

OBSERVANCE OF HAND WASHING PROCEDURES PERFORMED BY THE MEDICAL PERSONNEL AFTER THE PATIENT CONTACT. PART II

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Abstract

Objectives: The Centers for Disease Control and Prevention (CDC) as well as the World Health Organization (WHO) state that adequate hand hygiene maintained by medical personnel is an indispensable prerequisite for controlling nosocomial infections. The recommendations of CDC and WHO emphasize the obligation to wash hands after each contact with a patient, after the exposure to a potentially infectious material or upon the contact with objects surrounding the patient. **Materials and Methods:** The study was performed by quasi-observation among the group of 188 medical staff members (nurses and physicians) working in three selected hospitals of the Łódź Province. The procedure of hand washing/disinfection performed directly after the patient contact according to the recommendations of CDC and WHO was observed. The results were subject to statistical analysis ($p < 0.05$). **Results:** During 1544 h of observations, 4101 activities requiring hand washing were recorded. The medical personnel followed the hand hygiene procedures after the patient contact in 26.4% of the situations that require hygiene according to the guidelines. The level of observance of the hand washing procedures depended significantly on the type of performed activity, profession, degree of workload, index of activity, and time of duty hours. The mean time of hand washing after patient contact was 9.2 s for physicians and 6.7 s for nurses. **Conclusion:** Both the level of observance of hygienic procedures after the contact with patients as well as the time of hand washing are insufficient. There is an urgent need to work out educational programs on maintaining proper hand hygiene for medical personnel.

Key words:

Hygiene, Compliance with procedures, Hand washing, Medical personnel

INTRODUCTION

In today's world, no one doubts that proper hand hygiene of medical personnel is an efficient and the cheapest way to prevent nosocomial infections. Keeping hands clean after contact with patients, potentially infectious material, or polluted environment is a key element in interrupting the transmission of microorganisms. Part I of this paper (Observance of hand washing procedures performed by the

medical personnel before the patient contact. Part I. by Garus-Pakowska et al. [1]) explains the social and the hygienic hand washing/disinfection of hands by rubbing. According to the guidelines of the Centers for Disease Control and Prevention of Infectious Diseases in Atlanta (CDC) and the World Health Organization (WHO), social hand washing is mandatory in case of visible stains of dirt or blood, or other body fluids. This procedure is recommended also for the

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possible or proven exposure to spore-forming pathogens (e.g. *Bacillus anthracis*, *Clostridium difficile*). Besides, washing hands with soap and water is required after finishing the job and after using the toilet [2,3].

Hygienic hand washing or hygienic hand disinfection by rubbing is recommended in the following circumstances:

- After performing invasive and nursing procedures, regardless of whether gloves were used or not.
- After contact with blood, body fluids, mucous membranes, broken skin, after wound dressing, after contact with burns and bedsores, if dirt is not visible.
- After contact with the catheters, drains and equipment parts directly in contact with the tissues of the patient.
- After contact with intact skin of the patient, for example, after measuring the heart rate or blood pressure, after lifting a patient, etc.
- After contact with secretions and excretions of the patient and other materials potentially contaminated with germs.
- After contact with one patient and before contact with the next patient.
- In case of contact with a patient, between examinations of different parts of the body characterized by different microbial contamination.
- After contact with inanimate surfaces and objects located in the immediate vicinity of the patient.

The World Health Organization points out that in these situations, simple washing hands with soap and water is required when disinfectants are not available.

All of the recommendations emphasize the necessity to decontaminate the skin of hands after contact with the patient, but also after each use of protective gloves. Hand washing with water and soap should take minimum 15 s, while hand cleaning with disinfectants should take ca 20 to 30 s [2–4].

The aim of the work was to assess the compliance with the requirement of cleaning/disinfecting hands after each patient contact.

MATERIALS AND METHODS

The study participants included a group of 188 people (nurses and doctors) subjected to direct quasi-participatory observation. They were employees of three hospitals located in the Łódź region. One surgical (“increased risk”) and one conservative (medical care) department were selected for the study in each of the hospitals. Detailed description of the test method has been included in “Observance of hand washing procedures performed by the medical personnel before the patient contact. Part I” [1].

