Irritant contact dermatitis

A strategy for prevention in Dutch health care workers

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Evaluating the effect of electronic monitoring and feedback on the hand cream use in health care workers: Healthy Hands Project

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Abstract

Background
Healthcare workers (HCW) are at high risk for developing hand dermatitis (HD). Current guidelines on HD prevention recommend use of emollients; however, in practice adherence is poor.

Objective
To assess whether provision of creams, electronic monitoring and feedback on cream consumption can improve skin care in HCW.

Methods
A cluster randomized controlled trial was conducted on 19 academic hospital wards including 501 HCW during 12 months. The intervention wards (n=9; 285 HCW) were provided with hand cream dispensers equipped with an electronic system to monitor use, which was regularly communicated to the HCW using posters. The process outcomes were self-reported cream consumption in both groups and electronically measured consumption per ward in the intervention group (IG) vs the control group (CG).

Results
The self-reported cream use at follow up was significantly higher in the IG compared to CG, before (OR=2.27; 95%CI 1.29-3.97; p=0.004) and during (OR=3.30; 95%CI 1.80-6.06, p<0.001), the shift, while at baseline there was no difference between the groups. In the IG, the electronically measured cream use was on average 0.4 events/shift/HCW.

Conclusion
The intervention improved hand cream usage and therefore may be considered as a practical strategy to promote skin care in HCW. Notwithstanding, application frequency remained lower than recommended in the present study and current guidelines.
Introduction

Prevention of hand dermatitis (HD) in the health care sector is critical for health care workers (HCW) as well as for the safety of patients. National guidelines for the prevention of occupational skin diseases (OSD) have been established in various countries following common hierarchal structure in prevention: elimination, reduction of exposure to the hazard or replacement of a hazardous substance by organisational or technical measures, and when this is not sufficient, also applying personal protection and behavioural measures. In many health care settings, avoidance of irritants is difficult due to specific patient care workflows and hygienic requirements. In these settings personal protection such as gloves and use of emollients is considered as the primary measure to maintain a competent skin barrier. Thus, the guidelines of the Dutch Society of Occupational Medicine (NVAB) recommend regular use of emollients, ideally after a wet-work activity, to enhance the skin barrier and prevent hand dermatitis (HD). In a recent guideline developed by a working group of the European Society of Dermatology (ESCD) application of moisturizers on hands is recommended during the working day but especially after work and before bedtime. A recent Cochrane review, reported that moisturizers may result in a clinically important protective effect. However the main obstacle remains poor adherence to hand care recommendations. To improve skin care in HCW, we developed an intervention based on provision of hand cream, continuous electronic monitoring and repeated feedback of cream use to the wards. A similar approach has been applied in the intervention studies on hand hygiene, showing improvement in compliance. In general, monitoring and feedback are widely used as a strategy to induce behaviour change and have been shown to be in particular effective when: 1) baseline performance is low; 2) the source is a supervisor; 3) it is provided more than once; and 4) it is provided both verbally and in written form. Group monitoring is widely recognized as being more effective than other monitoring systems based on tracking individuals’ actions, which can be seen by staff as punitive or a breach of their privacy, and which do not exploit the powerful effect of peer group coherence.

The primary outcome, change in HD severity, will be reported in a separate paper. Here we focus on the process outcome defined as the effect of the intervention on the use of hand creams. Further, practical aspects regarding favoured time and location of cream use will be discussed in the context of current recommendations.
Methods

The study population consisted of 501 HCW recruited from 19 wards and allocated to the intervention or control arm. Randomization was performed at ward level and the study was run between May 2016 – December 2017. Inclusion criteria were written informed consent and employment as a nurse or nutrition assistant at one of the included wards with exposure to ‘wet work’. Participants were excluded if they were employed at more than one ward during the trial period.11 Ethics approval to conduct the trial has been granted by the Medical Ethics Review Board of the Academic Medical Center (AMC) (reference number NL54372.018.15). Trial registration: NTR 5564, date of registration, November 2, 2015. An informed consent to participate in the trial was obtained from all participants.

