

# Design and validation of pictograms and educational video clips to improve the knowledge of skin care and protection: Comprehension and recall among professional hospital cleaners

Farnam B. Sedeh<sup>1</sup> | Thórunn E. Michaelsdóttir<sup>2</sup> | Ole S. Mortensen<sup>3,4</sup> |  
Gregor E. Jemec<sup>1</sup> | Kristina S. Ibler<sup>1</sup>

<sup>1</sup>Department of Dermatology, Zealand University Hospital, Roskilde, Denmark

<sup>2</sup>Department of Clinical Physiology, Nuclear Medicine, and PET, Rigshospitalet, University of Copenhagen, Copenhagen, Denmark

<sup>3</sup>Department of Occupational and Social Medicine, Holbæk University Hospital, Holbæk, Denmark

<sup>4</sup>Department of Public Health, Section of Social Medicine, University of Copenhagen, Copenhagen, Denmark

## Correspondence

Farnam B. Sedeh, Department of Dermatology, Zealand University Hospital, Sygehusvej 5, 4000 Roskilde, Denmark.  
Email: [farnambarati@gmail.com](mailto:farnambarati@gmail.com)

## Funding information

Danish Working Environment Fund, Grant/Award Number: 20205100702

## Abstract

**Introduction:** Insufficient knowledge about protection and care of the skin among Danish hospital cleaners, particularly immigrant cleaners, is guessed to be a widespread issue that can increase the likelihood of them developing occupational hand eczema (OHE). This study aimed to design and validate 10 pictograms and 10 short video clips showing recommendations for skin care that would help prevent OHE among professional cleaners.

**Methods:** Ten pictograms and 10 short, educational video clips, based on standard, recommended information were developed in collaboration with a medical illustrator and a video director. The materials were validated in a two-step process that included bus drivers (primary validation) and professional cleaners (secondary validation).

**Results:** During the primary validation, 5 of the 10 pictograms (50%) were comprehended correctly by at least 85%. Those that were misinterpreted, were modified and retested several times until they were understood correctly by at least 85%. During the secondary validation, all 10 pictograms achieved acceptable levels of comprehension among professional cleaners. All the video clips were comprehended correctly by both bus drivers and cleaners.

**Conclusion:** Ten easy-to-understand pictograms and 10 educational video clips for cleaners about the prevention of OHE have been designed and validated.

## KEYWORDS

contact allergy, dermatitis, healthcare workers, picture, prevention

## 1 | INTRODUCTION

Hand eczema (HE) is a commonly occurring skin condition that impacts a substantial portion of the general population, with a reported 1-year prevalence of around 10%.<sup>1</sup> Occupational hand

eczema (OHE) is a subtype of HE caused, or exacerbated, by work-related activities. It is a common condition in many Western countries, affecting up to 30% of employees in high-risk occupations.<sup>1,2</sup> High-risk professions for OHE include healthcare workers, hair-dressers and professional cleaners.<sup>1,2</sup> The latter group is frequently

This is an open access article under the terms of the [Creative Commons Attribution-NonCommercial-NoDerivs](https://creativecommons.org/licenses/by-nc-nd/4.0/) License, which permits use and distribution in any medium, provided the original work is properly cited, the use is non-commercial and no modifications or adaptations are made.

© 2023 The Authors. *Contact Dermatitis* published by John Wiley & Sons Ltd.

exposed to wet work and irritants/allergens contained in disinfectants and detergents. Although cleaners often use protective gloves, these also hold the potential for skin irritation if not used correctly.<sup>3-5</sup> The 1-year prevalence of OHE among cleaners is between 8% and 28%, while the lifetime prevalence is reported to be around 22%.<sup>3,6-8</sup> Consequences associated with OHE include unscheduled absences from work, decreased quality of life and income, and limited career options.<sup>3,5,9-13</sup>

Patients with HE in Denmark are usually informed about the disease by a physician and provided with a written leaflet containing recommendations regarding how to protect the skin.<sup>14,15</sup> This procedure is more or less standard, regardless of the patient's profession.<sup>14</sup> However, this information is only offered if the patient attends a dermatology clinic.

Danish cleaners are currently not offered any education or information about skin care and protection—nation- or hospital-wide. A limited level of knowledge regarding skin care and protection was found in a previous study of 142 Danish cleaners.<sup>16</sup> Workers who grew up outside of Denmark appeared to be especially at risk and in need of special attention.<sup>16</sup> Lack of knowledge about OHE and inadequate skin protection behaviour may, consequently put this high-risk occupational group at risk of developing the disease. Furthermore, there has been no validation of the leaflet among professional cleaners. This raises the question of whether or not those who attended a dermatology clinic, were able to understand the information they were given.

