the first or second reminder was sent. This short questionnaire only contained questions on hand eczema and behaviour in order to increase the motivation of participants to respond. Due to this decision, only 36% of the study population filled out at least 4 out of the 5 cost questionnaires (chapter 9). Another option would have been to decide, before the study started, to reduce the amount of questionnaires. The healthcare workers now received five questionnaires within one year, which might have influenced their motivation to fill out every questionnaire. However, the reason why we chose to have a questionnaire every three months was because we wanted to capture the seasonal changes in hand eczema prevalence. For future research it might therefore be advisable to distribute an extensive questionnaire – containing questions on hand eczema, behaviour, behavioural determinants, and costs – at baseline and after 6 and 12 months. An additional (very) short questionnaire can be distributed after 3 and 9 months which only includes questions on hand eczema and hand eczema symptoms. In this way, the number of questions participants have to fill out will be reduced and the seasonal changes in hand eczema prevalence are captured.

Sample size and non-responders.

The sample size calculation presented in chapter 2 revealed that 1200 workers were needed to detect a 25% change in hand eczema prevalence in the intervention group compared to the control group, based on a one-year prevalence of 24% for hand eczema. However, there were a few problems concerning the sample size calculation. First of all, the one-year prevalence of hand eczema was 12% (chapter 3) instead of the expected 24%. Second, after 12 months of follow up, only 1095 participants out of the 1649 participants filled out the question on hand eczema (chapter 8). The sample size needed ($n=1200$

completed questionnaires) was therefore not reached. The number of non-responders was considerable: more than 30% after 12 months (chapter 8). The difference between baseline values of non-responders and the baseline values of the total population, however, was minimal (chapter 8). Therefore, we assume that these differences influenced our results very marginally.

OBJECTIVE 2: PREVALENCE OF HAND ECZEMA AND PRODUCTIVITY LOSSES RELATED TO HAND ECZEMA

Hand eczema in the Netherlands: a lack of awareness or a lack of exposure?

At the beginning of this study, we assumed hand eczema to be a large problem among healthcare workers in terms of prevalence. We based this assumption in large part on a hand eczema prevalence study conducted in one hospital in the Netherlands that found a prevalence of 24%, but defined hand eczema differently than we did¹¹. Based on our results in chapter 3, we found that the problem was not as big as this study suggested. Only 12% of the 1232 healthcare professionals (healthcare workers with patient-related tasks) reported hand eczema in the past year. This is more or less on par with the one-year prevalence of hand eczema in the general population¹². The low prevalence of hand eczema in our study population compared to the literature could be explained in several ways.

A first explanation could be that healthcare professionals might not be aware of what hand eczema is, and therefore they do not report it (chapter 3). This was reflected by the finding that the prevalence of hand eczema was low, but the prevalence of symptoms related to hand eczema was high: almost 50% of the population reported these symptoms within a span of 3 months. In addition, the intervention seemed to have raised awareness for hand eczema and might have resulted in an increased prevalence of self-reported hand eczema in the intervention group (chapter 8). This suggests that the problem was probably there, but was not recognized by the healthcare workers. Our study might have helped place a spotlight on a hidden problem.

An alternative explanation is that the prevalence of hand eczema was indeed low. This finding might be partly influenced by the population we selected for our trial. Although the study population of the trial seemed representative for healthcare workers in general (chapter 3 and chapter 8), the main group consisted of employees from university hospitals. Jungbauer et al.⁹ showed that nurses in nursing homes are more frequently exposed to wet work compared to nurses in intensive care units and regular wards of the hospital. In addition, the study by Visser et al.¹³ found that the type of exposure to wet work in apprentice nurses differed between settings: in hospitals, exposure to wet work was mainly due to the use of disinfectant, while in nursing homes and homecare the main exposure was caused by hand washing. They also suggested that disinfectant use did not lead to an increased risk for hand eczema, while hand washing did in fact lead to an increased risk¹³. As a result, nurses in nursing homes might

have a higher risk for developing hand eczema. Unfortunately, in our study only two small nursing homes were included. The other participants were recruited from university hospitals where the exposure to wet work might have been lower. Therefore, we advise to incorporate more nursing homes in future studies on hand eczema, to capture the wide range of exposure to wet work in healthcare workers.

