

Skin exposure in geriatric care – a comparison between observation and self-assessment of exposure

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The aim of this study was to compare observation and self-assessment of skin exposure to irritants during a working day in nursing in geriatric care. The study group consisted of 40 volunteers, 13 nurses, and 27 assistant nurses. Before the start of a working day, the participants completed a questionnaire regarding skin exposure to water, gloves, hand disinfection, and moisturizers. Observers subsequently used a hand-held computer to register the time and frequency of each exposure. The total mean skin exposure time was 96 min per working day, including glove use. The mean exposure time to water was 9 min per working day. A tendency to overestimate was found for all exposures. A strong correlation between self-reports and observations was found for hand disinfection and moisturizers, while a moderate correlation was found for gloves and number of water exposures and a weak correlation for total time of water exposure. Despite the differences between self-assessment and observation of the exposure, we consider the questionnaire to be useful for surveying skin exposure in nursing. Furthermore, the observations in this study suggest that nursing work in geriatric care may comprise limited exposure to water.

Key words: hand disinfection; protective gloves; self-reports; validation; wet work. © Blackwell Munksgaard, 2007.

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Exposure to skin irritants in occupational life is an important risk factor for hand eczema (1–3), and nursing is usually considered a risk occupation (4–6). Common skin irritants in nursing are water, hand washing, and hand disinfection, and extensive use of protective gloves can also be considered to constitute skin exposure.

Blood-borne infections in the 1980s and multi-resistant *Staphylococcus aureus* (MRSA) in the mid-1990s have resulted in intensified use of protective gloves and hand disinfection in Swedish health care. The importance of hand washing has been stressed as well. As a result of an infection control campaign, hand washing in some instances has been replaced by hand disinfection. As it seems that the use of gloves and hand disinfection has increased in nursing and water exposure may have decreased over time, it is of interest to survey the exposure, and it is desirable that questions used are validated.

The aim of this study was to compare observation and self-assessment of skin exposure to irritants during a working day in nursing in geriatric care. The participants filled in a questionnaire

before the start of a working day. Observers subsequently used a hand-held computer to register the time and frequency of each exposure.

Subjects and Methods

Study population

The study group consisted of 36 female and 4 male volunteers in a geriatric ward, 13 nurses and 27 assistant nurses. The mean age of assistant nurses was 40 years (range 25–58 years) and that of nurses 36 years (range 24–61 years). The study was performed in 3 different geriatric clinics in 6 different regular wards in Stockholm, Sweden, from February 2006 to June 2006.

Observations

The observations were performed by 2 trained observers during 1 working day or 2 half days (AM + PM) for each participant. The mean total observation time per individual was 508 min (range 419–613 min). Using a hand-held computer (palm), the duration of each exposure was registered continuously in real time during the

whole working day, except for lunch breaks. 6 circles around fields on the computer display screen corresponded to exposure to water, hand washing, hand disinfection, protective gloves, moisturizers, and 'no exposure', respectively. When the subjects exposed themselves to one of the exposures, the observer marked the appropriate circle on the display screen, using a pen, and timing was initiated. When the exposure was discontinued for any reason, the observer marked 'no exposure' or a new circle with another exposure. When gloves were used, no other exposure was registered simultaneously. The FIT software system (J. Held, Swiss Federal Institute of Technology, Zurich, Switzerland) was used for data collection (7). The data were then transferred to a personal computer for analysis. The software calculated and stored start, stop, and total time of the observations. Information about the number of times the fields in the circles were activated during the work shift, including the mean duration of each event, was also supplied. The measurements gained through observation were regarded as the 'gold standard'. The estimated time for hand disinfection (isopropanol and ethanol), because vaporization is not possible to observe, was 1 min. The time for the hand washes was registered by the observers, except when the participants washed their hands out of sight, in which case the estimated time was 1 min.

Questionnaire

A questionnaire was handed to the participants by the observer immediately before the start of the working day. The subjects filled in the questionnaire and handed it back to the observer. It comprised 5 questions regarding exposure to water, frequency and total time of exposure, use of disinfection, use of protective gloves, and use of moisturizers (Table 1). Questions regarding sex, occupation, age, and hand eczema were also

included. The observers gave no further instructions or information to the subjects when handing over the questionnaires.

Data analysis and statistics

For statistical analysis, ssps, version 13.0 (SSPS Inc., Chicago, IL, USA), was used. The time, continuously measured in the observations, was converted to the ordinal response scale used in the questionnaire.