Not all individuals understand written material equally well, and this is especially true for those with a low level of education. A national Danish registry-based study of professional cleaners between 1995 and 2016 concluded that more than half had primary education (9–10 years) as their highest educational level and 39% had completed secondary education (three additional years).<sup>17</sup> Other factors that can be challenging for effective communication include old age, language barriers due to migration background, low health literacy, and cultural background.<sup>18,19</sup> Functional illiteracy refers to individuals, who face challenges in reading, writing, and understanding written information, which is necessary for everyday life tasks.<sup>20</sup> According to a Danish study conducted with a sample size of 1124 adults, it was discovered that 3% of the participants had severe challenges in functional reading skills, while an additional 9% had moderate difficulties.<sup>20</sup> In addition, limited educational background and age over 45 years old were found to predict these functional reading difficulties.<sup>20</sup> Among non-Western immigrants in Denmark, the number of cases of functional illiteracy has been reported to be over 50%.<sup>21</sup>

The use of visual aids, including pictograms, has been shown to improve health outcomes in people with poor language skills and low levels of formal educational.<sup>22</sup> Since professional cleaners in Denmark often display both, it is our hypothesis that visual aids such as pictograms and educational videos could be used to improve knowledge of skin care and protection. This study developed, validated and user-tested 10 pictograms and 10 educational video clips to test this hypothesis.

## 2 | METHODS

### 2.1 | Research design

The first stage of the design process included a review of published studies investigating the use of pictograms in medical settings. This was done by searching PubMed, EMBASE and Cochrane Library in July 2021.<sup>22</sup> No studies investigating the use of pictograms in relation to OHE or HE were found. However, studies were found in other fields of medicine, and these were used to gain knowledge about the important factors to consider before the development, validation and user-testing of pictograms. A scoping review was published based on the findings.<sup>22</sup> The pictograms should be original and based on the national recommendations about skin care and protection<sup>14,15</sup> (Table 1). They should reflect the real world (i.e., hands and other objects or situations) while minimising distracting details. The pictograms should be understandable to the target population, ideally without the use of words or letters. However, a few short words or symbols were allowed, if necessary to provide clarification or context. The second stage was to design 10 clear and easy-to-understand pictograms in collaboration with an experienced medical illustrator.<sup>1</sup> The decisions to incorporate text or symbols were carefully evaluated by the medical illustrator and the video director, who balanced the need for concise information with the overall visual impact. The 10 pictograms were redesigned six times before they were deemed ready for validation by the research team.

Recognising the potential limitations of relying solely on pictograms to convey messages, the research team made a strategic decision to incorporate video into the study. Ten educational video clips based on the final validated pictograms were developed by a video director.<sup>2</sup> While pictograms provide a visual representation of

**TABLE 1** Common recommendations for skin protection measures for patients with hand eczema in Denmark.<sup>14-16</sup>

1. Use protective gloves when starting wet-work tasks
2. Protective gloves should be used when necessary but for as short a time as possible
3. Protective gloves should be intact and clean and dry inside
4. When protective gloves are used for more than 10 min, cotton gloves should be worn underneath
5. Wash your hands in lukewarm water. Rinse and dry your hands thoroughly after washing
6. Disinfectants should be used according to the recommendations for the workplace
7. Do not wear rings at work
8. Apply moisturisers on your hands during the working day or after work. Select a lipid-rich moisturiser free from fragrance and with preservatives having the lowest allergen potential
9. Moisturisers should be applied all over the hands, including the finger webs, fingertips and back of the hand
10. Take care also when doing housework, use protective gloves for dishwashing and warm gloves when going outside in winter

information, their interpretation relies heavily on the participant's individual understanding and perception. By introducing the educational video clips with live action our research group aimed to provide participants with a more direct way of comprehending the intended message. Each of the 10 video clips presented the same information as in the pictograms in a live-action version with human actors showing, for instance, how to use protective gloves, local disinfectants, cotton gloves beneath protective gloves and moisturisers. It contained no spoken words or text and only featured the natural ambient sounds of the environment. When selecting actors, a crucial consideration was to ensure that the target population would be able to identify with them. Recognising the importance of representation and inclusivity, the research team made deliberate efforts to choose actors who accurately portrayed the diversity found within the target population, including individuals with a range of skin colours. The video was set and filmed in a hospital cleaning department.

The pictograms and video clips were developed in collaboration with a professional cleaner who was an equal research partner in the study group. His contribution during the design and planning phases, was based on his in-depth knowledge of the industry, cleaning practices, and the challenges that cleaners face. His perspective ensured that the material aligned with the realities and needs of professional cleaners. In addition, he provided input during participant recruitment, data collection, validation and finally interpretation of the findings. All the pictograms and video clips were approved by the study group before beginning the process of validation.

## 2.2 | Recruitment and sampling

Two populations were used in this study. The first comprised bus drivers who had not been involved in occupations with a high risk of HE (primary validation). For instance, they had never worked as professional cleaners, healthcare workers, metal workers, hairdressers, food service workers or bakers or in any other occupational fields with 'wet work'. Other inclusion criteria included: (1) Participants  $\geq 18$  years of age and (2) Participants who had not had HE. Bus drivers were considered a suitable group for primary validation due to their occupational context, which differs markedly from that of professional cleaners. Since bus drivers are not directly exposed to the same cleaning tasks and chemicals, they were assumed to have less prior knowledge about skin care and protection and HE. Their involvement in the validation process provided valuable insights into the effectiveness of the visual materials in conveying information to individuals with limited background knowledge of the topic. The second population included professional hospital cleaners. The inclusion criteria were: (1) Participants  $\geq 18$  years of age, (2) Participants permanently employed or who had worked as cleaners for at least 3 months. The exclusion criterion for both bus drivers and cleaners was a low level of Danish language skills, such that they could not participate in an interview. Both the primary and secondary validations were undertaken using groups of 20 workers.