Problems with determining absenteeism and presenteeism due to hand eczema

Hand eczema seemed to have only a minor influence on work, as sick leave due to hand eczema was reported by 0.3% of the population, and of the healthcare professionals with hand eczema only 1.7% reported sick leave owing to hand eczema. In addition, the quality and amount of work the healthcare professionals with hand eczema performed on days they went to work with hand eczema was hardly effected by their condition (chapter 3). We concluded in chapter 3 that the compensation system in the Netherlands might explain part of the low percentage for sick leave. In the Netherlands, no distinction is made between work-related and non-work-related diseases for receiving sickness or disability pensions. Workers receive these pensions regardless of whether their disease is work-related. As a result, there is no urgency in the Netherlands to recognize work-related diseases. This might lead to an underreporting of absenteeism resulting from hand eczema, since the healthcare workers perceived no need to mark their sick leave as work-related. For the small effects of hand eczema on productivity at work, we hypothesized in chapter 3 that hand eczema might not interfere with work. In chapter 9, we also suggested that the intervention might have increased awareness among participants about how their hand eczema can affect their work. Therefore, the presenteeism measured at baseline might be an underestimation of the true effect of hand eczema on work productivity. However, there are also other problems related to the concepts of absenteeism and presenteeism.

The first problem is that according to the overview studies by Zhang et al.¹⁴ and Krol et al.¹⁵, it is almost impossible to objectively measure presenteeism and absenteeism. As a result, most studies rely on self-assessment – like our study – to assess both concepts^{14;15}. Reduction in the quality of work due to a health condition is especially difficult to measure using self-assessment¹⁴. It therefore begs the question as to whether the assessment of absenteeism and presenteeism in our study was accurate. Second, the few (all quantitative) studies on hand eczema and the relation to work performance showed mixed results¹⁶. Therefore, a recommendation would be qualitatively studying if and how hand eczema can influence work productivity. The advantage of qualitative research on this topic over quantitative, is that qualitative data may give insight into the underlying reasons for certain actions. Workers can then explain exactly how hand eczema influences their work, instead of being restricted to answer categories predefined by researchers. This might be especially interesting, because – and this is the third problem – no consensus exists on which instrument to use to measure presenteeism¹⁴; while the use of one versus another instrument might generate differences in presenteeism. For instance, in our study we used two different instruments to measure presenteeism, namely the WHO-HPQ (World Health Organization Health and Work Performance Questionnaire)^{17;18} and a modified version of the PRODISQ (PROductivity and DISease Questionnaire)¹⁹. Both gave different outcomes in terms of costs (chapter

9). Investigating this concept qualitatively might therefore give more valuable insights into the problem, compared to quantitative research on this topic.

OBJECTIVE 3: BARRIERS AND FACILITATORS FOR THE MULTIFACETED IMPLEMENTATION STRATEGY AND THE NVAB GUIDELINE

How well can the NVAB recommendations be implemented among healthcare workers?

One of the main goals of the multifaceted implementation strategy was to implement the NVAB recommendations among healthcare workers. This implementation was operationalized by measuring behaviour related to the specific recommendations. In chapter 7 and 8, one of the conclusions was that the multifaceted implementation strategy was effective in implementing the following recommendations: 1) Use a disinfectant instead of water and soap (effects on hand washing); 2) use a moisturizer on a daily basis; and 3) wear cotton under gloves if wearing gloves for longer than 10 minutes. The strategy showed no effect in terms of encouraging the use of a disinfectant and gloves, or decreasing the use of/exposure to wet work, jewellery, and body lotion (chapter 7 & 8). In line with these results, chapter 4 showed that the working group mainly implemented solutions with the goal to stimulate the implementation of moisturizers and hand hygiene procedures. This was probably because the latter was also beneficial for infection prevention within the department, and the moisturizer was probably chosen because very few workers use moisturizer on a daily basis (chapter 4). In addition, the strategy was effective in enhancing the compliance to the guideline as a whole in the intervention group compared to the control group (chapter 7 and 8).

However, as mentioned above, not all recommendations were implemented, and – as presented in chapter 4 and 5 – there were barriers (and facilitators) for each recommendation that might have lowered the magnitude of the effects. Wearing cotton under gloves particularly evoked a lot of resistance (chapter 5), and solutions on cotton under gloves were implemented only very minimally within the intervention departments, as our process evaluation showed (chapter 4). For the implementation of the NVAB recommendations, some ideas can be formulated about how the implementation might be enhanced.

