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Frankfurt Public Health Office, Frankfurt / Main

Compliance with hand hygiene in hospitals in Frankfurt / Main, Germany

Summary

Background: Compliance with hand hygiene is the most important measure to prevent nosocomial infections in hospitals. Compliance may be assessed via observation studies or by recording the amount of alcohol-based hand rub used for hand disinfection as an indicator for hand hygiene.

Material and methods: On behalf of the routine infection control visits the Frankfurt Public Health Office asked for the data of the consumption of hand disinfectant in the hospitals per year. The 2007 data of all 17 hospitals in Frankfurt/M are presented.

Results: As expected, larger hospitals exhibited higher overall hand disinfectant consumption. In the various hospitals, 30–60 % of the overall amount of hand disinfection was used in patients' wards, < 10 bis > 60 % in operative units, and 3–20 % in other areas. Assessment of disinfection consumption in 212 wards, covering 1,367,148 patient days, resulted in great differences between intensive care units (median 82 ml/patient day) and non intensive units (adults 18 ml/patient day), in oncological wards it was 24 ml/patient day, and in psychiatric wards 4,5 ml/patient day. In children's wards median consumption of hand rub disinfectant was higher: intensive care units 108 ml/patient day; non-intensive care wards 43 ml/day, oncological wards 141 ml/patient day.

Discussion: Controlling data on the consumption of hand disinfectant are easily available. By demanding and discussing these data on behalf of its routine hygiene control visits, the public health department could emphasise the importance of hand hygiene as an effective method for preventing nosocomial infections. In addition all hospitals could be encouraged to take part in the "Clean Hands Campaign", the German branch of the WHO campaign "Clean care is safer care".

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Introduction

Hand disinfection is an essential, indeed, if not the most important, measure in preventing infection. Within the framework of an inspection of hygiene practices carried out in 2006 in Frankfurt hospitals pursuant to Article 36 of the German Protection against Infection Act [1], doctors and nurses were surveyed by staff of the Municipal Health Office on basic issues of hand hygiene and asked to carry out hygienic hand disinfection. This survey revealed that mistakes were noted among doctors, in particular, and that these were fewer in the case of nurses. For example, between 40 and 50 % of doctors wore hand jewellery, including rings, compared with around 20 % of nurses; around three-quarters of doctors who were asked to demonstrate hand disinfection did so properly, compared with nine out of ten nurses. Often, staff were not sufficiently conversant with the recommendations on hand hygiene formulated by the Commission for Hospital Hygiene and Infection Prevention [2] or these were not complied with.

Furthermore, for a number of years now the Health Office had been asking the hospitals about the amount of hand disinfectants consumed, as an indicator for implementation of hand hygiene requirements. To begin with, the entire consumption per hospital was recorded, but this can only serve as a rough guide and depends to a large extent on the surgical and functional departments. For the past two years hospitals have been asked to give the consumption on the basis of the different departments. In addition, the number of patient days per ward was recorded. This paper outlines the results recorded for 2007 and gives an overview of developments aimed at improving hand

Corresponding author:*Priv.-Doz. Dr. Ursel Heudorf**

Frankfurt Public Health Office
Braubachstr. 18–22
60311 Frankfurt

Email:

ursel.heudorf@stadt-frankfurt.de

hygiene practices in medical institutions in the city of Frankfurt am Main.

Materials and Methods

At the time the inspections were announced for 2008, all 17 hospitals in Frankfurt were requested to indicate the amount of hand disinfectants consumed by them, per department, during the previous year and to also give the number of patient days per year. Some hospitals submitted to the Health Office a list of the hand disinfectants purchased (number of certain containers), on the basis of which the Health Office itself calculated the number of litres consumed, whereas other hospitals indicated the number of litres consumed. Some hospitals submitted this information while also indicating the cost centres, and also including a second list on cost centre assignment. In other lists the number of patient days per ward was given. From these data the Health Office calculated the entire consumption, consumption for the surgical departments as well as for all the other departments together (outpatient departments, functional diagnostics, laboratory, pharmacy, etc.). Ward-specific consumption was also linked to the number of patient days per ward. Data were further evaluated (percentiles) with the SPSS program, version 11.