The video validation was undertaken with a fresh set of bus drivers ( $n = 20$ ) and professional cleaners ( $n = 20$ ); none of whom had participated in the validation of the pictograms. The educational video containing the 10 clips is available using the following link (<https://region-hovedstaden-ekstern.23video.com/secret/81023617/084898fcc12fdd54a3d9280fc2df3fd6>).

Informed consent was obtained from each prospective participant, emphasising their right to make an autonomous and informed decision about their involvement in the study. The informed consent process involved providing participants with comprehensive information about the aim of the research project, the procedures as well as the potential risks and benefits associated with participation in the study, the voluntary nature of participation and the confidentiality measures in place to protect their personal information. The present study was approved by Regional Ethics Committee for the Zealand Region (journal number: EMN-2022-04317).

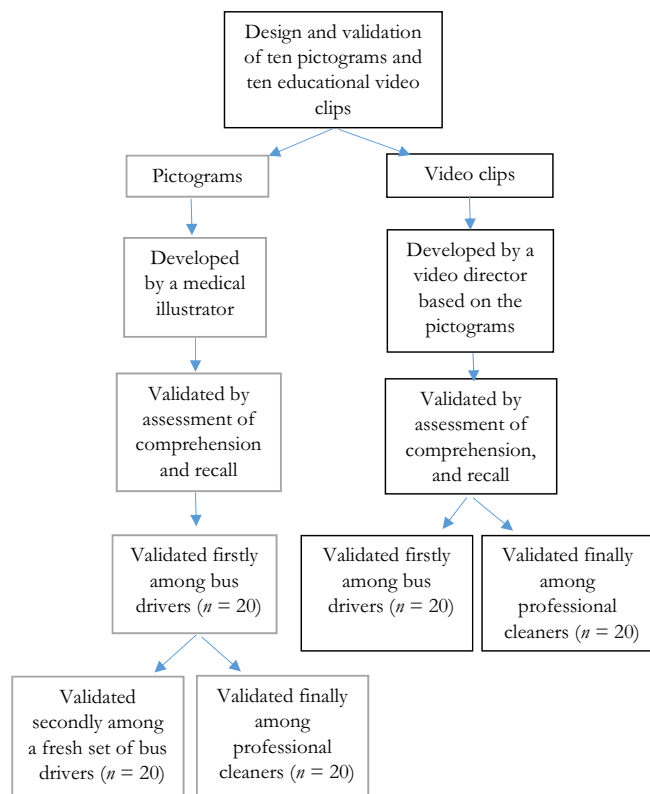
## 2.3 | Data collection

### 2.3.1 | Pictograms and video clips, and validation

The validation of the pictograms and video clips was conducted through one-to-one semi-structured interviews. On average, the interview sessions lasted approximately 40–50 min. Each of the 10 pictograms was printed on white A4-sized paper and presented in a 10 cm\*10 cm format to ensure comfortable viewing. The pictograms were shown in turn, one after the other. The 10 video clips were each presented individually one at a time on a full computer screen with a 1440\*900 pixel resolution. The participants were given the opportunity to view each video clip multiple times if needed. The validation of the pictograms and video clips was based on comprehension (phase 1) and recall (phase 2), in agreement with previous studies investigating the validation of picture-based materials.<sup>23–25</sup> The data collection involved recording the interviews. The recorded audio material served as the primary basis for the subsequent analysis.

### 2.3.2 | Phase 1: Assessment of comprehension

The present study assessed participants' comprehension of the pictograms and video clips by examining transparency and translucency (Figure 1). The term 'transparency' is used to describe how easily the meaning or significance of an image can be assessed by a participant when the meaning or significance is not already known to them.<sup>23–25</sup> On the other hand, 'translucency' investigates the degree to which the image and its intended meaning are strongly associated.<sup>23–25</sup> After presenting each pictogram, transparency was investigated by asking participants the following questions: (1) 'What do you think this pictogram means?' and 2) 'When you look at this pictogram what action should you undertake?'. These two questions were asked in two rounds, initially without the participants being aware that the pictograms were related to skin care and protection or HE, and second



**FIGURE 1** Strobe flow diagram illustrating different steps regarding the design and validation of pictograms and 10 educational video clips.

after the participants had been informed about the relationship. These questions were asked as each pictogram and video scene were presented in turn. The pictograms and video clips were shuffled before and during this process to ensure they were presented at random. After investigating comprehension, the pictograms and the video clips were presented for a third time so the researcher explained what the intended meanings had been. The participants were asked to rate, 'the degree of accuracy in representing the intended meaning', using a 7-point scale.<sup>23-25</sup> This was later used to define the translucency score. A score of one meant that there was no relationship between the pictogram or the video scene and its meaning, whereas a score of 7 indicated 'a highly robust relationship between these'.<sup>23-25</sup> In addition, the participants were then asked to provide feedback on how the pictograms and video clips could be improved. All the answers and suggestions were noted and recorded for each pictogram and video scene by the first author.