To begin with, certain elements of the NVAB guideline itself could be improved. The multifaceted implementation strategy was not effective for wet work, e.g. the amount of time the hands of the healthcare workers are moist or wet during a workday (chapter 7 and 8). Moreover, very few working groups prioritized wet work as one of the recommendations they wanted to implement (chapter 4), while at baseline, more than 15% of the workers in the intervention group reported performing wet work for more than 2 hours a day. In chapter 7 we argued that the lack of effectiveness of the recommendation for wet work could be explained by the fact that the NVAB guideline focused on

diminishing wet work by means of wearing gloves¹. Also, in the scientific literature, gloves are mentioned solely for the diminishment of wet work, such as in the review of Agner and Held²⁰ and in the study by Jungbauer et al.¹ on wet work in nurses. However, gloves are not the only solution for reducing wet work. In chapter 5, the interviewees came up with some interesting ideas for diminishing wet work, for instance, using microfiber cloths to wash patients, and letting patients wash themselves. It would therefore be interesting to study whether these measures might also reduce wet work - they may provide more options for diminishing wet work, apart from wearing gloves. This is especially important, because compatibility – the degree to which the guideline is perceived by the healthcare workers as being consistent with the work they have to perform⁴ – was a major problem for the implementation of the guideline (chapter 5). Giving working groups more options to solve a problem, might work enhancing, because they then can choose the option that fits their work best. Another point that might need to be adjusted in the NVAB guideline is the recommendation not to wear jewellery at work. We added this recommendation to the intervention protocol because irritants can become trapped beneath – for instance – a finger ring leading to hand eczema²⁰. However, this recommendation was not incorporated in the NVAB guideline¹. We do not know why it was not included in the guideline. The literature suggests that wearing jewellery can be a risk factor for developing hand eczema²⁰; adding this recommendation to the NVAB guideline should be considered.

There is also another way the implementation of the recommendations can be improved. Chapter 5 showed that many barriers for the implementation of the NVAB guideline were at the level of innovation (the guideline) itself. These barriers were largely related to the concept of compatibility. Apparently, it was rather difficult for the working group members to translate the recommendations from the NVAB guideline to their daily practice. According to Ploeg et al.²¹ role models can have the task to make this translation and to tailor the guideline for implementation, within the context of their work. However, as chapter 6 showed, role models did not mention this as one of their main tasks. This is probably due to the fact that we did not mention this task during role model training (chapter 6). Ploeg et al.²¹ argue that in this role, role models are similar to linking agents. Linking agents help to bridge the gap between new information (the guideline) and daily practice²². Ploeg et al.²¹ argue that to perform this role, training is needed. A way to improve the implementation of the NVAB recommendations might therefore be to train the role models to take on a linking agent role. However, Thompson et al.²² consider a linking agent to be an external person or organisation, therefore, it might be a better idea to incorporate the role of the linking agent in the package of the specialized nurse, who provides guidance for all the intervention components (working groups, role model training, and education). The specialized nurse could help the working groups to tailor the NVAB recommendations to their work context. During the educational session the specialized nurse could also give more practical instructions on how to use the guideline in daily work. During the study period, the specialized nurse merely provided guidance for the process, but was not trained, nor requested, to help the working group or the department to tailor the NVAB recommendations to the work context. The role of the specialized nurse could therefore be expanded with this extra role, while the original role models continue to perform their role as they learned during training.

The implementation of the components of the multifaceted implementation strategy

In addition to the implementation of the NVAB recommendations, chapter 4 discussed the implementation of the multifaceted implementation strategy. Below, we will discuss the findings from this chapter per component of the strategy. In addition, recommendations will be given on how the components can be improved for future implementation research.

Education.

During the educational sessions, workers were informed about how to prevent hand eczema and how to use the recommendations from the NVAB guideline. The goal of these sessions was mainly to increase knowledge and awareness about (the prevention of) hand eczema. This seemed to have worked well, as the strategy was effective on knowledge and awareness compared to the control group six months after baseline (chapter 7). On the other hand, attendance rates for the educational sessions were quite low: only 52% of the workers went to the educational sessions (chapter 4), while in chapter 5, increasing knowledge was considered to be a very important facilitator for the implementation of the recommendations. In chapter 4, we recommended planning more educational sessions beforehand and at different moments to enhance attendance rate. Forsetlund et al.²³ suggested in their review that healthcare workers who go to educational sessions are probably more interested in the subject being taught, and therefore they are already performing well regarding the encouraged behaviour. For the healthcare workers who do not attend educational sessions, the opposite might be true: they are less interested in the subject, and as a result they do not perform the desired behaviour²³. Therefore, these healthcare workers are the group that needs the educational sessions most. A higher attendance rate, especially among this group, might thus contribute to a more effective strategy. More research is needed to investigate how attendance rates in this group could be improved.