Results

The results showing overall consumption per year and hospital, classified in descending number of beds per establishment, are shown in Figure 1. It was revealed that the bigger hospitals tended to have a higher consumption of hand disinfectants than the smaller establishments and that in the majority of hospitals hand disinfectant consumption increased over the years. Hospital No. 1 had for years broken down hand disinfectant consumption on the basis of wards and per nursing day, but had not given the hospital's entire consumption, which explains why data on total consumption at not given in this figure.

Figure 2 a shows the entire and ward-related consumption for 14 hospitals for 2007, Figure 2 b shows the specified proportion of ward-related consumption, consumption for the surgical departments

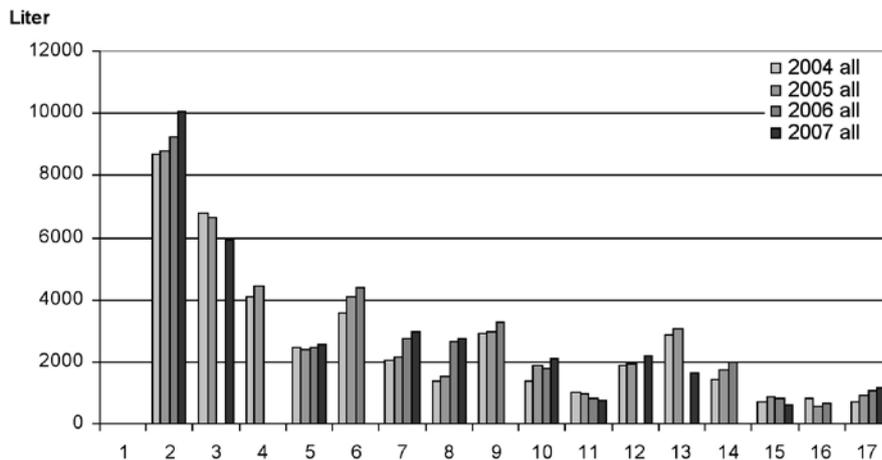


Figure 1: Hand disinfectant consumption in hospitals in Frankfurt am Main – 2004 to 2007 – total consumption based on the hospitals' data on purchased disinfectants.

as well consumption in other departments. One can note that four hospitals only gave ward-related consumption. For the other hospitals, it was revealed that surgical department consumption ranged between < 10 and > 60 % of the entire consumption, and consumption by areas other than wards and surgical departments varied

between < 5 and > 30 % of total consumption. Table 1 shows an overview of nursing-day-related hand disinfectant consumption on 212 wards in various Frankfurt hospitals for 2007. These account for 1,367,148 patient days. Accordingly, in the case of adult patient wards, the median hand disinfectant consump-