Compliance with hygiene procedures was defined as washing the hands at any time interval with soap and water or antiseptic formulation, or disinfecting the hands by rubbing hand sanitizer immediately after contact with patients, as recommended by the Centers for Disease Control and Prevention in Atlanta and the World Health Organization:

- after patient nursing (bathing, making bed, dressing),
- in the case of visible soiling of hands,
- after performing invasive procedures,
- after wound dressing,
- after handling catheters and medical equipment parts directly in contact with the tissue of the patient,
- after contact with a patient’s secretions and excretions,
- after using gloves.

The duration of hygiene procedures was measured using an electronic stop-watch Magma 10 (Hanhart GmbH & Co. KG, Germany). The subjects were not informed what kind of activities were being observed. The Bioethics Committee approved the study protocol (Resolution of the Bioethics Committee, Ref. No. RNN/113/06/KE).

Statistical inference was conducted at the significance level $p < 0.05$. We used two-sided tests for the verification of the statistical hypotheses. We used a logistic regression model with random effects for analysis of hygiene procedures for hand washing. In the random effect model we

used a person as a grouping variable. We used the random effect model to account for the within-person correlation. All statistical analyses were conducted using R statistical package (<http://www.r-project.org>).

RESULTS

The study group comprised all employees of the six selected departments of the three hospitals of the Łódź Region (125 nurses and 63 doctors). Further description of the structure of the study groups may be found in the paper by Garus-Pakowska et al. [1].

During the observations, 4101 activities were reported as requiring hand hygiene. For the statistical analysis, 3498 operations were selected which, in accordance with the recommendations of the CDC and WHO, require observing full hygienic procedure (washing/disinfection of hands and wearing protective gloves).

The analysis of the hand hygiene procedures performed after contact with patients or potentially infectious material in relation to the sum of all observed situations requiring such hygiene procedures showed that medical personnel washed their hands in 26.4% of circumstances which in accordance with the recommendations required such action.

Although the percentage of compliance with hand hygiene "AFTER" patient contact is still low (26.4%), the difference relative to hand washing "BEFORE" patient contact (5.2%) [1] is statistically significant ($p < 0.001$) (Table 1).

Table 1. Compliance with hand hygiene "before" vs. "after" contacts with the patient or a possibly infectious material

Hygiene	Hand washing			
	yes		no	
	n	%	n	%
Before the activity	181	5.2	3 317	94.8
After the activity	929	26.4	2 574	73.6

$p < 0.001$.

Adherence to the guidelines regarding hand washing after contact with patients was dependent on the type of the performed activity ($p < 0.001$). Medical personnel washed their hands most frequently after activities involving contact with the patient's excrements, such as *per rectum* examination (75%) or insertion of a urinary catheter (55.4%). After performing procedures such as e.g. endoscopy and/or biopsy, the hand washing procedure was performed in less than 46% of the observed activities. The adherence to the hand washing procedure after contact with blood was less frequent. For example, for blood sampling, the compliance rate was 39.8%. The personnel washed their hands definitely least frequently after measuring blood pressure, physical examination and after patient-nursing activities (Table 2).

The compliance with the hand hygiene recommendations was similar for all examined departments (Table 3). It was not dependent on the department character, either. Both in the conservative and the "increased risk" departments, the hand washing frequency was similar (Table 4).

Hygienic behaviors when dealing with the patients or infectious material were more frequent in the case of physicians than nurses. The difference is statistically significant at $p < 0.001$ (Table 5).

The workload defined as the activity index (the number of activities requiring hand hygiene per observation unit) affected the level of compliance with the hygiene recommendations. The more numerous were the activities requiring hand hygiene per unit of time, the less frequently the recommendations were adhered to $p < 0.001$ (Table 6).

The index of effective workload (total time devoted to work during the observation unit, including cleaning work, administrative work, etc.) confirmed that the work per time unit was significantly ($p < 0.001$) associated with lesser personnel compliance with the hand washing requirements after contact with the patients (Table 7).