The working groups.

The goal of the working groups was to identify barriers associated with the implementation of the NVAB guideline, to find solutions for these barriers, and to implement them within their departments. A specialized nurse guided the working group sessions with a high fidelity (85%) to the study protocol (chapter 4). The specialized nurse delivered almost all the working group meetings to the intervention departments (94%). Working group members themselves delivered 87 out of the 104 solutions (84%) within their departments. Of the workers at the departments, 92% noticed at least one solution implemented by the working group, and of those workers, 96% used at least one solution. The working groups ensured, as argued in chapter 4, that the most feasible solutions for their departments were selected. Considering these points, the working groups might have been the most successful part of the implementation strategy. However, chapter 4 also identified two weaknesses within this strategy: 1) recommendations from the NVAB guideline that require more effort to implement might never be prioritized – and thus implemented – by the working groups; and 2) many selected solutions were solutions on education and information. Education was already integrated in the multifaceted implementation strategy. A recent review on educational strategies did not find significant differences

between (moderate) intensive education and non-intensive education²³. This suggests that providing more educational sessions to the same group of people might not increase the effectiveness of the multifaceted implementation strategy. In addition, solutions on information – e.g. written material – might not increase implementation, as a leaflet was already part of the strategy. Given these arguments, it might be advisable to help the working group select more effective implementation strategies when choosing solutions for the identified barriers. A characteristic of the participatory approach used in the working groups is that workers have to have sufficient knowledge to influence processes and outcomes to achieve their goal²⁴. Yet, the working group members received no information on effective implementation strategies during the meetings. Therefore, an idea would be to inform the working group members about this subject during the meetings, so that they are capable of making an informed decision on which implementation strategy to choose. The other problem with the participatory working groups was that difficult to implement recommendations were not prioritized. However, it is not possible to adapt the working groups in such a way that these recommendations are also included, as the method is based on easy changes²⁵. A different implementation strategy is thus needed to solve the more difficult implementation problems. In the previous paragraph this was touched upon by discussing how barriers related to the innovation level can be reduced.

The role models.

One component of the strategy that did not entirely work as intended was that of the role models. The goals of the role models were to encourage the use of the NVAB guideline among their colleagues, to be a good example for their colleagues, and to address their colleagues when non-adherence was observed. Chapter 7 showed that social influence did not show significant effects. In addition, chapter 4 showed that only 64% noticed the role models and only one third of the workers actively engaged with the role models, while almost all the role models stated that they performed at least one task related to their role (93%). In addition, role models were not always enthusiastic about their role or felt capable of performing their role (chapter 6).

One might argue that the role models did not contribute in terms of affecting behaviour, and might – as a result – be removed from the multifaceted implementation strategy. The implementation of the role models might indeed have been too limited to contribute to effects on behaviour. On the other hand, one can also argue that the role models are a component worth keeping. First of all, participants considered a person who keeps the subject of hand eczema prevention under the attention as an important facilitator for the implementation of the NVAB guideline (chapter 5). The same person might also play a part in the maintenance of the intervention within their department by keeping hand eczema prevention on the minds of the workers. Secondly, the study by Huis et al.²⁶ found that there is an added value of including components directed at enhancing social influence to a state-of-the-art implementation strategy. Thus, our multifaceted implementation strategy might in fact be enhanced by the role models. However, since the role models were not particularly successful at enhancing social influence, adaptations are needed to make this component of the strategy more effective.

First, the selection method can be improved. In chapter 6, we concluded that role models needed to be selected differently, for instance by selecting workers who were already familiar with coaching tasks. In

addition, in chapter 4, we suggested selecting role models who already fulfilled the role of a role model in an informal way within their department. The study by Stenberg et al.²⁷, in addition, showed that it is important that the person who is responsible for the implementation of a guideline has the knowledge, skills, and mandate to lead the implementation. That still leaves the question: who to select? Within hospital departments, there are healthcare workers who have specific areas of focus, for instance hand hygiene, wound care, safety, ergonomics, etc. They have the task to bring this subject to the attention of their colleagues. A recommendation therefore would be to expand the tasks of these healthcare workers, for instance healthcare workers who have hand hygiene as their area of expertise could include within that hand eczema prevention. These healthcare workers are more or less familiar with role model tasks, and they have a formal position within their department where they encourage awareness of certain areas.