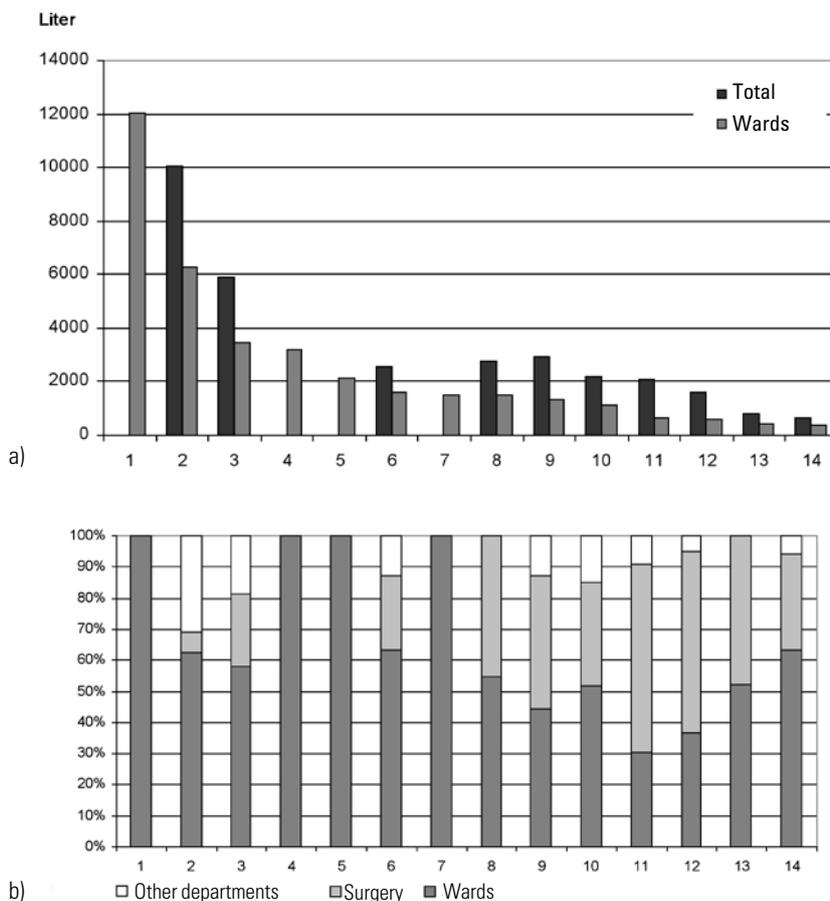


Figure 2: Hand disinfectant consumption in Frankfurt hospitals in 2007 – total and ward-specific consumption in litres (a) and as a percentage of the entire consumption on the wards, in surgical departments and in other departments (b).

Table 1: Hand disinfectant consumption on 212 wards in Frankfurt hospitals in 2007 – in respect of patient days.

	Ward	Ward	Patient days	Hand disinfectant consumption per patient day ml/d		
		N	N	P 25	P 50	P 75
Adults	ICU	20	67269	60.3	81.7	103.6
	Non-ICU	144	1040335	13.3	17.9	24.1
	Oncology	10	58874	11.2	24.1	62.3
	Psychiatry	20	132429	3.0	4.5	7.3
Children	ICU	4	11183	91.9	107.7	143.9
	Non-ICU	5	26195	19.1	43.0	63.7
	Oncology	2	7120	115.8	140.5	165.2
	Psychiatry	3	9971	2.2	3.7	5.8
	Neonatology	4	13772	53.0	59.5	82.3
Sum		212	1,367,148			

P 25, P50 and P75 in each case 25th, 50th and 75th percentiles, i.e. in each case in 25, 50 and 75% of wards consumption was below the given value.

tion was 82 ml per nursing day in intensive care units (ICUs). On the “normal” nursing wards, 18 ml hand disinfectant was used per nursing day, with few overall differences seen between operative and conservative disciplines. Noteworthy in terms of the different specialist departments were only the ENT, infection and oncology wards, which had a somewhat higher mean hand disinfectant consumption (20–25 ml/nursing day), and various orthopaedic wards showing a consumption of 60 ml/treatment day. Conversely, on psychiatric wards the median consumption was < 5 ml hand disinfectant consumption per nursing day.

In general, hand disinfectant consumption was higher on children’s than on adult wards. That was true not only in the case of the ICUs (median 108 vs. 82 ml/nursing day), but also for the general wards (43 vs. 18 ml/ nursing day); for the children’s psychiatric wards hand disinfectant consumption was comparable with that of the adult psychiatric wards (Table 1, Figure 3).

Table 2 compares hand disinfectant consumption for the 212 wards of Frankfurt hospitals with 1748 data items recorded on hand hygiene within the framework of the German Hospital Infection Surveillance System (Hand-KISS system) [3] – also for 2007. Noteworthy is that hand disinfectant consumption rates were somewhat higher for Frankfurt hospitals than the data recorded in the HAND-KISS system for Germany on the whole.

Discussion

Hand hygiene is the most important measure for prevention of nosocomial infections. Already more than 150 years ago, Semmelweis produced spectacular evidence to attest to that pivotal role [4,5]. But in general there is a tremendous need to improve compliance with these recommendations [6–13]. That was demonstrated by an orientational survey of the level of existing knowledge and conductance of hand disinfection among doctors

and nurses in Frankfurt hospitals in 2006. The reasons cited in the various studies for the poor compliance included, inter alia, stressful working conditions, lack of time, profession (doctors’ status more so than that of nurses), superiors acting as poor role models or lack of confidence in the efficacy of hand disinfection, lack of knowledge and fear of skin damage as well as lack of appropriate policies within the respective institution [10,11,14–20]. In the Frankfurt study it was also noted: where the chief medical superintendent and medical director did not make hand

