

**Keywords***Hygienic hand disinfection**Compliance**Hand rub consumption**Health care associated infections***Christiane Reichardt\*, Nadine Mönch, Sonja Hansen, Christine Geffers, Petra Gastmeier**

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# German wide reference data of alcoholic hand rub consumption

## Summary

**Background:** Hand hygiene is one of the main measures to prevent health care associated infections. Therefore, the improvement of hand hygiene compliance is the preferential aim of the German hand hygiene campaign "AKTION Saubere Hände". Measurement of compliance is an essential component of the conceptual design. One possibility is the measurement of alcohol based hand rub usage as a surrogate for compliance.

**Method:** Within the "AKTION Saubere Hände" campaign, the Hospital Infection Surveillance System (KISS) developed the "Hand-KISS" module. All hospitals participating in the campaign and all hospitals interested feed their hand rub usage data into the system. The hand rub usage is recorded per year, per ward and per patient days

**Results:** By January 2009, 472 hospitals registered to the module. By October 2008 usage data covering the year of 2007 of 160 hospitals were available. Analysis of this data comprehends more than 14 Million patient days and overall about 290,000 litres of alcohol based hand rub usage. 269 intensive care units used in median 67 ml hand rub per patient day, compared to 14 ml per patient day in 1715 non-intensive care units. We found considerable differences between intensive care units and between different departments.

**Conclusion:** Our results demonstrate very well the necessity for improvement in most areas, even though there are no standards available. The calculated reference data of hand rub usage are the basis for benchmarking with comparable units.

are estimated to contract a healthcare-associated infection each year, with between 10,000 and 15,000 dying because of such an infection [3]. Intensive care units (ICUs) are the areas most at risk for healthcare-associated infections. It must be assumed that, depending on the type of ICU, between 10 and 30 % of all patients contract such an infection [4].

In terms of their pathogenesis, healthcare-associated infections are classified as either endogenous or exogenous infections. Endogenous infections have their source in the patient's own flora and their spread is attributable to the individual patient's own risk factors as well as to the patient's exposure to invasive and therapeutic measures. Exogenous infections, conversely, are caused by microorganisms that are transmitted from the external environment to the susceptible patient. It is estimated that exogenous infections account for around between 20 and 30 % of all healthcare-associated infections [5].

The aim of hygienic hand disinfection is to prevent microbial transmission. Hand disinfection with an alcohol-based hand disinfectant is a measure that can be easily and quickly performed [6]. If the hand disinfectant is made available at the point of patient care, hygienic hand disinfection can by all means be integrated into working procedures and carried out even when staff are coping with heavy workloads [7].

In Germany and at international level, compliance with hand disinfection is around 50%, or often less [8,9]. Furthermore, there is pronounced variation in compliance, for example in accordance with the professional group, discipline, type of working activity.

To increase compliance with hand disinfection so-called multimodal interventions are needed [10]. An important component of these is measurement of compliance and feedback of the results to

## Introduction

Nosocomial (healthcare-associated infections, hospital-acquired infections) pose a major risk to the safety of our patients. They inflict additional suffering, prolong the hospital stay and are responsible for higher mortality rates and higher costs [2]. In Germany, around 500,000 patients

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Table 1: Consumption data in ml per patient day in 269 intensive care units from 2007 (Hand-KISS reference data from 13/10/2008).

Type of ward	Per hospital	Per ward	Patient days	Annual consumption Litres	MW*	Q1	Median	Q3
Internal medicine	36	41	139,859	8,988	64	42	59	82
Interdisciplinary	111	126	500,221	37,869	76	45	66	86
Surgery	26	37	141,675	11,132	79	51	77	101
Other surgical disciplines	11	15	54,963	3,173	58	38	56	74
Other conservative disciplines	7	8	30,299	1,664	55	28	59	87
Paediatrics	14	14	43,421	3,240	75	37	98	127
Neonatology	26	28	97,337	9,203	95	48	85	156
Other departments	137	269	1,007,775	75,268	75	44	67	94