Secondly, the study by Huis et al.²⁸ showed that, for the compliance to hand hygiene protocols, it is important to have a team culture where it is normal for workers to address each other when non-compliance is observed. To accomplish this, the study by Huis et al.²⁸ incorporated a meeting with the whole department about how you can address each other and how you give and receive feedback. A facilitator for the implementation of the NVAB guideline is also to have an open culture within their department (chapter 5). We would therefore suggest adding such a meeting to the implementation strategy. This meeting can be planned together with the educational session.

Reminders.

Of the study population, 78% reported to have seen the reminders (posters containing the recommendations from the NVAB guideline) that were placed at relevant places within the departments (chapter 4). The review by Cheung et al.²⁹ concluded that reminders are promising tools for changing healthcare professionals' behaviour. Reminders can be specifically effective for changing habits of healthcare professionals³⁰, a barrier for implementation that was also identified in our study in chapter 5. Changing habits requires a disturbance of the normal environment where behaviour takes place and that is exactly what reminders do³⁰: they change the environment of the healthcare workers. The reminders, thus, might have been an effective part of the strategy, especially because the posters were mentioned as a facilitator for the implementation of the recommendations (chapter 5). However, we cannot know this for sure, as we did not investigate the effects of the reminders separately.

OBJECTIVE 4: (COST) EFFECTIVENESS OF THE MULTIFACETED IMPLEMENTATION STRATEGY

The ASE model: a well-chosen model for studying behaviour?

In our study no effect was found on the behavioural determinants derived from the ASE model after six months (chapter 7). The ASE model is a model that explains behaviour. We used the determinants from this model to investigate behaviour related to the prevention of hand eczema. Behaviour was used as a measure for the implementation of the recommendations for hand eczema. The assumption was that

the implementation strategy had to be effective on the determinants' attitude, social influence, self-efficacy (ASE), and the intention to perform the behaviour, before an effect on behaviour could be obtained. Behaviour did show significant effects in the intervention group compared to the control group after six months (chapter 7), even though the ASE determinants did not. This leads to the question: how to interpret these results? We assumed that significant differences between the control and intervention group on behaviour would be preceded by a significant difference between those groups in the ASE determinants. As the latter did not happen, it is rather difficult to explain how the intervention worked. Which mechanisms were involved in reaching the effect on behaviour? In chapter 7, we argued that behaviour changed because barriers related to the implementation of the recommendations to prevent hand eczema were decreased, while facilitators might have been enhanced. Barriers and facilitators in the ASE model may limit a person's ability to translate their intention into actual behaviour³¹, in this case compliance with the recommendations. In chapter 2 we explained that the focus of the implementation strategy is on the model designed by Fleuren et al.⁴. This model incorporates barriers and facilitators related to the implementation of an innovation, and is not merely focused on ASE determinants⁴. In other words, the strategy targeted factors that came after attitude, social influence, self-efficacy, and intention in the ASE model. Hence, studying solely the components attitude, social influence, self-efficacy, and intention, does not seem to be a logical choice. Measuring the barriers and facilitators mentioned by Fleuren et al.⁴ would have perhaps provided more insight into the mechanisms of the strategy. Therefore, research is needed to develop a questionnaire that can measure barriers and facilitators for the implementation of innovations, like for the implementation of the guideline in our study.

The effects and non-effects of the strategy on behaviour

The multifaceted implementation strategy was effective on behaviour, but was not effective for the implementation of all recommendations related to the NVAB guideline, as has been explained previously. Below, we will reflect upon what this means for the overall effectiveness and usefulness of the implementation strategy.

The first question to address is: is an effect on some but not all specific preventive behaviour enough to prevent hand eczema? Unfortunately, the results on self-reported hand eczema (chapter 8) do not answer this question. Therefore, the results on behaviour need to be discussed by using the literature. First of all, it is not necessary to completely avoid exposure to an irritant to prevent hand eczema, because in most cases a reduction of the exposure is sufficient³². One of the most important irritants for developing hand eczema is water³³. Hand washing is one of the activities where healthcare workers are exposed to this irritant³⁴. Lan et al.³⁵ argued that reducing the frequency of hand washing might be the most effective strategy for reducing the prevalence of hand eczema in nurses. As a result, the effect on hand washing in our study (chapter 7 and 8) might contribute for a large part to the prevention of hand eczema in our study population. However, the total amount of time for wet work was not diminished following the multifaceted implementation strategy, and as a result this exposure still continues. The question is whether a diminishment in hand washing frequency is sufficient when the exposure to wet work endures. Fortunately, people in the intervention group also reported more frequent use of a

moisturizer. Moisturizers can protect the skin against repeated exposure to irritants³⁶. In addition, another protective measure showed an effect, namely the use of cotton under gloves, which protects the hands against the occlusive effect of gloves³⁷. All together, the results on behaviour look promising for the prevention of hand eczema. However, more research is needed to investigate how exposure to wet work can be diminished as this might largely contribute to the development of hand eczema.