The histograms for self-rated exposures from the questionnaire regarding the frequency of exposure to water, total time of water exposure, use of disinfection, use of protective gloves, and use of moisturizers all showed clear tendencies to be normally distributed. The relation between registered data and data from the questionnaire was analysed using Pearson's rank correlations.

For water and glove exposure, respectively, the subject was classified as 'high-exposed' if exposed more than 12 times a day, otherwise classified as 'low-exposed'. Furthermore, for water and gloves exposure, the subjects were classified as either 'overestimators' or 'equal/underestimators' regarding their self-rating compared with the observed time. After cross-tabulating these 2 variables (high/low exposed and over/equal underestimators), a Fisher's exact test was performed to test the hypothesis that there were higher proportions of overestimators among those frequently exposed during the day.

There were no missing data in the questionnaires or in the observations. No ethics approval was needed for the study, according to the Ethics Committee of Karolinska Institutet, Stockholm (No. 04-135/4).

Results

Observed skin exposure during a working day is presented in Table 2. The total mean skin

Table 1. Questions on skin exposure asked in the questionnaire

1. How many hours a day, at work, do you use occlusive protective gloves (rubber or plastic)?
☐ Not at all ☐ < ½ hr/day ☐ ½–2 hr/day ☐ 2–5 hr/day ☐ > 5 hr/day
2. Are your hands, at work, exposed to water?^a
☐ Not at all ☐ < ½ hr/day ☐ ½–2 hr/day ☐ 2–5 hr/day ☐ > 5 hr/day
3. How many times a day, at work, are you exposed to water?^a
☐ Not at all ☐ 1–10 times ☐ 11–20 times ☐ > 20 times
4. Are your hands, at work, exposed to hand disinfection?
☐ Not at all ☐ 1–10 times ☐ 11–20 times ☐ > 20 times
5. How many times a day, at work, do you use moisturizers?
☐ Not at all ☐ 1–2 times ☐ 3–5 times ☐ > 5 times
6. Have you during the past 12 months had hand eczema on some occasion?
☐ Yes ☐ No

^aTime without protective gloves.

Table 2. Observed skin exposure during a working day in nurse assistants and nurses in geriatric care

	Total (n = 40) Mean (range)	Nurse assistants (n = 27) Mean (range)	Nurses (n = 13) Mean (range)	Total (n = 40) Mean (range)	Nurse assistants (n = 27) Mean (range)	Nurses (n = 13) Mean (range)
	Exposure time (min)			Number of exposures (n)		
Protective gloves	65 (0–136)	83 (47–136)	27 (0–86)	11 (0–26)	14 (6–26)	5 (0–14)
Water ^a	9 (1–55)	10 (1–55)	6 (2–13)	14 ^b (2–27)	14 ^c (2–27)	11 ^d (4–21)
Hand disinfection ^c	22 (0–54)	26 (4–54)	14 (0–41)	22 (0–54)	26 (4–54)	14 (0–41)
Moisturizers				1 (0–6)	1 (0–2)	1 (0–6)
Total ^f proportion of working day (%)	96 (19)	119 (24)	47 (9)			

^aTime includes hand washing.

^bOf which 10 were hand washings.

^cOf which 11 were hand washings.

^dOf which 8 were hand washings.

^eEach hand disinfection was estimated to take 1 min.

^fIncludes exposure to protective gloves, water and hand disinfection.

exposure time in nurses and assistant nurses together was 96 min per working day, including glove use. The mean exposure time to water was 9 min (range 1–55 min) per working day, and the majority of the water exposures observed were linked to hand washing. The mean exposure time for protective gloves was 83 min in assistant nurses and 27 min in nurses during the working day. For nurses as well as for assistant nurses, the mean duration of each exposure period to gloves was 6 min.

Self-reported skin exposure in relation to observed exposure is presented in Table 3. The Pearson's correlation varied from 0.246 to 0.679. Figure 1 shows self-reported skin exposure in relation to observed exposure, expressed as underestimation, correct estimation, or overestimation. A tendency to overestimate was found for all the exposures.

There was no statistically significant relation found between 'high-exposed' and 'overestimators' regarding exposure to water. No such relation was found for gloves either.