Intervention

The study design has been described in detail in a previously published study protocol and flow chart.11 The intervention group was provided with hand cream dispensers placed at accessible locations at wards, continuous electronic monitoring of cream use and feedback on the frequency of cream use on ward level. The feedback was regularly provided by means of posters presenting the compliance on ward level to skin care recommendations, that is, application minimum 2 times/shift.

Education lessons

Education on skin care and protection was provided in both intervention group and control group by the research team in the form of lessons every 3 months from baseline to the end of study. More than 1 session was planned per ward each time to reach as many HCW as possible. The research team consisted of a physician and trained medical students. The HCW on each ward were invited via the nursing manager to join the lesson (approximately 5-10 minutes) held at the wards. In small groups (5-20), HCW were trained in basic knowledge about the skin, the development of hand dermatitis and recommendations for skin protection and skin care, as proposed by the NVAB guidelines.2 Based on the ‘3 moments of skin cream application’- approach, as recently proposed, 12 the HCW were recommended to apply creams at three moments; 1) before starting a shift 2) after washing hands and 3) after work, with setting a goal of at least 2 times/shift.
Electronic monitoring of cream consumption

Hand cream (Stokoderm Aqua Sensitive, Deb-STOKO Europe GmbH, Krefeld, Germany) was provided in electronically enabled dispensers at the wards in the IG on several most accessible locations. Per ward on average 5-10 dispensers were located at sinks next to hand alcohol dispensers, in the toilet, staff room (where staff has meeting or takes breaks), at entrance of ward, corridors, patient rooms and medication rooms. The electronic monitoring system (DebMed GMS System) registered real-time of use of creams for each dispenser, allowing insight in the total consumption of creams per ward, frequency of application and detailed pattern of use regarding time of the day and location. The system allows electronically enabled dispensers to communicate via a wireless network to local hubs and then via a 3G signal to a remote server where data is collated and can be retrieved for analysis (Fig. 1). The system also includes analysis software and web based reporting tools to provide user centred feedback with the data.

Feedback

Electronically acquired data on cream consumption and trends (e.g. total number of hand cream application events, popular moments or periods of use and popular locations) were used for feedback reports to the management. Per protocol this feedback was intended to reach the HCW via the managing nurse during regular meetings of the staff. As this didn’t seem to be feasible for the managing nurses, we switched after the first feedback session to a visual prompt directly available to all HCW. For this purpose, every month, starting from April 2017, workplace posters presenting the compliance data were placed at noticeable locations at the wards to remind staff of their performance and motivate them to reach their skin care goals (Fig. 2). On the poster, the compliance rates of the past month were graphically presented in two colors: showing instantly whether compliance was improved (green) or worsened (red) compared to last month. Furthermore, on the posters a reminder to use creams at least two times per shift was stated.
Fig. 1. DebMed® GMS™ installation System

Fig. 2 Feedback Posters
Data collection
Indicators aimed at detecting change in behavior towards enhanced skin care were assessed using questionnaires in both groups and electronic monitoring of cream consumption in the IG. Questionnaires were completed at baseline and follow up to record individual consumption of creams and individual exposure to skin irritants (the estimated frequency of handwashing, use of hand sanitizers and glove use per shift). The electronic monitoring system provided real time registration of application events per dispenser.

Questionnaires were taken at baseline and after 6, 12 and 18 months. The questionnaires at baseline and 12-months were completed by HCW and collected by the research team during the organized visits on the wards. The 6- and 18-month questionnaires were delivered to the team manager at the wards who were asked to distribute them among the HCW after explaining the purpose of the survey. The questionnaire at baseline included general data including gender, period of employment as a HCW, ward, history of atopic dermatitis and hand dermatitis. Furthermore, it included questions regarding exposure to wet work (estimated frequency of handwashing and use of hand rubs and gloves per shift) and hand cream use before, during and after the shifts. At 12 months, demographic questions were omitted, but additional questions were asked addressing attendance during the education sessions and visibility/memorability of the feedback posters. At 6 months only questions regarding wet work and hand care were asked. The questionnaire at 18 month included some additional questions regarding individual perceptions regarding the use of creams during work and reach and acceptance of the intervention (attendance and opinions on the effects of the educational sessions and the feedback posters in this trial).