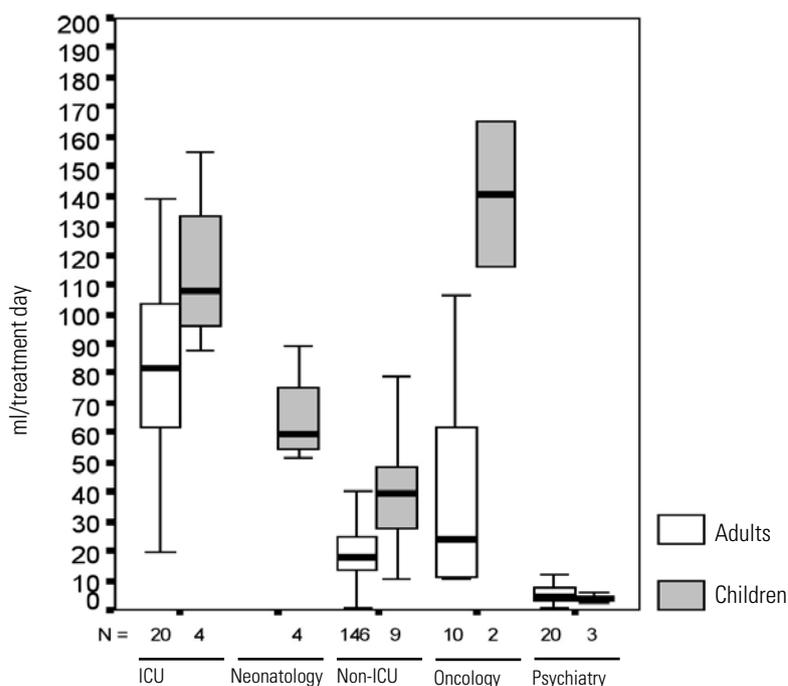


Figure 3: Hand disinfectant consumption per nursing day on various wards – for adults and children.

Table 2: Hand disinfectant consumption in 2007 in 212 wards in Frankfurt hospitals compared with data for the whole of Germany from the Hand-KISS system on 1748 wards – ml hand disinfectant / nursing day.

	Frankfurt				KISS			
	Wards	Hand disinfectant ml/treatment day			Wards	Hand disinfectant ml/treatment day		
	N	P25	P50	P75	N	P25	P50	P75
Intensive care units								
Internal medicine	9	37	70	91	39	40	59	84
Interdisciplinary	1		#		106	45	66	26
Surgery	7	64	102	129	36	51	78	102
Other surgical disciplines					15	38	56	74
Other conservative disciplines	3	71	93	139	8	28	59	87
Paediatrics	3	88	111	155	12	51	107	127
Neonatology	1		#		25	65	88	162
All departments	24	66	90	109	241	45	68	98
Non- Intensive care units								
Internal medicine	44	14	18	25	411	12	15	21
Interdisciplinary	7	15	18	19	124	9	13	19
Surgery	28	14	19	23	287	10	15	19
Other surgical disciplines	53	10	18	25	327	9	12	18
Other conservative disciplines	44	5	11	21	255	6	12	19
Paediatrics	13	8	33	64	89	19	30	48
Neonatology	4	53	59	82	14	17	37	68
All departments	193	11	17	25	1507	10	14	20

For data protection reasons, hand disinfectant consumption is not given for < 3 wards

P25, P50 and P75 in each case 25th, 50th and 75th percentiles, i.e. in each case in 25, 50 and 75% of wards consumption was below the given value.

hygiene a high priority, infection control personnel also found it difficult to point out mistakes to staff and ask them to change their practices. But nosocomial (hospital-acquired) infections not only inflict avoidable suffering on the patient, they also constitute a major cost factor. Four to five moderate nosocomial infections cost as much as the entire annual budget earmarked by a hospital for hand hygiene products [26].

A number of concepts aimed at improving hand hygiene in hospitals proved a success in terms of practical implementation – not only as regards better compliance with hand hygiene requirements [6,9,10,13,21,22], but also in terms of the decline in infection rates or colonisation rates with multi-resistant microorganisms [12,13,23]. These included, inter alia, more widespread availability of alcohol-based disinfectants with good acceptance profiles, a multidisciplinary approach to training and promotion of hand hygiene practices, better involvement of persons

with a role model function (senior staff), balanced patient-staff ratios [11,16,18,20,21,22,24,25].