### 2.3.3 | Phase 2: Assessment of recall

Prior to testing the recall process, participants' attention was distracted. This was done by using some time to collect demographic data. The participants were asked about their age, gender, country of birth, the highest educational level achieved, number of years working as a bus driver or hospital cleaner, and employment status (whether

full-time or part-time). Before conducting the assessment, the order of the pictograms and video clips was randomised by shuffling. Then the participants were questioned about the intended meaning of the pictograms and video clips. The answers were recorded.

At the end of the study, to avoid bias by the research team, an independent and external researcher (the second author) was invited to review the recorded interviews and evaluate the participants' responses regarding both comprehension and recall. The responses were registered as (1) 'correct', (2) 'partially correct', (3) 'incorrect' and (4) 'critically confused'.<sup>23-25</sup>

### 2.3.4 | Redesign of a pictogram

Those pictograms and video clips, which did not achieve the validation criteria, were redesigned in close collaboration with the medical illustrator and the video director who used the participants' feedback and suggestions for improvements. For each redesigned pictogram or video scene, a new set of 20 participants was recruited for the validation process (Figure 1).

## 2.4 | Data analysis

If the participants used the precise wording that has been used to explain the meaning of the pictogram and the video clip, then this was noted as the 'correct' answer.<sup>23</sup> In those cases where the participants used different words or had an incomplete understanding of the meaning, but could nonetheless demonstrate the correct action, their response was classified as 'partially correct'.<sup>23</sup> Both 'correct' and 'partially correct' responses were accepted when assessing transparency.<sup>23</sup> In accordance with the standards established by the American National Standards Institute (ANSI), a pictogram in our study is considered valid if its transparency level achieves at least 85% and if it does not result in critical confusion in more than 5% of the population.<sup>23,26</sup> In this study, a pictogram and a video clip, were considered valid if at least 85% of the participants were able to correctly identify the intended meaning during the comprehension and recall assessments. In addition, pictograms and video clips were required to achieve a minimum translucency score of 5 to demonstrate a 'good' or 'very strong' relationship with their intended meaning.<sup>23-25</sup>

## 3 | RESULTS

### 3.1 | The participants

A total of 100 participants were enrolled in this study, with 60% ( $n = 60$ ) included specifically for the purpose of validating the pictograms, while the remaining 40% ( $n = 40$ ) were included to validate the video clips. Among the sample of bus drivers, a predominant majority were male (75%,  $n = 45$ ), aged between 26 and 35 years

(36.7%,  $n = 22$ ) and had either been born or raised in Denmark (66.7%,  $n = 40$ ). Furthermore, the majority reported primary school as their highest educational level reached (46.7%,  $n = 28$ ), had worked for between 5 and 9 years (51.7%,  $n = 31$ ), and reported having a full-time employment status (85%,  $n = 51$ ; Table 2).

Among the sample of professional cleaners, 50% ( $n = 20$ ) were male and 50% ( $n = 20$ ) were female. A predominant majority aged between 56 and 65 years (40%,  $n = 16$ ) and had either been born or raised outside of Denmark (55%,  $n = 22$ ). Furthermore, the majority reported primary school as their highest educational level reached (45%,  $n = 18$ ), had worked for between 1 and 4 years (42.5%,  $n = 17$ ) and all of the cleaners reported having a full-time employment status (100%,  $n = 40$ ; Table 2).

**TABLE 2** Demographic data of the participants.

Characteristic	Total number of participants ( $n = 100$ )	Bus drivers ( $n = 60$ )	Professional cleaners ( $n = 40$ )
<b>Age</b>			
18–25 years old	13 (13)	13 (21.7)	-
26–35 years old	22 (22)	22 (36.7)	-
36–45 years old	18 (18)	7 (11.7)	11 (27.5)
46–55 years old	15 (15)	2 (3.3)	13 (32.5)
56–65 years old	26 (26)	10 (16.6)	16 (40)
Over 65	6 (6.0)	6 (10)	-
<b>Sex</b>			
Male	65 (65)	45 (75)	20 (50)
Female	35 (35)	15 (25)	20 (50)
<b>Country of born</b>			
Born or raised in Denmark	58 (58)	40 (66.7)	18 (45)
Born or raised outside of Denmark	42 (42)	20 (33.3)	22 (55)
<b>Educational background</b>			
Primary school	46 (46)	28 (46.7)	18 (45)
Vocational education	22 (22)	14 (23.3)	8 (20)
Higher education	8 (8.0)	8 (13.3)	-
Non-education	24 (24)	10 (16.7)	14 (35)
<b>Years worked at the workplace</b>			
Under 1 year	10 (10)	7 (11.6)	3 (7.5)
1–4 years	36 (36)	19 (31.7)	17 (42.5)
5–9 years	42 (42)	31 (51.7)	11 (27.5)
Over 10 year	12 (12)	3 (5.0)	9 (22.5)
<b>Employment status</b>			
Full-time	91 (91)	51 (85)	40 (100)
Part-time	9 (9.0)	9 (15)	-

## 3.2 | Validation of initially designed pictograms

### 3.2.1 | Bus drivers (primary validation)

A summary of the findings from this process is presented in Table S1. Initially, the pictograms were presented without the participants being aware that they were related to skin care and protection or HE. During this process, 5 of the 10 original pictograms (50%) achieved a transparency level of at least 85% among the bus drivers. The remaining pictograms that did not reach the minimum cutoff point were 2–4, 6 and 10. In the second round, when the context of the pictograms had been explained before being presented, the same pictograms (2–4, 6 and 10) again did not reach the minimum cutoff point, although the number of correct and partially correct answers increased. Common misinterpretations for these pictograms included: pictogram (2): *taking off the gloves when the time is 25 min past five*; pictogram (3): *I should use gloves when touching my eyes*, pictogram (4): *I can take white gloves or blue gloves*, pictogram (6): *I should not wash my hands at all and should instead only use hand disinfectant*, and the pictogram (10): *I should either wear blue or black gloves*.