Statistical analysis
The HCW were randomized to the intervention or control groups at the ward level. Wards (as the unit of randomization) were randomized in fixed size blocks of two and stratified into “high” or “low” levels of exposure to “wet work”. Wet work exposure was estimated at the ward level from the quantity of soap purchased in the period January to May 2016. The first half of the wards with highest soap purchase were categorized as high-exposure, the lower half as low-exposure.

Characteristics of wards, working years, working hours, sex, self-reported hand dermatitis in the last half year, self-reported use of creams, alcoholic hand rubs and handwashing are presented by using descriptive statistics and no formal statistical testing was carried out, except for cream use data. We used counts and percentages to present categorical variables. P-values of less
than 0.05 were considered statistically significant and statistical uncertainty of descriptive measures was expressed using two-sided 95% confidence intervals. The analyses were performed by an investigator (MS) supervised by the principal investigator (SK). All statistical analysis was performed using IBM SPSS statistics version 24 (IBM, Armonk, New York).

The analyses on the cream consumption at baseline was performed in all participants, while the difference in cream consumption between IG and CG at follow up was performed in HCW who completed the follow up questionnaires (per protocol population). We obtained odds ratios (OR) and P-values for the difference between the IG and CG using mixed-effect ordinal regression analysis with exchangeable working correlations matrix to account for clustering within wards. For association analysis, we calculated non-parametric correlation (Spearman’s rho, $\rho$) between frequency of moisturizing hands before/during and after shift.

**Results**

At baseline, 501 HCW were recruited from 19 wards randomized into an intervention group (IG) (9 wards, 285 HCW) and control group (CG) (10 wards, 216 HCW). The demographic characteristics of the study population are described in details elsewhere. At baseline, there were no marked differences concerning a history of self-reported hand dermatitis, exposure to wet work and hand cream use between the two arms (Table 1).

At baseline, all 501 participants were informed on the design and goals of the study and completed a baseline questionnaire. At 12 months follow up, the response rate was 59% (167 HCW) in the IG and 61% (132 HCW) in the CG completing the 12 month- questionnaire (”per protocol” population). At 18 months 61% (102 HCW) of the “per protocol” population in the IG returned the questionnaires and 56% (74 HCW) in the CG. For the “intention to treat” population this was respectively 36% and 34% at 18 months. At 6 months less than 25% of the questionnaires were returned.

In total, as planned, 6 small group education sessions were given by the research team during the trial and repeated 3-5 times separately per ward to reach as many HCW as possible. As assessed by questionnaire at 12 months, 81% of all participants who completed the trial took part in at least one of the education sessions; 95% of the IG and 64% of the CG. Ninety per cent of participants who attended found the education to be useful.
Self-reported cream use

The cream consumption was reported by the HCW separately for three time points ‘before’, ‘during’ and ‘after’ the shift and categorized as ‘never’, ‘less than 50% of my shifts’, ‘more than 50% of my shifts’ and ‘almost always’. As presented in Fig.3 and Table 1, the baseline use of hand creams was low, 70-80% of HCW never applied cream before and during the shift. After the shift this proportion is somewhat lower (≤50%). At baseline, however, there was no difference between IG and CG. Analysis by a mixed-effect ordinal regression revealed that the cream consumption at follow-up was significantly higher in the IG as compared to the CG, while at baseline there was no difference between the groups. At follow up HCW in the IG were 2.27 (95% CI 1.29 to 3.97, P=0.004) times more likely to report a higher frequency of hand cream use before the shift compared to the CG. During the shift this was 3.30 (95% CI 1.80 to 6.06, P<0.001) times more likely. There was no significant difference in cream use after the shift between both groups. (OR=1.55,95%CI 0.91-2.64, P=.11). When looking at overall cream use (i.e. per entire shift), at baseline 38% of HCW in the IG and 43% in the CG reported to never use creams. After the intervention, the proportion of HCW reporting ‘NEVER’ to apply creams was 18% in IG and 32% in the CG. HCW with confirmed severe HD reported more frequently to always use creams (69%; 20/29) than HCW with no, mild, or moderate HD (4% 18/470).

We analyzed data on hand cream use collected at baseline and 12 months, which were defined as process outcome measures. Although data on hand cream use and exposure was also collected at 6 and 18 months, these data were not analyzed due to low response rates.
Table 2. Characteristics of healthcare workers (HCWs) and wet-work activities at baseline (T0) and 12-month follow up (T12).