\*pooled arithmetic mean value

Table 2: Consumption data in ml per patient day in 1715 non-intensive care units from 2007 (Hand-KISS reference data from 13/10/2008)

Type of ward	Per hospital	Per ward	Patient days	Annual consumption Litres	MW*	Q1	Median	Q3
Internal medicine	122	459	3,981,231	64,517	16	11	15	21
Interdisciplinary	68	151	1,135,001	18,490	16	9	13	19
Surgery	119	343	2,893,196	43,515	15	10	15	19
Other surgical disciplines	101	351	2,665,953	38,479	13	9	12	18
Other conservative disciplines	85	298	2,079,438	30,990	15	6	12	20
Paediatrics	40	99	490,684	16,609	34	19	30	47
Neonatology	12	14	58,206	2,389	41	17	37	68
Other departments	151	1,715	13,303,709	214,989	16	10	14	20

\*pooled arithmetic mean value

personnel. This can be done directly through observation or indirectly by recording the hand disinfectant consumption. In the latter case, hand disinfectant consumption is used as a surrogate parameter for hand disinfection. Observation-based recording of compliance is a very onerous process and is also dependent on the investigator's subjective perceptions, something that can be a major source of errors.

The national "Clean Hands CAMPAIGN" launched in Germany has been designed as a multimodal intervention and is aimed at improving compliance with hand disinfection in German healthcare institutions. Within the framework of the Hospital Infection Surveillance System (known by its German acronym "KISS"), which is part of that campaign, the Hand-KISS module was developed, whereby hospitals can record data on their hand disinfectant consumption. This paper now gives an overview of the very first reference data collected on hand disinfectant consumption for the whole of Germany.

## Method

Within the framework of the Clean Hands CAMPAIGN, the Hand-KISS module was developed as part of the Hospital Infection Surveillance System. All hospitals participating in that campaign, as well as all other hospitals that are interested in this project, feed their data on hand disinfectant consumption into this system. These data are recorded annually and per ward. Hospitals can also participate in the Hand-KISS system while restricting their participation to only certain wards.

For each ward of a hospital the total annual consumption of alcohol-based hand disinfectants is recorded and divided by the number of patient days. Stratification is also performed showing a breakdown of the major disciplines and whether the respective ward is an ICU or a non-ICU.

## Results

By January 2009, more than 472 hospitals had announced their willingness to feed their data into the system. By October 2008, consumption data from 2007 were available for 160 hospitals. These thus give an overview of more than 14 million patient days, during which a total of around 290,000 litres of hand disinfectants were consumed (Tables 1 and 2). The reference data can be viewed on the KISS website ([www.nrzhygiene.de](http://www.nrzhygiene.de)).

The median consumption in all 269 ICUs was 67 ml per patient day (Table 1). But there were major differences between the ICUs (interquartile range of 44 to 94 ml per patient day). Major differences were also observed between the various medical disciplines. For example, the paediatric ICUs recorded a median consumption of 98 ml per patient day (interquartile range of 37 to 127 ml per patient day g), whereas, for example, the internal medicine ICUs had a median consumption

Table 3: Methods for measurement of compliance with hand disinfection.

	Direct observation	Indirect: hand disinfectant (HD) consumption as an indicator
Endpoint	Direct measurement	Surrogate parameter: HD consumption per patient day
Conductance	<ul style="list-style-type: none"> <li>– Onerous and time consuming</li> <li>– Only prospective study</li> </ul>	<ul style="list-style-type: none"> <li>– Easy to conduct</li> <li>– Much less time consuming</li> <li>– Retrospective study also possible</li> </ul>
Validity	<ul style="list-style-type: none"> <li>– Observation effect (Hawthorne effect)</li> <li>– Random effects possible due to short observation period /small sample size</li> <li>– Subjective method, validation needed to minimise error quota</li> </ul>	<ul style="list-style-type: none"> <li>– Typical indicator</li> <li>– Good sensitivity, but limited specificity</li> <li>– Overestimates possible, e.g. HD used for other purposes</li> <li>– Dependent on quality of consumption data</li> </ul>
Application	<ul style="list-style-type: none"> <li>– Well suited to risk areas (ICUs) or to validation of the results of indirect data recording</li> <li>– Identifies changes</li> <li>– Permits error analysis of everyday practices</li> <li>– Also serves for interventional purposes</li> </ul>	<ul style="list-style-type: none"> <li>– Well suited to observation of a hospital's overall situation</li> <li>– Permits large-scale benchmarking</li> <li>– Identifies changes</li> </ul>