The second point we want to discuss is wearing cotton under gloves. Remarkably, chapter 4 showed that they were hardly implemented by the working groups, and in chapter 5 many barriers were mentioned for this recommendation, while chapter 7 and 8 showed that the strategy had an effect on cotton under gloves with a rather high odds ratio at 12 months (OR: 6.3; 95% CI 3.2; 12.4). However, it was never the goal to have every healthcare worker wear cotton under their gloves. This protective measure should only be used when wearing gloves for longer than 10 minutes. In healthcare, nurses seem to wear gloves approximately 2 to 6 minutes at a time, depending on what ward they are working in⁹. This implies that the majority of the healthcare workers did not need to wear cotton under their gloves. Therefore, the implementation of wearing cotton under gloves might have been more successful than the process evaluation implies, although there is still a lot to improve for making the implementation of this recommendation more successful, as argued in the previous paragraphs.

The results on hand eczema and costs: the result of increased awareness?

The multifaceted implementation strategy showed negative results concerning hand eczema prevalence after 12 months (chapter 8), and the strategy appeared to be not cost-effective from both the societal and the employer's perspective (chapter 9). The intervention group was 1.5 times more likely to report hand eczema (95% CI 1.0; 2.0), and 1.3 times more likely to report symptoms related to hand eczema (95% CI 1.1; 1.6) compared to the control group after one year of follow-up (chapter 8).

For the findings on hand eczema and cost-effectiveness, we hypothesized in chapters 8 and 9 that these findings might be influenced by an increased awareness among healthcare workers. In chapter 8, we argued that it is not likely that hand eczema prevalence could double within only 3 months following the implementation of recommendations that are designed to prevent hand eczema. The most plausible explanation for this finding might thus be that the intervention group became more aware of hand eczema, and as a result reported hand eczema more often during the follow-up measurements. In line with this explanation, the multifaceted implementation strategy showed an effect on awareness after 6 months in the intervention group compared to the control group (chapter 7). For cost-effectiveness we argued in chapter 9 that very high presenteeism costs in the intervention group – compared to the control group – might explain why the implementation strategy was not cost-effective. To explain these high costs, we hypothesized that this might be due to an awareness effect in the intervention group, or it might be a direct product of the increase in hand eczema prevalence, as presenteeism was assessed as productivity losses at work resulting from hand eczema. When more participants reported hand eczema, it is likely that more people also filled out the questions on presenteeism, as only participants who reported that they went to work while having hand eczema filled out the questions on

presenteeism. As they might have become more aware of how hand eczema influences their work, they might have started reporting presenteeism. In conclusion, all the results in chapter 8 and 9 might be merely a result of increased awareness rather than a reflection of reality.

In the literature on hand eczema, only one other study reported this awareness effect. In this study, self-reported hand eczema increased after education, while a clinical examination did not reflect this increase³⁸. In addition, studies on other health problems reported an increase in self-reported health complaints after an intervention had taken place. The study by Thomas et al.³⁹ assessed continence status during a span of 12 months in women at two different points in time: first by means of a telephone interview, second by means of an interview with a clinician. They noticed that a quarter of all women reported a different continence status during the telephone interview compared to the clinician interview: the so-called 'switchers.' The majority of this group switched from continent to incontinent. All the switchers were contacted by phone to ask why they changed their status. One of the main reasons was that they became more aware of their continence status following the telephone interview and therefore were more attuned of a leaking experience and noticed leaking with more precision³⁹. In addition, a clustered randomized controlled trial about depression in adolescents found a negative effect on self-reported depressive symptoms following an intervention to prevent these symptoms. They concluded that this might be due to an increased awareness among study participants⁴⁰. Considering these studies and the results of our study, there seems to be an indication that awareness might influence self-reported health complaints following an intervention.