<table>
<thead>
<tr>
<th>HCW characteristics</th>
<th>Self-reported Outcomes</th>
<th>Intervention group T0</th>
<th>Intervention group T12</th>
<th>Control group T0</th>
<th>Control group T12</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wards</td>
<td></td>
<td>8 clinical ward, 1 outpatient clinic, 285 HCW</td>
<td>8 clinical ward, 1 outpatient clinic, 167 HCW</td>
<td>10 clinical wards, 216 HCW</td>
<td>10 clinical wards, 133 HCW</td>
</tr>
<tr>
<td>History of hand dermatitis past 6 or 12 months; n (%)</td>
<td></td>
<td>95 (33%)</td>
<td>54 (32%)</td>
<td>72 (33%)</td>
<td>43 (32%)</td>
</tr>
<tr>
<td>Frequency of use of hand alcohol n(%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less than 5 times a shift</td>
<td></td>
<td>9 (3%)</td>
<td>3 (2%)</td>
<td>6 (3%)</td>
<td>4 (3%)</td>
</tr>
<tr>
<td>5 to 10 times a shift</td>
<td></td>
<td>9 (3%)</td>
<td>7 (4%)</td>
<td>9 (4%)</td>
<td>11 (8%)</td>
</tr>
<tr>
<td>11 to 15 times a shift</td>
<td></td>
<td>26 (9%)</td>
<td>17 (10%)</td>
<td>26 (12%)</td>
<td>11 (8%)</td>
</tr>
<tr>
<td>More than 15 times a shift</td>
<td></td>
<td>242 (85%)</td>
<td>139 (83%)</td>
<td>175 (81%)</td>
<td>109 (82%)</td>
</tr>
<tr>
<td>Frequency of hand washing; n (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less than 5 times a shift</td>
<td></td>
<td>31 (11%)</td>
<td>20 (12%)</td>
<td>17 (8%)</td>
<td>11 (8%)</td>
</tr>
<tr>
<td>5 to 10 times a shift</td>
<td></td>
<td>86 (30%)</td>
<td>42 (25%)</td>
<td>73 (34%)</td>
<td>27 (20%)</td>
</tr>
<tr>
<td>11 to 15 times a shift</td>
<td></td>
<td>74 (26%)</td>
<td>43 (26%)</td>
<td>72 (33%)</td>
<td>52 (39%)</td>
</tr>
<tr>
<td>More than 15 times a shift</td>
<td></td>
<td>97 (34%)</td>
<td>62 (37%)</td>
<td>52 (24%)</td>
<td>44 (33%)</td>
</tr>
<tr>
<td>Frequency of glove use n (%);</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less than 5 times a shift</td>
<td></td>
<td>20 (7%)</td>
<td>12 (7%)</td>
<td>30 (14%)</td>
<td>17 (13%)</td>
</tr>
<tr>
<td>5 to 10 times a shift</td>
<td></td>
<td>34 (12%)</td>
<td>17 (10%)</td>
<td>48 (22%)</td>
<td>23 (17%)</td>
</tr>
<tr>
<td>11 to 15 times a shift</td>
<td></td>
<td>60 (21%)</td>
<td>32 (19%)</td>
<td>56 (26%)</td>
<td>41 (31%)</td>
</tr>
<tr>
<td>More than 15 times a shift</td>
<td></td>
<td>171 (60%)</td>
<td>107 (64%)</td>
<td>82 (38%)</td>
<td>53 (40%)</td>
</tr>
<tr>
<td>Frequency use of moisturising creams before shift; n (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Never</td>
<td></td>
<td>210 (74%)</td>
<td>82 (49%)</td>
<td>160 (74%)</td>
<td>89 (67%)</td>
</tr>
<tr>
<td>About half of shifts</td>
<td></td>
<td>23 (8%)</td>
<td>33 (20%)</td>
<td>26 (12%)</td>
<td>23 (17%)</td>
</tr>
<tr>
<td>More than half of shifts</td>
<td></td>
<td>16 (6%)</td>
<td>18 (11%)</td>
<td>9 (4%)</td>
<td>12 (9%)</td>
</tr>
<tr>
<td>Almost always</td>
<td></td>
<td>34 (12%)</td>
<td>32 (19%)</td>
<td>22 (10%)</td>
<td>12 (7%)</td>
</tr>
<tr>
<td>Frequency of use of moisturising creams during shift; n (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Never</td>
<td></td>
<td>197 (69%)</td>
<td>62 (37%)</td>
<td>151 (70%)</td>
<td>85 (64%)</td>
</tr>
<tr>
<td>About half of shifts</td>
<td></td>
<td>48 (17%)</td>
<td>37 (22%)</td>
<td>43 (20%)</td>
<td>25 (19%)</td>
</tr>
<tr>
<td>More than half of shifts</td>
<td></td>
<td>6 (2%)</td>
<td>27 (16%)</td>
<td>9 (4%)</td>
<td>17 (13%)</td>
</tr>
<tr>
<td>Almost always</td>
<td></td>
<td>34 (12%)</td>
<td>42 (25%)</td>
<td>15 (7%)</td>
<td>7 (5%)</td>
</tr>
<tr>
<td>Frequency of use of moisturising creams after shift; n (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Never</td>
<td></td>
<td>131 (46%)</td>
<td>43 (26%)</td>
<td>108 (50%)</td>
<td>48 (36%)</td>
</tr>
<tr>
<td>About half of shifts</td>
<td></td>
<td>22 (13%)</td>
<td>37 (22%)</td>
<td>26 (12%)</td>
<td>37 (20%)</td>
</tr>
<tr>
<td>More than half of shifts</td>
<td></td>
<td>29 (10%)</td>
<td>27 (16%)</td>
<td>24 (11%)</td>
<td>37 (20%)</td>
</tr>
<tr>
<td>Almost always</td>
<td></td>
<td>88 (31%)</td>
<td>60 (36%)</td>
<td>58 (27%)</td>
<td>33 (25%)</td>
</tr>
</tbody>
</table>
Electronically measured cream use
The electronic system was activated in August 2016 and continuously monitored cream application events for the duration of the trial. Fig. 4 shows the total number of cream application events per month averaged for all 9 intervention wards. The average number of cream applications per HCW per shift was 0.4. There seemed to be an increasing trend in use during the trial with a peak in May and in December/January. Fig. 5 shows the most popular moments of cream use and the location of cream dispensers. The dispensers with highest consumption of creams were located at the toilet, in staff rooms and the corridor and the least used location were patient rooms. The times of day with the highest frequency of cream use for all the locations together were at 10 am, 12pm and 3 pm. There were no significant differences between electronic measured cream use between wards with high -exposure to wet work and to low-exposure wards (resp. median=181.8 and median=174.5 total cream applications per month per HCW. The estimated median values were based on 20 working days/month and a 8 working hours/shift ).
Figure 3. Self-reported hand cream use before, during and after the shifts in the intervention group vs the control group. HCW, healthcare