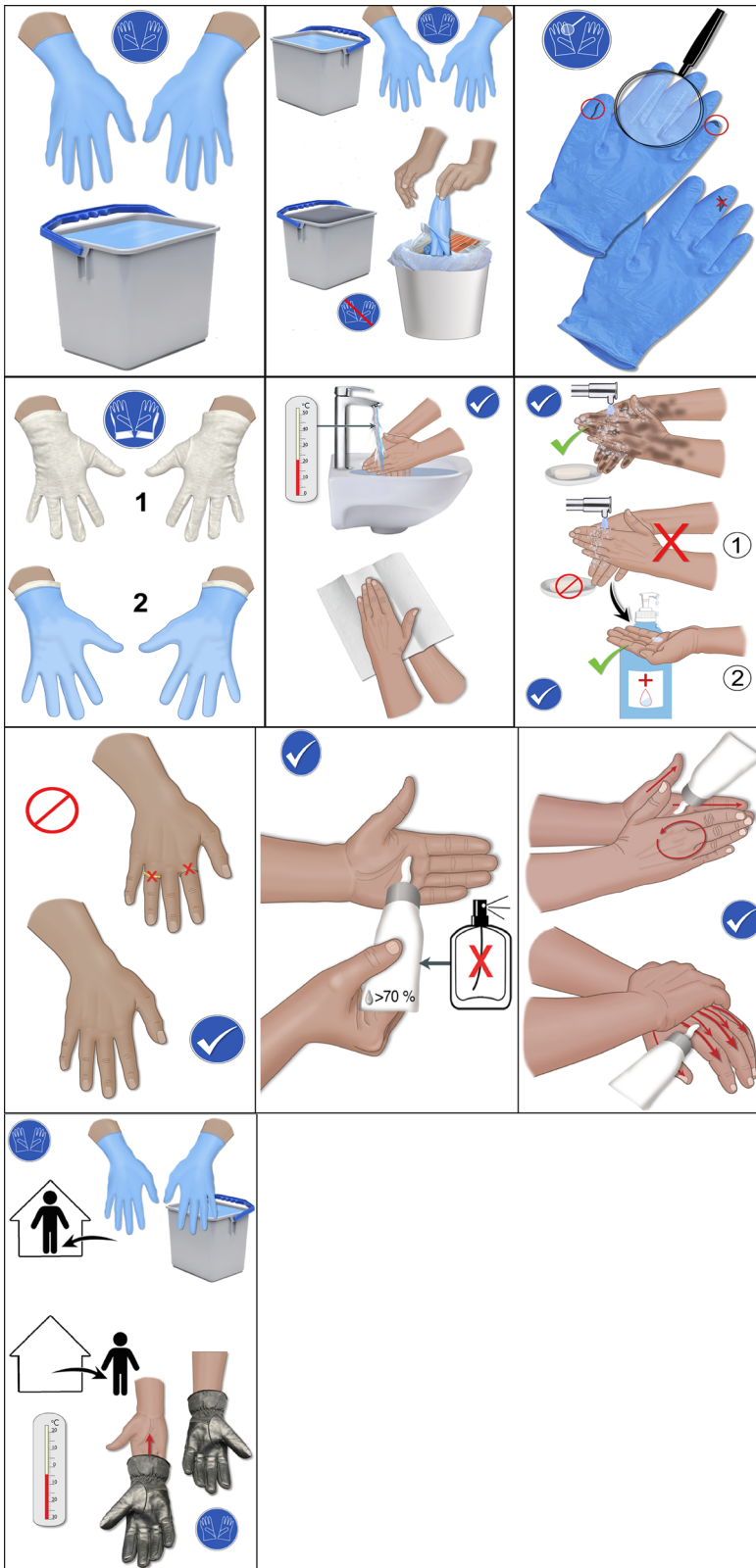
When the short-term recall was investigated, it was observed that all 10 pictograms (100%) were accurately recognised by all bus drivers (Table S2). For translucency, 5 of the 10 pictograms (50%) received a rating of 5 or higher from 85% of the participants. Notably, the same pictograms that fell below the minimum cutoff point also received a score below 5 in translucency (pictograms 2–4, 6 and 10).

### 3.2.2 | Validation of redesigned pictograms

Five of the initial pictograms (50%) did not meet the standards and were redesigned based on the recommendations provided by the bus drivers, who initially needed help to understand them correctly. During the validation process of the redesigned pictograms, it was observed that all of them achieved a transparency score rate of 85% and obtained a translucency score of at least 5 by 85% of the participants. Additionally, all the bus drivers were able to recall the pictograms correctly during the short-term recall assessment (Table S2).