7 out of 40 individuals reported hand eczema on some occasion during the previous 12 months. The exposure time to skin irritants was 1 hr and 45 min in mean for persons with hand eczema and 1 hr and 33 min in mean among those who did not report eczema.

Discussion

Both nurses and assistant nurses tended to overestimate all the exposures. The participants showed the biggest difficulties in estimating total exposure time to water. Altogether, 33/40 overestimated their total exposure time to water and the correlation between self-reports and observations was weak (0.246). The correlation for the number of water exposures was moderate, and the parti-

cipants therefore estimated frequency more correctly than they estimated total exposure time. In a Dutch study of wet work among nurses, observation showed less than half the duration of wet work reported in self-reports, but almost double the frequency of wet exposures (8). In a previous validation study on skin exposure, participants likewise tended to overestimate their total exposure time to water, gloves and hand washing, and there was a positive relation between high number of exposures and overestimation of the total exposure time (9). In the present study, however, no such association was found. A possible explanation for the overestimation of water exposure is that nurses/assistant nurses by tradition experience their work as wet work.

The nurses/assistant nurses in this study were exposed to skin irritants to a limited extent and to water for only 9 min per working day. The nurses were less exposed than assistant nurses, most likely because they had more administrative tasks. In Germany, occupational skin exposure to irritants has been regulated since 1996 (10). In these regulations, 'wet work' has been described as wet hands for more than 2 hr a day, use of occlusive protective gloves for more than 2 hr a day, or hand washing exceeding 20 times a day. In our study, only 1 individual was exposed to hand washing more than 20 times a day, and no one had water exposure of more than 2 hr. Two individuals used gloves for more than 2 hr. The individuals in this study were not randomly chosen and therefore may not be representative of all nurses and assistant nurses in geriatric care in Sweden, although all were employed in regular wards in 3 out of 7 geriatric clinics in Stockholm. Our cautious interpretation of these data is that nursing in geriatric care today may comprise limited exposure to water.

Table 3. Self-reported skin exposure in relation to observed skin exposure during a working day in nurse assistants and nurses in geriatric care^a

Self-reported exposure		Observed exposure					Correlation ^b
Protective gloves							
Exposed time		Not at all	< ½ hr	½–2 hr	2–5 hr	>5 hr	0.403
	Not at all		1	2			
	< ½ hr		5	11	1		
	½–2 hr	1		15	1		
	2–5 hr			3			
	>5 hr						
Water							
Exposed time		Not at all	< ½ hr	½–2 hr	2–5 hr	>5 hr	0.246
	Not at all		7				
	< ½ hr		23				
	½–2 hr		6	1			
	2–5 hr		3				
	>5 hr						
Water							
No. of exposures		Not at all	1–10 times		11–20 times	>20 times	0.521
	Not at all		7		1	1	
	1–10 times		6		11	2	
	11–20 times		1		8	3	
	>20 times						
Hand disinfection							
No. of exposures		Not at all	1–10 times		11–20 times	>20 times	0.679
	Not at all		5			1	
	1–10 times	1	6		4	6	
	11–20 times				3	14	
	>20 times						
Moisturizer							
No. of exposures		Not at all	1–2 times		3–5 times	>5 times	0.618
	Not at all	10	1				
	1–2 times	12	11		1		
	3–5 times	1	3				
	>5 times					1	

^aFigures in bold indicate correspondence between self-reports and observations.^bPearson's rank correlation.

Nursing is traditionally regarded as 'wet work', and as a consequence, it is regarded as a risk occupation for developing hand eczema. National registers regarding occupational skin diseases are usually incomplete, but they do give indications of the risk of developing hand eczema in different

occupations. In Germany, the northern Bavarian register of occupational diseases gives the incidence of occupational skin diseases as being 1.5/1000 in nurses compared with an average of 0.8/1000 in the total work force (11). The register of occupational skin diseases in Saarland, also