Feedback Posters in the IG

From April to December 2017 a total of 8 feedback posters (see Fig 2 for an example) were placed at prominent locations (e.g. next to a sink, in the toilet, entrance/exit of the ward) on the intervention wards on a monthly basis.
The opinion of HCWs about the posters in the IG was assessed by means of questionnaires at 12 months and 18 months of follow up. At 12 months 87% (145) of the HCW reported to have noticed the posters. At 18 months, this proportion increased to 98% (100 of 102 HCW). A large proportion of HCW (86%; 88 HCW) understood the message displayed on the posters, and the majority (78%; 80 HCW) found that the posters were useful reminders to stimulate skin care. 43% of HCW reported that the posters moved them to use creams.

![Fig. 4. Average number of total cream application events per month illustrated for all intervention wards together. Education was provided every 3 months. Feedback posters were delivered every month starting from April.](image)

**Attitudes towards creams and cream use in the IG**

As assessed from the questionnaires at 18 months, 65% (66 HCW) reported to use creams provided in the electronic dispensers and 38% (39 HCW) reported to use personal creams. The most reported barrier for not using hand creams was belief that creams interfere with their workflow (81% of HCW). 94% reported they are aware of the benefits of cream use. The available cream in the dispenser was rated for quality/likeability as ‘good’ (median=4 on a Likert scale ranging from 1=very poor to 5= excellent). 86% reported that the creams were located where they needed them.
Fig. 5. Toilets, staff rooms and corridors are illustrated as the most popular locations, and patient rooms as the least popular. Between 10 AM and 3 PM, creams are used most often. Data were recorded during the trial from August 2016 to December 2017.