### 3.2.3 | Professional cleaners (secondary validation)

Once all pictograms were correctly validated among bus drivers, they were validated among professional cleaners (Tables S3 and S4). All 10 pictograms (100%) reached a transparency score of 85% when presented as blinded (round 1). A higher percentage of correct comprehension was reached once the relationship of the pictograms to skin care and protection or HE was explained (round 2). For translucency, all pictograms received a score of 5 or higher from 85% of the professional cleaners. When investigating the short-term recall, all pictograms (100%) were identified correctly by all professional cleaners (Tables S3 and S4 and Figure 2).



**FIGURE 2** The 10 pictograms developed and validated to improve the knowledge of skin care and protection among professional cleaners.

### 3.3 | Validation of the educational video clips

The 10 video clips (100%) reached a transparency score of at least 85% when presented to bus drivers (primary validation) and professional cleaners (secondary validation; Tables S5–S8). In relation to translucency,

all the video clips received a minimum score of 5 from the participants. When investigating the short-term recall, the meaning of all video clips (100%) was correctly recalled by all bus drivers and professional cleaners.

An example of classifying answers into different categories during the data analysis is presented in Table S9. In addition, the

interview guide used during the validation process is presented in Table S10.

## 4 | DISCUSSION

In the current study, we designed and validated 10 pictograms and 10 educational video clips based on 10 practical recommendations aimed at preventing OHE through the use of personal protective equipment and protective behaviour. These recommendations are included in the most recent HE guidelines produced by the European Society of Contact Dermatitis.<sup>1</sup> Based on this study, there are some key points to consider.

Sample size is a critical consideration, as it directly impacts the depth, richness and generalisability of the findings. In our study, the sample size of 100 participants offers a substantial and diverse data set for analysis. It provides the opportunity to gather a range of perspectives and experiences, leading to meaningful findings that contribute to the understanding of our research topic. Our sample size can be considered substantial and comparatively large.

Picture-based materials, including pictograms and videos, are useful for populations that face challenges in accessing or understanding written health information due to factors such as limited reading skills, unfamiliarity with the language or low health literacy.<sup>27</sup> It is crucial to provide a comprehensive description of the target population when discussing the design and validation of such materials.<sup>27</sup> In our study, an uneven age distribution was observed among the participants. Of the cleaners, the majority were between 56 and 65 years old (40%), 46 and 55 years old (32.5%) and 36 and 43 years old (27.5%). Twenty-two (55%) of the cleaners were born or raised outside of Denmark, and the majority (45%) reported primary school as the highest educational level attained, 20% reported vocational education as their highest educational level and 35% had no education at all.

One of the professional cleaners was included in our study group to represent the target population and to provide input into the design process. Pictograms and other visual materials have the potential to be interpreted in a variety of ways, with variations influenced by factors such as differences in visual literacy skills, culture, educational level and other personal characteristics may also play a role. During the primary validation, only 5 of the 10 pictograms (50%) achieved a transparency score of at least 85% among the bus drivers. During the secondary validation, all the pictograms met or surpassed this. This difference may be explained by variations in personal characteristics as well as knowledge of skin care and protection. Including the target population in the design process is a significant factor for a successful outcome.<sup>22,27</sup> The level of familiarity that participants have with the specific topic plays a significant role in their understanding of images. This can impact the utility of using pictograms.<sup>24,28</sup>

In our study, the number of correct and partially correct answers increased once the concept and role of the pictograms in relation to skin care and protection as well as HE had been explained to the participants. Despite their apparent simplicity, picture-based materials can place a significant cognitive burden, particularly on individuals

who require assistance to comprehend the overall message.<sup>27</sup> Therefore, it is beneficial to introduce the participants to the concepts and role of these materials before using them.

When testing and evaluating pictograms, it is of the utmost importance to note all comments and incorrect interpretations to make effective modifications.<sup>27</sup> In our study, incorrect interpretations and suggestions regarding pictograms 2–4, 6 and 10 were noted during the primary validation and given to the graphic designer to inform the necessary revisions. When the redesigned pictograms were validated in a new group of bus drivers, all achieved a transparency score of at least 85% among the participants. We recommend that reporting incorrect interpretations and suggestions for improving pictograms is extremely important to achieve the best results. The improvement of pictograms based on feedback during the primary validation might also be a potential factor contributing to better outcomes during the secondary validation. However, it should be noted that this improvement was based on the knowledge, understanding and perception of a different target population, which may or may not differ from that of professional cleaners. While this improvement has the potential to benefit the secondary validation concerning pictograms, it is also possible that it may not address the specific needs and requirements of this population at all.

While pictograms offer several advantages, it is also crucial to acknowledge their limitations. For instance, pictogram number 4 can be mentioned. This pictogram advises the use of cotton gloves underneath protective gloves for extended periods. To depict the cotton gloves under the protective gloves, the cuff of the cotton glove peeks out from under the protective glove. In cleaning tasks, there is a risk of liquids splashing into the cotton cuff and seeping into the fabric. Therefore, it is recommended to have the protective gloves cover the cuff of the cotton glove. However, accurately representing this scenario in the corresponding pictogram poses a significant challenge and can be seen as a potential limitation.