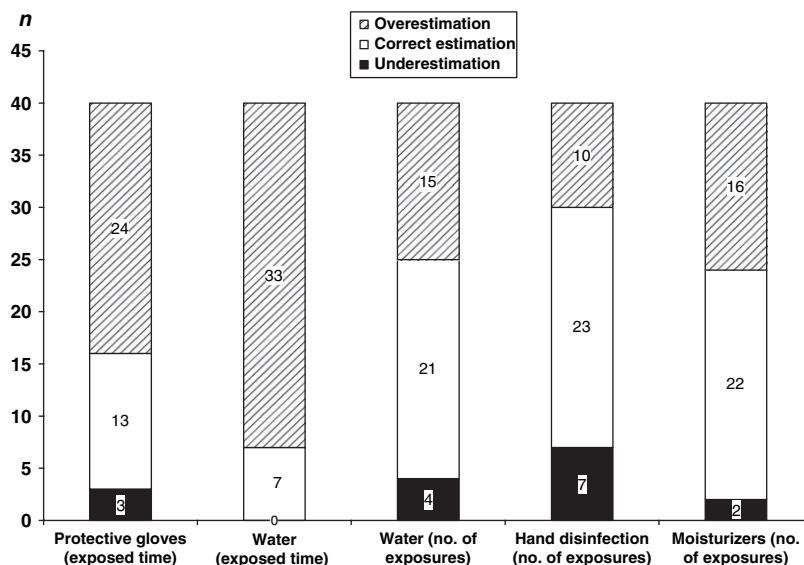


Fig. 1. Self-reported skin exposure during a working day in relation to observed skin exposure, expressed as underestimation, correct estimation, or overestimation in nurse assistants and nurses in geriatric care.

in Germany, reports similar figures, with an incidence rate of 1.3/1000 in nurses (12). The Danish National Board of Industrial Injuries Registry shows an incidence rate of 0.7/1000 in nurses and the EPIDERM and OPRA in the UK, 0.2–0.3/1000 (13, 14). It appears as though there is a slightly increased risk of developing hand eczema in nursing. Compared with bakers and hairdressers, who were reported by the Danish National Board of Industrial Injuries Registry to have an incidence of 8.4/1000 and 5.6/1000, respectively, the risk seems to be low in nurses (13).

The regulations regarding infection control in health care in Sweden came into effect in 1982 and recommend the use of hand disinfection before and after contact with patients and hand washing when hands are visibly dirty or 'feel dirty' (15). Blood-borne infections and MRSA have resulted in increased use of protective gloves and hand disinfection, probably owing to better observance of the regulations. Some of the hand washing has been replaced by hand disinfection following an infection control campaign. In our study, the participants used hand disinfection a mean 22 times per working day and washed their hands a mean of 10 times a day. Some studies indicate that hand disinfection may be less damaging to skin compared with hand washing and may therefore reduce the risk of hand eczema (16–18). In our study, glove use was classified as skin exposure. Use of protective gloves, although intended as prevention, may be a risk factor for hand eczema (19). Short-term use probably gives a lower risk, but continuous and protracted use may contribute to hand eczema (20, 21). However, the impairment may be prevented by using cotton gloves underneath the occlusive gloves (21). As it seems that gloves constitute the main skin exposure in nursing today, it is important to carefully select the gloves used. Gloves should be low allergenic and should be suitable for the work tasks. Using moisturizers when having occupational hazardous exposure has been shown to be beneficial in preventing hand eczema (22). In our study, the mean number of times the nurses/assistant nurses used moisturizers was only once a day.

The method used in this study has been used in previous studies for validating questionnaires regarding work postures and skin exposure and was easy to apply and reliable (9, 23). The questions validated in this study are aimed to be used in future epidemiological surveys to estimate occupational skin exposure, thus skin exposure during an average working day. For this reason, we have chosen to let the participants complete the questionnaire before the start of the working day. The day observed might not have been an

average day, and it would have been desirable to observe the individuals for several days. This was unfortunately not possible to accomplish. The time was continuously measured in the observations, but in the questionnaire, an ordinal response scale was used. We considered the ordinal scale more suitable for the participants, especially when estimating long exposure times. If the questionnaire was designed to have a continuum of answers, it would be fair to assume that the participants would report their exposure rounded to the nearest half hour or whole hour. We did not specifically ask for number of times of hand washing because we thought it would be confusing to separate water exposure and hand washing, but the majority of the water exposures were linked to hand washing. In a Dutch study (8), it was suggested that the risk of hand dermatitis from wet work may be related to the frequency of wetting and drying cycles. Influenced by this, we asked for total exposure time as well as for number of exposures to water.

In conclusion, the nurses and assistant nurses in this study overestimated their exposure to skin irritants. However, we consider the questionnaire to be useful for surveying skin exposure in nursing. Furthermore, the observations in this study suggest that nursing work in geriatric care may comprise limited exposure to water.

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