Exposure to wet work
Self-reported frequency of wet work activities (hand washing, gloves and hand disinfectants) at baseline and follow up are shown in Suppl. Figure. 1. At baseline, more than 80% of HCW in both groups belonged to the highest category of hand disinfectant users (more than 15 times per shift). A similar pattern was reported at follow-up. At baseline and at follow-up at least 60% in the IG and CG group reported to wash hands more than 10 times per shift. At follow-up, the respective percentages were 63% and 72%. The frequency of glove usage differs between the IG and CG at baseline, and a similar pattern has been observed at follow up.

Self-reported outcomes on hand dermatitis
At baseline, 33% (95) HCW in the IG and 33% (72) in the CG reported having hand dermatitis in the past year. At 12-months, a similar prevalence (32%) of hand dermatitis was reported in both IG (54 HCW) and CG (43 HCW).
Discussion

Improving skin care behavior is an important goal to prevent HD in HCW. In an intervention study focused on prevention of HD in the healthcare setting we investigated whether provision of hand creams accompanied with electronic monitoring and feedback on hand cream use may prevent hand dermatitis. Here, we show that the intervention was successfully implemented and resulted in an improved adherence to recommended skin care practices. This study provides, for the first time, real-time data on hand cream use in HCW regarding frequency of use as well as indicating favored locations and times of application in HCW.

Self-reported cream use

At follow-up, the self-reported hand cream use before and during the shifts was significantly higher in the IG compared to the CG, while at baseline there was no difference between groups. Consistently, the proportion of HCW that report to never use hand creams was lower in the IG than in the CG at follow-up (18% and 32%, respectively). At baseline, the respective percentages had been 38% and 43%. Such a large proportion of HCW reporting to never use hand creams is surprising and alarming. In the Netherlands, the guidelines on the prevention of contact dermatitis recommend use of emollients on regular base and creams are often provided by the employer. Similar recommendations have been proposed by the working group for diagnosis, prevention and treatment of hand eczema of the European Society of Contact Dermatitis (ESCD), stating that moisturizers should be applied on the hands during the working day and especially after work and before bed time. Interestingly, almost half of HCW (46% and 50% in respectively IG and CG) reported at baseline never to use hand creams ‘after the shift’, a ‘key application time’ recommended by the ESCD working group. After the intervention, this proportion decreased to 26% in the IG and 36% in the CG. The literature data on cream use in occupational settings is scarce. In a study of Große-Schütte et al 10% of HCW reported to never use hand care products. This study based on questionnaires reported that approximately 15% of HCW apply moisturizers after hand washing. The present study revealed that having severe symptoms of HD is associated with a higher frequency of cream use in HCW, which is in agreement with findings of van der Meer et al.
Electronic monitoring of cream use

Despite the improvement of self-reported hand cream use in this trial, the electronically monitored cream use of 0.4 events per HCW per shift in the IG remained below the recommended frequency of at least 2 times/shift. As more than one third of HCW reported that next to electronic dispensers they (also) used their own creams, this electronically measured application frequency might be somewhat underestimated, but still likely below the current recommendations of 2-3 times per day.2,3,12

The finding that almost 20% of the HCW at follow-up still reported to never use hand cream is worrisome, especially realizing that at least a third of HCW reported skin problems. Hand dermatitis is not only a problem for the affected individual, but may also pose a health hazard for patients as damaged skin increases bacterial flora.16 Furthermore, HCW with damaged skin seem to avoid hand disinfectants due to stinging sensation.17

Although the majority of HCW did report to be aware of the benefits of hand creams, most of them reported that creams interfered with their workflow, especially when wearing gloves. Consistently, the highest frequency of cream use was recorded at moments when HCW didn’t perform direct patient care activities: around 10 am during their coffee break, around 12 am during lunch break and around 3 pm during clinical handover when the shifts change (ends or starts). Other reported barrier to use hand care was the “greasiness” of the available creams, but nonetheless the likeability of the dispenser-cream was rated good (median=4 on a Likert scale ranging from 1=very poor to 5=excellent).