of 59 ml per patient day (interquartile range of 42 to 82 ml per patient day).

For the 1715 non-intensive care units for which data were recorded, the median hand disinfectant consumption was 14 ml per patient day, with an interquartile range of 10 to 20 ml per patient day (Table 2). Here, too, the paediatric and neonatology wards, with a median consumption of 30 and 37 ml, respectively, were in sharp contrast to other wards, with 25% of the latter wards having a consumption of more than 47 and 68 ml per patient day.

## Discussion

For any intervention aimed at improvement of compliance to prove successful, a mechanism must be devised to measure its success. To measure compliance with hand disinfection, two such systems are available, each of which has its pros and cons (Table 3). Both measuring mechanisms are used at international level. The World Health Organisation's (WHO) campaign "Clean Care is Safer Care" is based on both measuring mechanisms, as is the United Kingdom's "Clean your hands campaign", the Swiss "Swiss hand hygiene campaign" and the Belgian campaign – to mention but a few. In France a legal agreement has been reached on annual registration of hand disinfectant consumption in hospitals.

Whether annual hand disinfectant consumption is a suitable process and reference parameter has been the subject of ongoing controversial discussion. The reference data on hand disinfectant consumption are a source of objective data permitting comparison between similar hospital wards. It has been demonstrated that hand disinfectant consumption as a surrogate parameter is able to identify changes in compliance [8,9].

Thanks to the amount of data available, it can be assumed these reference data will allow institutions to make valid comparisons with comparable wards. For example, if the available baseline data are compared with data from Geneva University Hospital, one can see that in that hospital's non-surgical ICUs the mean hand disinfectant consumption was 19 ml per patient day [11]. In the Hand-KISS module, hand disinfectant consumption on comparable wards was 15 ml per patient day. Likewise, the data on neonatology ICUs (85 ml per patient day) are comparable with data from the literature (66.6 ml per patient day before intervention and 89.2 ml per patient day after intervention) [12].

At present, it is difficult to estimate on what level of compliance these consumption data have been based since there are no desired values available. The number of care episodes (patient contacts) requiring hand disinfection differs greatly from one

ward to the next. On an interdisciplinary ICU, McArdle et al. counted 159 direct and 191 indirect patient-care episodes per patient in 24 hours [13]. If one assumes that hand disinfection is conducted for all these patient contacts and that for each hand disinfection activity 3 ml hand disinfectant is used, that would amount to a consumption of 1050 ml per patient day. Our own investigations carried out in two ICUs counted between 120 and 150 contacts requiring hand disinfection per patient per day (only direct patient contacts were counted). (Reichardt, unpublished data). To date, there are no data available on the number of contacts where hand disinfection is needed in non-ICUs.

## Conclusion

The data available so far highlight that – even in the absence of desired values – there is considerable room for improvement in the majority of areas. The "Clean Hands CAMPAIGN", together with mechanisms devised by the campaign provide an excellent opportunity to draw attention to hand disinfection at national level and make appropriate interventions. In this respect, the mechanisms devised for measurement of compliance play a pivotal role. They serve as the basis for change ("Where are we positioned?") and demonstrate that (feedback as a learning effect, motivation and also control). It is desirable that hand disinfection consumption be recorded in as many areas as possible and that, furthermore, observational studies be conducted on compliance, so that in that way approximate desired values can be defined.

## 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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