Table 2. Compliance with the hand washing procedure after activities requiring hygiene, depending on the activity type

Activity	Activities that require hand washing (total) (n)	Hand washing after the activity (%)	
		yes	no
Collect blood	304	39.8	60.2
Insert/remove cannula	144	31.9	68.1
Install/remove drip	1 035	22.9	77.1
Inject	627	22.8	77.2
Perform biopsy/endoscopy	70	45.7	54.3
Change wound dressing	239	38.9	61.1
Insert urinary catheter	65	55.4	44.6
Touch equipment that comes in direct contact with mucous membranes	82	19.5	80.5
Perform <i>per rectum</i> examination/enema	8	75.0	25.0
Contact with patient's excrements (changing diapers)	183	39.3	60.7
Patient nursing (washing)	576	16.1	83.9
Record arterial blood pressure	167	2.4	97.6
Physical examination of a patient	441	15.1	84.9
Feed a patient	160	11.1	88.9

p < 0.001.

Table 3. Compliance with the hand washing procedure after activities requiring hygiene, depending on the department

Department	Hand washing after the activity			
	yes		no	
	n	%	n	%
Hospital 1				
surgery department	145	26.1	410	73.9
medical care department	246	28.6	615	71.4
Hospital 2				
surgery department	174	28.1	445	71.9
medical care department	58	30.1	135	69.9
Hospital 3				
surgery department	110	28.9	270	71.1
medical care department	191	21.5	699	78.5

p = 0.65.

Table 4. Compliance with the hand washing procedure after activities requiring hygiene, depending on the character of the department

Character of the department	Hand washing after the activity			
	yes		no	
	n	%	n	%
Medical care	495	25.5	1 449	74.5
Increased risk	429	27.6	1 125	72.4

p = 0.39.

Table 5. Compliance with the hand washing procedure after activities requiring hygiene, depending on the profession

Profession	Hand washing after the activity			
	yes		no	
	n	%	n	%
Doctor	76	53.1	67	46.9
Nurse	848	25.3	2 507	74.7

p < 0.001.

Table 6. Compliance with the hand washing procedure before activities requiring hygiene, depending on the activity index

Activity index*	Hand washing after the activity			
	yes		no	
	n	%	n	%
1-3	502	37.1	852	62.9
4-6	280	23.7	901	76.3
> 6	142	14.7	821	85.3

* The number of activities requiring hand hygiene during an observation unit.

p < 0.001.

Table 7. Compliance with the hand washing procedure after activities requiring hygiene, depending on the index of effective workload

Index of effective workload (min)*	Hand washing after the activity			
	yes		no	
	n	%	n	%
1-15	201	36.4	351	63.6
16-45	541	25.9	1 546	74.1
≥ 46	182	21.2	677	78.8

* The total working time in an observation unit.

p < 0.001.

Table 8. Compliance with the hand washing procedure after activities that require it, depending on the time of day

Time of day	Hand washing after the activity			
	yes		no	
	n	%	n	%
7–12 a.m.	543	28.2	1 380	71.8
1–6 p.m.	194	26.4	542	73.6
7–11 p.m.	187	22.3	652	77.7

$p = 0.083$.

Table 9. Time devoted to washing/disinfecting hands after activities that require it

Department	Hand washing time after the activity (s)					
	doctors			nurses		
	mean	median	range	mean	median	range
Hospital 1						
surgery department	10.3	10.8	2.30–32.80	5.8	4.5	1.00–18.30
medical care department	10.2	9.4	4.20–20.73	6.1	5.0	1.31–22.80
Hospital 2						
surgery department	8.6	7.8	2.07–19.42	8.3	7.2	1.21–35.49
medical care department	13.4	12.3	5.02–24.01	7.5	6.0	1.04–24.68
Hospital 3						
surgery department	5.8	5.7	4.14–7.42	6.2	6.0	1.18–17.36
medical care department	6.2	6.1	3.15–12.08	6.6	6.0	1.42–31.64
Total	9.2	7.4	2.07–32.80	6.7	5.6	1.00–35.49

During night duty hours, medical personnel tended to comply with the requirement to wash their hands after the activity less frequently than in the afternoon and early morning duty hours. The difference was on the border of statistical significance (Table 8).