The dispensers in the staff-only rooms such as coffee-, break- and meeting rooms and toilets were used more often than the dispensers in rooms where patient care is delivered (patient rooms or medication rooms). There seemed to be an increasing trend in use during the trial with a peak in May and in December. It could be speculated that the increase in May is related to the introduction of feedback posters in April. The first feedback poster seems to have had the most impact, which could be explained by issues of user-fatigue, desensitization by the prompt (posters) and loss of novelty, which is illustrated well by citations of HCW like: ‘at first, the posters evoked competitiveness, but after a while I didn’t really notice them anymore’. The increase in cream use in December/January is most likely caused by the cold and dry weather leading to skin dryness in winter.

Feedback

The feedback posters, showing whether compliance in comparison with last month improved (green) or worsened (red), was well noticed by HCW and most
of them perceived them as useful. To increase visibility, the posters were placed in the staff toilets and staff break rooms as suggested previously as optimal display locations. Almost half of HCW (43%) felt additionally motivated by the posters. As this was reported at the end of the trial, it could be argued whether loss of novelty played a role in the motivating effect of the posters. Initially the intention was that the feedback would be provided verbally by the managing nurses during regular meetings. This did not prove practical and it would be interesting to learn whether addition of this recommended step would further improve the effectiveness of the intervention.

4.4 Education

Several studies have suggested that the low use of hand creams by HCW could be due to lack of knowledge. To avoid differences in the level of knowledge between IG and CG in the present trial, we provided small group education lessons meant to increase awareness on risk behavior and importance of skin care. The educational program was implemented well and was visited by the majority (81%) of the HCW who completed the trial. The attendance rates in the IG (95%) were higher than in the CG (64%). Likely, awareness of HCW being allocated to the control group, might have affected their motivation. Issues of preference and disappointment are not uncommon in trials where participants are aware of allocation. Higher attendance of the education lessons in the IG may have influenced the cream use, however this was not possible to evaluate as we didn’t assess the level of knowledge of HCW.

Exposure to wet work

The majority of HCW reported to wash their hands with soap more than 10 times per shift. Previously, Visser et al 19 found that washing of hands >10 times per shift doubles the risk for HD. Consistently, in this intervention study we found that exposure to wet work estimated from soap use at ward level was a significant risk factor for HD. Also, we found high use of disinfectants; more than 80% of HCW used these more than 15 times per shift. Notably, the disinfectant (Sterilium) used by HCW in this trial contained glycerol, a known moisturizer which prevents skin dryness. As addition of a moisturizer to disinfectants has previously showed to prevent skin irritation, it might be speculated that the addition of glycerol in the disinfectants used in the present study have diminished the need for hand creams.
Strengths and limitations

Strengths of our study included the stratified randomized control design and the generalizability of our findings due to the large number of participants in a hospital setting and the relatively long follow-up period. For the first time cream consumption in HCW has been assessed by an electronic monitoring system. Real-time monitoring of cream use provided detailed data on the preferred locations for dispensers and moments of use, which can be valuable in designing future strategies to set up best practices for skin care in HCW.

One of the study limitations was not blinding participants regarding allocation, which might have caused performance bias in the control group. Another limiting factor was using self-reported data of the cream use to enable comparison of arms. This is known to be less accurate than electronic data, which could only be measured in the IG. The electronic system we used in this trial could not provide individual usage but only cream consumption at ward level. Electronic data on cream use of HCW might have caused underestimation of the total cream use as HCW not only used the dispenser creams, but also their own hand creams. Also, HCW in both IG and CG very frequently use disinfectants containing emollients. This may also have influenced hand care behavior.

Conclusion

Our findings show that electronic monitoring of hand cream use combined with feedback improves skin care behavior among HCW and therefore should be considered as a practical strategy to promote skin care. Our approach was easy and feasible to incorporate in daily practice in a health care setting without interfering with the workflow of HCW.

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References

Suppl. Fig. 1. Self-reported wet work activities