Against that background, the Frankfurt Municipal Health Office then pondered what could be done to improve hand hygiene in the hospitals within its jurisdiction. The orientational survey of the level of knowledge and conductance of hygienic hand disinfection was not viewed in a positive light by the hospitals; rather, they saw this more as a bureaucratic control mechanism instead of seeing it as a source of help, underscoring the importance of hand hygiene.

The Health Office does not have enough staff to carry out in-depth, well-planned observational studies into compliance with the hand hygiene requirements. Moreover, it would be hardly possible to conduct such elaborate studies without staff being aware of that, hence an observational effect (Hawthorne effect) has to be taken into account and random results are possible/probable during short obser-

vation times. The alternative chosen was thus to record hand disinfectant consumption as a surrogate parameter. That indicator – parameter – can be easily obtained, generally from the controlling data of the hospitals' administrative departments, however, the quality of such data is a function of the method used to record the consumption data and of the how distinctions are made when recording such data. For example, the survey conducted in Frankfurt hospitals during the initial years showed that the entire consumption per hospital did not permit any real insights, as this would have to be broken down and assigned to the various departments and, furthermore, linked to the actual patient days rather than to the number of beds. When using such an approach for recording data, it must also be ensured that the cost centre given really does correspond to the respective ward and not use a system – as was customary practice in two hospitals – whereby the dispensers were refilled with hand disinfectant by house-

keeping staff, while then citing the house-keeping department as the cost centre. The orientational survey showed that hand disinfectant consumption increased in the majority of hospitals between 2004 and 2007. Possible reasons for that were the rise in the number of patient days, higher case numbers – in particular as regards the surgical cases – but also possibly because of more interventions on the part of the infection control team based on the controlling data recorded. In the few cases where there was a marked decline in consumption, it was possible to clearly impute this to organisational and structural changes as well as to a declining case numbers.

Based on the experiences gathered hitherto with hand disinfectant consumption data as a discussion basis for compliance with hand hygiene requirements, the Health Office intends conducting such surveys at regular intervals. In-depth analysis of data collected for 212 wards in Frankfurt hospitals in 2007 show – in concordance with the results from 2005/6 [27] – that hand disinfectant consumption on children's wards is in general markedly higher than on adult wards; furthermore, this was much higher in ICUs than in "normal wards". The median consumption in 20 adult ICUs was 82 ml/nursing day, for three paediatric ICUs this was 108 ml/nursing day. Surprisingly, median consumption on normal adult wards was less than 20 ml/nursing day for virtually all medical disciplines, with an average consumption of little more than 20 ml/patient days being observed on ENT, infection and oncology wards; one positive exception

was the orthopaedics wards, for which a mean consumption of 60 ml/nursing day was recorded. The results obtained are evaluated during the subsequent year's inspection and differentiated according to the various hospitals. Accordingly, it was possible to discuss any conspicuous findings, e.g. a relatively lower hand disinfectant consumption on an oncology ward, with the respective establishment – so as to find remedial solutions. On comparing newly collected data with data from the previous year, it was possible to evaluate and discuss with the individual hospitals the outcome of improvement efforts. Direct comparison with the number of nosocomial infections recorded within the framework of Article 23 of the Protection against Infection Act is hardly possible or advisable because, among other things, only very few device-associated infections (e.g. ventilation-associated pneumonia or catheter-associated sepsis in ICUs) or postoperative infections associated with a number of less well-defined indicator surgical operations are recorded in a standardised manner in the hospitals. Hence, any positive effect that there might be on nosocomial infections – by not taking account of those nosocomial infections for which no routine mandatory recording is prescribed – cannot be properly recorded and, as such, would no doubt be underestimated.