Adherence to hand hygiene after activities requiring it did not depend on the extent of cooperation with the personnel of the hospital infection control teams ($p = 0.55$). The compliance with the recommendations was low even in cases where the infection control team assessed the hospital personnel affirmatively.

After the activities requiring it, hand hygiene procedure lasted on average 9.2 s in case of doctors and 6.7 s in case of nurses. The mean duration of hand washing after the

activities requiring it was 7.5 s for the personnel of “increased risk” departments and 8.3 s for the personnel of the remaining departments (Table 9).

DISCUSSION

Interrupting the transmission of microorganisms is one of the key elements of preventing the spread of microorganisms in the environment. Studies show that the hands of medical personnel are the most important vector of the pathogens in healthcare [5–8]. Hence, hand washing after contact with infectious material is extremely important for maintaining proper hygiene in the hospital environment. Unfortunately, this simple

hygienic procedure continues to be neglected by the medical personnel.

In the Polish literature of the 80s, only one report on hygiene-related behavior of medical personnel could be located and it was performed using the participant observation method. The study involved the personnel of intensive care units. The participants were informed about the aim of the study and the heads of the hospital departments rigorously recommended the personnel to wash their hands whenever necessary. In spite of that, per 100 direct contacts with the patients, the personnel were noted to wash their hands only in 37% of the cases [9]. Our results confirmed that even after performing activities associated with high-risk of infection transmission (changing wound dressings, insertion of a urinary catheter, blood sample collection) the observance of hand hygiene rules was poor. At the same time, we noted that the personnel recognizing their personal risk of contamination was significantly more prone to obey the hand hygiene recommendations after contacts with the patients than before such contacts. These results may indicate that in the application of hygiene procedures, medical personnel take into account their own safety rather than the safety of the patients. Thus, it seems reasonable to believe that the protection against infection is illusory. Observations indicate that and hygiene, as part of safeguarding against infection, in the eyes of medical personnel is intended for the protection of the workers rather than for the safety of the patients.

Studies by Whitby and McLaws carried out in three departments of Princess Alexandra Hospital in Brisbane (Australia) confirm this conclusion. Observations of the nursing personnel revealed differences in hygiene-related behavior depending on the character of the department, but the behavior was also more hygiene-oriented after the contact with the patient than before it. In the department of infectious diseases, the rate of following

the hygiene procedures was 67.2% before and 69.9% after contact with the patient. In the intensive care unit, the values were 44.3% and 49.3%, respectively. In the department of internal medicine it was 25.4% and 27.4%, respectively [10]. In our study we found no differences in the hygiene-related behavior of the personnel depending on the nature of the department. In all departments, the hygiene procedures were neglected to a similar extent. The results of other studies confirm significant differences in compliance with hygiene-related recommendations before and after contact with the patients [11–13]. The extent of compliance with hygiene procedures is affected by the workload. The more activities the employees had to perform to serve the patients in a time unit, the less frequently they washed their hands. Perhaps this is the reason for other authors' conclusion that hygiene procedures were better respected by doctors compared to nurses. It should be noted, however, that it is the nurses that have more contact with the patients, so it is them who are required to wash/disinfect their hands more frequently. The adherence to the recommendations for hand hygiene is at a much lower level than expected. In addition, it appears that even if the hygiene procedures are followed, their effectiveness may be questionable because they are not properly executed. Studies show that hand washing takes on average 8–15 s [14–16]. This study confirms that the average time for washing hands is much shorter than it is required. After activities requiring hand hygiene, the mean hand washing time was 9.2 s for doctors and 6.7 s for nurses.

CONCLUSION

In view of the presented analysis (very low rate of following the procedures and too short hand washing/disinfecting time), it seems that the compliance with the guidelines is highly insufficient.

Higher workloads cause that the hospital hygiene procedures are more frequently neglected. Hand hygiene

procedures are more frequently disregarded in the afternoon and at night than during the morning duty shifts.

Hand washing/disinfection time is on the average twice shorter than recommended.

Urgent need to encourage proper hospital hygiene behaviors among nurses and doctors has been found to be necessary.

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