In our study, bus drivers and professional cleaners understood the educational video clips well. This might be because live-action may make the topic more familiar and easier to relate to compared to animation or pictures.

### 4.1 | Strengths and limitations

To our knowledge, the present study is the first to investigate the design and validation of pictograms and educational video clips to improve the knowledge of skin care and protection in high-risk occupations such as professional cleaners. Materials such as these could potentially lead to better skin protection behaviour, eventually reducing the risk of cleaners developing OHE. Our study has some limitations. There might be interview bias associated with our results since the study was based on semi-structured interviews. Interview bias is where the expectations or opinions of the person conducting an interview interfere with their objectivity, either negatively or positively, clouding their judgement of the person being interviewed. Factors such as the size and colour of pictograms could also potentially affect

our results. There are no standard guidelines for assessing the effectiveness of pictograms and video clips. However, most studies tend to use The International Organization for Standardization, requiring the graphic symbols to be understood by a minimum of 67%,<sup>29</sup> or the ANSI, as used in our study, which requires that the pictogram or any other visual aid is correctly interpreted by at least 85% of the target population, with no more than 5% experiencing critical confusion.<sup>26</sup> Another limitation is related to the examination of recall in our study. We only focused on short-term recall and did not examine long-term recall. To use pictograms and video clips in the future to prevent HE, long-term recall, defined as the cognitive process involved in transferring information from short-term memory into the more enduring storage of long-term memory, is needed. Our study could have been conducted and evaluated in an even more standardised manner if the interviews had been transcribed and analysed systematically. However, this has been challenging due to having a large sample of 100 participants.

## 4.2 | Suggestions for future measures

The impact of pictograms and educational video clips on the prevention of HE should be studied further in more randomised trials.

## 5 | CONCLUSIONS

We have designed and validated 10 pictograms and 10 educational video clips to improve the knowledge of skin care and protection, potentially leading to preventing OHE in professional cleaners. Pictograms and videos are especially helpful for people with difficulties accessing and/or comprehending information presented as text due to unfamiliarity with the language and limited reading skills.

### AUTHOR CONTRIBUTIONS

**Farnam B. Sedeh:** Conceptualization; investigation; writing – original draft; methodology; validation; writing – review and editing; formal analysis; data curation. **Thórunn E. Michaelsdóttir:** Investigation; writing – original draft; methodology. **Ole S. Mortensen:** Conceptualization; writing – original draft; methodology; validation; supervision; project administration. **Gregor E. Jemec:** Conceptualization; investigation; methodology; supervision; writing – original draft. **Kristina S. Ibler:** Conceptualization; investigation; funding acquisition; writing – original draft; methodology; validation; writing – review and editing; supervision; project administration.

### ACKNOWLEDGEMENTS

This research has received funding from Danish Working Environment Fund with the grant number being: 20205100702.

### CONFLICT OF INTEREST STATEMENT

Dr Gregor E. Jemec reported receiving grants from AbbVie, LEO Foundation, Afyx, InflaRx, Janssen-Cilag, Novartis, UCB, CSL Behring, Regeneron, Sanofi, Boehringer Ingelheim, Union Therapeutics and

Toosonix and personal fees from Coloplast, Chemocentryx, LEO Pharma, Incyte, Kymera and VielaBio. Dr Kristina S. Ibler has been part of advisory boards and received personal fees from Astra Zeneca, Leo Pharma, Sanofi Genzyme and Eli Lilly. Drs Gregor E. Jemec and Kristina S. Ibler declare that none of the mentioned conflicts of interest had any influence on the content of this manuscript. The rest of the authors do not have any conflicts of interest.

### DATA AVAILABILITY STATEMENT

The data sets generated and/or analysed during the current study are available from the corresponding author on reasonable request.

### ENDNOTES

<sup>1</sup> Name: Kari C. Toverud.

<sup>2</sup> Name: Morten Hansen.