Considering the hypothesis of an awareness effect, two aspects seem to be important: to eliminate the awareness effect in future studies and to study this effect. The latter is essential, because we still do not know whether the effects observed in our study are truly a result of increased awareness or are a negative effect of the intervention. An idea to study the awareness effect would be to perform follow-up qualitative interviews – as was done in the study by Thomas et al.³⁹ – with part of the participants who switched answers during follow-up. This would give us more in-depth knowledge about why participants filled out a different answer at follow-up. As a result, we could investigate whether this was caused by an increase in awareness. It is important to gain more insight in this relatively unknown problem, as many studies study health complaints by means of self-reports. Further, it is important to find ways to eliminate the awareness effect in intervention studies relying on self-reports. In chapter 8, we discussed several methods to eliminate this effect: assessment by a dermatologist in part of the population, let participants take photographs of their hands and send them to a dermatologist for assessment, incorporating a photographic guide in the questionnaire, or to educate the control group on how to recognize hand eczema (symptoms). All ideas have their pros and cons, as discussed in chapter 8. More research is needed to investigate which of these methods would be most effective in excluding the awareness effect. Furthermore, there is a method for both investigating the awareness effect and the elimination of this effect, namely by performing a three-armed randomized controlled trial. Departments could then be randomized to one of the following groups: 1) a leaflet containing the evidence-based recommendations on the prevention of hand eczema; 2) education on how to recognize hand eczema; 3) the multifaceted implementation strategy. In this way, we could research whether education contributes to the awareness effect by comparing groups 1 and 2, and we could investigate

the effects of the multifaceted implementation strategy by comparing groups 2 and 3. However, a trial would be expensive – for the present study we already needed 1500 participants (chapter 2) – and it might be difficult to recruit so many departments for participation.

WHAT CAN RESEARCHERS LEARN FROM OUR RESULTS?

Although the multifaceted implementation strategy was effective in implementing at least a part of the recommendations for the prevention of hand eczema, the strategy did not show effects on hand eczema (the primary outcome measure), and the strategy was not cost-effective. It is still uncertain whether these negative effects were caused by increased awareness among the intervention participants following the multifaceted implementation strategy, or were a direct negative consequence of the strategy itself. The implementation and use of this strategy on a larger scale can thus not be recommended. However, the results of this study can form a good basis for the development of hypotheses for future research.

First of all, as previously argued, more research is needed to investigate and/or eliminate the awareness effect. In addition, a longer follow-up period in future research might be advisable. In chapter 8, we argued that behaviour needs to change first before an improvement of hand eczema can be expected. Therefore, more time is needed to study whether hand eczema decreases following a change in behaviour. Further, the study might be replicated in a different population. In the present study, we focused on primary prevention of hand eczema, and hand eczema did not seem to be very prevalent in our study population (chapter 3). Our study showed that an important barrier for the implementation of the NVAB guideline was that hand eczema was not perceived within the departments. Employees therefore found it difficult to give priority to a problem that they would not mark as highly important themselves (chapter 5). Focusing on populations where hand eczema is more prevalent might also be more cost-effective⁴¹.

A second point of interest is the multifaceted implementation strategy itself. The strategy seemed to be effective for implementing the guideline ‘Contact Dermatitis’ of the NVAB, as it showed positive results on preventive behaviour for hand eczema prevention. In addition, chapter 4 showed that it is a feasible strategy to use in a healthcare setting. Although, we cannot advise using the strategy for the prevention of hand eczema, it might still offer a good stepping-stone for the development of future implementation strategies. These future strategies should take into account the previously addressed points for improvements for the strategy related to: the educational session, the role models, and tackling implementation problems that are not ‘low-hanging fruits.’ Research is necessary to investigate whether these improvements lead to a more effective implementation and whether the strategy is suitable for other populations and other guidelines.

A third point that might be used from our trial is our study on role models in chapter 6. Role models are considered to be a promising element for enhancing implementation of evidence in healthcare⁴².

However, to our knowledge, only few studies investigated how role models perceive their tasks^{21;43}, and no studies exist on which barriers and facilitators role models encounter while performing their role. This information might be important to optimize their functioning. Chapter 6 provided some insights, although the results might not be generalizable because the role models were part of a multifaceted implementation strategy. However, future studies might consider the points mentioned in chapter 6 when adding role models to an implementation strategy or intervention.