Whereas up to 2008 the data recorded in Frankfurt hospitals could only be compared with those of a large Berlin hospital [28], since the middle of 2008 the initial findings of the Hand-KISS system were available [3], thus permitting comparison

of the Frankfurt findings with a large pool of external data. It was noted that, for the wards evaluated for different areas [ICU, non-ICU, etc.], in the Frankfurt hospitals ward-specific consumption was in general somewhat higher than in the some 1,750 wards for which data were collected throughout Germany in the Hand-KISS system. However, caution is needed when interpreting these data in view of the comparatively little breakdown of the "normal wards" in the Hand-KISS system. In view of the very low hand disinfectant consumption on psychiatric wards, these should possibly be recorded as a separate group since in that setting lower hand disinfectant consumption is not necessarily suggestive of poor compliance with hand hygiene requirements, bearing in mind the nature of the medical services rendered. Furthermore, it seems advisable to form further subdivisions within the groups "other conservative and other surgical disciplines", at least to highlight the oncology wards because of the high risk of infection faced by patients there. It cannot be ruled out that the comparatively major difference in hand disinfectant consumption observed for ICUs of Frankfurt hospitals compared with the ICUs recorded in the Hand-KISS system is also due to the fact that different wards are declared as ICUs. In its worldwide campaign "Clean care is safer care", the World Health Organisation had identified the dissemination of effective measures for improvement of hand disinfection as one of the five main targets for increasing patient safety [29,30].

In Germany this campaign is being implemented by means of the "Clean hands CAMPAIGN" [31]. In early 2008 the Frankfurt Municipal Health office was able to persuade all Frankfurt hospitals to participate in this campaign. At a press conference held in May 2008, the hospitals publicly signalled their willingness "to join in" (Figure 4) by affixing their signature to a placard. Since then, several training courses and activities have been organised by the hospitals. This subject has no doubt been identified as a topical and important issue. The Hand-KISS system constitutes an essential and, for the participants obligatory component, of the "Clean hands CAMPAIGN" launched throughout Germany, i.e. ward-specific recording of hand disinfectant consumption linked to patient days [3]. Since au-



Figure 4: "Clean Hands Campaign". All Frankfurt hospitals sign up and join in. (Press conference of May 2008). Photo: Frankfurt Public Health Office.

tumn 2008, the Hand-KISS system has also been offering other modules, i.e. recording of hand disinfectant consumption per year in functional departments in respect of the number of cases treated per year (surgical operations, endoscopies examinations, etc.). In the meantime, the Frankfurt hospitals have been requested by the Health Office to also participate in these modules. However, a response to that is still awaited. But already at this juncture it is clear that incorporation of hand hygiene into the "Clean hands CAMPAIGN" has had a positive effect and has promoted the acceptance of hand hygiene in Frankfurt hospitals.

Outlook

However, good hand hygiene practices are indispensable for infection prevention not only in hospitals, but also in other medical settings. Against that background, Frankfurt Municipal Health Office conducted training courses in all homes for the elderly on the topic of hand hygiene, including practical exercises based on a fluorescent agent and black light lamp. Plans are underway to run these training courses again in 2009 in all homes for the elderly in Frankfurt. Furthermore, the Health Office requested the management of all homes for the elderly, analogous to the Hand-KISS system in the hospital, to provide data to the Health Office on annual hand disinfectant consumption and on the number of patient days, and as far as possible to assign these data to different residential areas. The first responses have already been received. In addition, a training initiative on hand hygiene has also been launched for staff in cooperation with the bodies responsible for the emergency medical services and ambulance services, while recording data on hand disinfectant consumption and on the number of deployments. It is planned to offer such a service also to ambulatory nursing services on a voluntary basis. But it is not only in the medical setting that (hand) hygiene-based infection prevention is important. Outside the hospital, the domiciliary setting and its infection risks and requisite hygiene measures have (once again) increasingly attracted more attention in recent times [32]. In childcare facilities, in particular, more importance is to be ascribed again to the topic of hand

hygiene (hand washing). In that spirit, in autumn 2008 the Health Office launched a pilot project based on a program developed by Bonn University in cooperation with the World Health Organisation "Hygiene Tips for Kids" [33] in some 20 childcare institutions in Frankfurt, which had already been successfully tried out in various parts of Germany. Now that it has proved a success, this program is to be offered to all childcare facilities in Frankfurt in 2009 (around 750). The intention here is to teach children through play about the importance of hand hygiene, allowing them to try out the "magic chest".

Conflict of Interest

The authors declare that there is no conflict of interest as understood by the International Committee of Medical Journal Editors.

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