### REFERENCES

1. Thyssen JP, Schuttelaar MLA, Alfonso JH, et al. Guidelines for diagnosis, prevention, and treatment of hand eczema. *Contact Dermatitis*. 2022;86(5):357-378.
2. Alfonso JH, Bauer A, Bensefa-Colas L, et al. Minimum standards on prevention, diagnosis and treatment of occupational and work-related skin diseases in Europe—position paper of the COST action StanDerm (TD 1206). *Eur Acad Dermatol Venereol*. 2017;31(Suppl 4):S31-S43.
3. Sedeh FB, Michaelsdóttir TE, Jemec GBE, Mortensen OS, Ibler KS. Prevalence, risk factors, and prevention of occupational contact dermatitis among professional cleaners: a systematic review. *Int Arch Occup Environ Health*. 2023;96(3):345-354.
4. Bauer A. Contact dermatitis in the cleaning industry. *Curr Opin Allergy Clin Immunol*. 2013;13:521-524.
5. Lynde CB, Obadia M, Liss GM, Ribeiro M, Holness DL, Tarlo SM. Cutaneous and respiratory symptoms among professional cleaners. *Occup Med*. 2009;59:249-254.
6. Carøe T, Ebbenhøj N, Agner T. A survey of exposures related to recognized occupational contact dermatitis in Denmark in 2010. *Contact Dermatitis*. 2014;70:56-62.
7. Mirabelli MC, Vizcaya D, Martí Margarit A, et al. Occupational risk factors for hand dermatitis among professional cleaners in Spain. *Contact Dermatitis*. 2012;66(4):188-196.
8. Aydin Taş T, Akiş N, Saricaoğlu H. Occupational contact dermatitis in hospital cleaning workers. *Dermatitis*. 2021;32(6):388-396.
9. Gupta SB, Gupta A, Shah B, et al. Hand eczema in nurses, nursing auxiliaries and cleaners—a cross-sectional study from a tertiary hospital in western India. *Contact Dermatitis*. 2018;79(1):20-25.
10. Weisshaar E, Radulescu M, Soder S, et al. Secondary individual prevention of occupational skin diseases in health care workers, cleaners and kitchen employees: aims, experiences and descriptive results. *Int Arch Occup Environ Health*. 2007;80(6):477-484.
11. Dietz JB, Menné T, Meyer HW, et al. Occupational contact dermatitis among young people in Denmark—a survey of causes and long-term consequences. *Contact Dermatitis*. 2022;86(5):404-416.
12. Lammintausta K, Kalimo K, Aantaa S. Course of hand dermatitis in hospital workers. *Contact Dermatitis*. 1982;8(5):327-332.
13. Feveile H, Christensen KB, Flyvholm MA. Self-reported occupational skin contact with cleaning agents and the risk of disability pension. *Contact Dermatitis*. 2009;60(3):131-135.
14. Agner T, Held E. Skin protection programmes. *Contact Dermatitis*. 2002;47:253-256.
15. Hand Eczema [Internet]. Knowledge Center for Allergy, Gentofte Hospital. Danish Contact Dermatitis Group. 2017. pp. 1–4. Accessed



- June 30, 2023. <https://www.videncenterforallergi.dk/kliniske-retningslinjer/patientinformation/patientinformation-haandeksem/>
16. Sedeh FB, Michaelsdóttir TE, Jemec GBE, Mortensen OS, Ibler KS. What do professional cleaners know about the skin care? A questionnaire-based study. *Contact Dermatitis*. 2023;88(4):286-293.
  17. Sejbaek CS, Flachs EM, Carøe TK, et al. Professional cleaning and risk of asthma—a Danish nationwide register-based study. *Scand J Work Environ Health*. 2022;48(2):127-136.
  18. Arcia A, Bales ME, William Brown MC III. Method for the development of data visualizations for community members with varying levels of health literacy. *AMIA Annu Symp Proc*. 2013;2013:51-60.
  19. Berkman ND, Sheridan SL, Donahue KE, Halpern DJ, Crotty K. Low health literacy and health outcomes: an updated systematic review. *Ann Intern Med*. 2011;155:97-107.
  20. Elbro C, Møller S, Nielsen EM. Functional reading difficulties in Denmark. *Read Writ*. 1995;7:257-276.
  21. Elbro C, Conrad J. analfabetisme i Den Store Danske på lex.dk. [Internet]. Accessed June 30, 2023. <https://denstoredanske.lex.dk/analfabetisme>
  22. Sedeh FB, Arvid Simon Henning M, Mortensen OS, Jemec GBE, Ibler KS. Communicating with patients through pictograms and pictures - a scoping review. *J Dermatolog Treat*. 2022;33(6):2730-2737.
  23. Vaillancourt R, Truong Y, Karmali S, et al. Instructions for masking the taste of medication for children: validation of a pictogram tool. *Can Pharm J*. 2016;150(1):52-59.
  24. Roberts NJ, Mohamed Z, Wong PS, Johnson M, Loh LC, Partridge MR. The development and comprehensibility of a pictorial asthma action plan. *Patient Educ Couns*. 2009;74:12-18.
  25. Mok G, Vaillancourt R, Irwin D, Wong A, Zemek R, Alqurashi W. Design and validation of pictograms in a pediatric anaphylaxis action plan. *Pediatr Allergy Immunol*. 2015;26(3):223-233.
  26. American National Standard Institute. Accredited standard on safety colours, signs, symbols, labels and tags: NEMA, 1991; Z535:1-5.
  27. Dowse R. Designing and reporting pictogram research: problems, pitfalls and lessons learned. *Res Social Adm Pharm*. 2021;17(6):1208-1215.
  28. Caffaro F, Cavallo E. Comprehension of safety pictograms affixed to agricultural machinery: a survey of users. *J Safety Res*. 2015;55:151-158.
  29. Published. ISO 9186-1:2014 Graphical Symbols—Test Methods—Part 1: Method for Testing Comprehensibility. [Internet] ISO; 2014. July 1, 2020. Accessed December 15, 2022. <https://www.iso.org/cms/render/live/en/sites/isoorg/contents/data/standard/05/92/59226.html>

## SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

**How to cite this article:** Sedeh FB, Michaelsdóttir TE, Mortensen OS, Jemec GE, Ibler KS. Design and validation of pictograms and educational video clips to improve the knowledge of skin care and protection: Comprehension and recall among professional hospital cleaners. *Contact Dermatitis*. 2023;1-9. doi:[10.1111/cod.14395](https://doi.org/10.1111/cod.14395)