A final point of consideration is that it is still important to implement the guideline ‘Contact Dermatitis’ in a healthcare setting, as healthcare workers are one of the high risk groups for developing hand eczema³⁷. Preventing hand eczema among this group becomes increasingly important, because more and more attention is being drawn to infection prevention in hospitals. Many interventions in healthcare are targeted at improving the compliance to hand hygiene protocols⁴⁴⁻⁴⁶, as compliance to these protocols seems to be low⁴⁷. However, higher compliance to hand hygiene protocols might also have consequences in terms of the risk of developing hand eczema. A review by Visscher et al.⁴⁸ concluded that repetitive hand hygiene leads to chronic irritation of the hands in nearly all healthcare workers. Apart from the problems this creates for healthcare workers themselves, it also has consequences for infection prevention. A reason for non-compliance to hand hygiene protocols is hand eczema, as was demonstrated in chapter 5: healthcare workers found it too painful to use a disinfectant while experiencing hand eczema. This was also found in the study by Kampf et al.³², and in the study by Visser et al.¹³, where apprentice nurses reduced hand hygiene activities or changed the type of hand hygiene products to reduce hand eczema symptoms. In addition, healthcare workers with hand eczema have more bacteria on their hands compared to healthcare workers with healthy skin⁴⁸. By increasing infection prevention within hospital departments one might also increase the prevalence of hand eczema, and a vicious cycle is created. Therefore, the implementation of the guideline ‘Contact Dermatitis’ is still necessary. More research is needed to develop an implementation strategy that is effective in decreasing hand eczema in this population. Important when developing a certain strategy, is to take into account the barriers and facilitators related to the NVAB-guideline mentioned by the healthcare workers in chapter 5. These barriers and facilitators can form the basis of a newly developed implementation strategy for healthcare workers.

WHAT CAN PRACTITIONERS LEARN FROM OUR RESULTS?

For practitioners, there are also some lessons to be learned from our results. First, occupational physicians should be aware that hand eczema might be underreported in the hospitals where they work. One of their main tasks in the Netherlands is to assist sick employees in their return-to-work^{49;50}, and as a result they often work with sick-listed employees. Physicians frequently mention that they never see sick-listed employees with hand eczema, and therefore they consider hand eczema a relatively small problem (based on personal communication with occupational physicians). As our study showed (chapter 3), absenteeism because of hand eczema is indeed not very prevalent. However, the prevalence of absenteeism does not resemble the prevalence of hand eczema itself, and the prevalence of symptoms

related to hand eczema. Therefore, occupational physicians might strongly underestimate hand eczema prevalence, when they base the prevalence solely on absenteeism rates. Occupational physicians should thus make use of other assessment tools to estimate the prevalence of hand eczema in their workers' population, for instance by performing risk assessments and translating the results into action to reduce risks related to hand eczema in hospitals. An additional lesson for the occupational physician is that physicians might advise healthcare workers to perform other tasks, which involve no exposure to irritants or contact with patients, or – when no other options are available – to take sick leave when having hand eczema. In chapter 3, it was demonstrated that most healthcare workers continue their work while suffering from hand eczema. As argued before, this could be a risk for the patients they work with in terms of infection prevention. Also, there is evidence that continuing work while having hand eczema might have a negative effect on the course of hand eczema⁵¹. Therefore, the occupational physicians might either advise healthcare workers with hand eczema to temporarily complete other tasks which do not involve irritants or contact with patients, or – when a change of tasks is not possible – to take sick leave while having hand eczema. In addition, occupational physicians should make people more aware of the long-term consequences of working while having hand eczema, and should give their patients suggestions on how to minimize exposure to irritants. Another lesson for practice is that physicians can learn from the barriers and facilitators related to the use of the NVAB guideline (chapter 5). They can try to foresee certain barriers when giving their patients advice on how they can prevent or diminish hand eczema. Physicians can advise their patients on how to incorporate the recommendations for the prevention of hand eczema into their work, and they can discuss barriers they might encounter when applying the recommendations in their work. For instance, physicians could explain to their patients that, although disinfectants sting, it is actually better to use these product compared to water and soap. This might help patients to overcome certain barriers.

CONCLUSION

This thesis showed that a multifaceted implementation strategy – consisting of education, role models, participatory working groups, and reminders – was an effective and feasible strategy for healthcare workers in improving their behaviour towards compliance to the NVAB guideline for the prevention of hand eczema. However, as the strategy showed negative effects for self-reported hand eczema and the cost-effectiveness of the intervention, further implementation of the multifaceted implementation strategy cannot be recommended. However, these conclusions should be drawn with caution because these results might be biased by the self-reported outcome measures. More research is needed to explain the results of the present trial, to further investigate effective strategies for the prevention of hand eczema among healthcare workers, and to research whether self-reported health complaints – like hand eczema – are influenced by an increased awareness following an intervention.

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