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## Every moment counts. Researching and acting for patient protection

Throughout the world, nosocomial infection is one of the greatest threats to patient safety. Approximately 5 million people in Europe and around 1.7 million people in the US acquire an infection during nursing or medical treatment each year. With nosocomial infections increasingly also occurring in outpatient facilities, the term healthcare-associated infection is commonly used.

### Hand disinfection is key preventive measure

According to experts, one third of these infections can be prevented by systematic hygiene and surveillance measures. Hygienic hand disinfection is the most important individual measure here [1]. Studies see a considerable potential for improvement, as in every other situation actually requiring hand disinfection medical and nursing staff does not act accordingly.

Since 2005, WHO has reflected the hand disinfection's importance for patient safety with its global "Clean Care is Safer Care" campaign. By measuring the consumption of hand disinfectants, the German "AKTION Saubere Hände" (Clean Hands Campaign) yielded an increase in compliance by around 30 per cent in its participating facilities [2].

### Central subject of research

With the global campaign emphasising the importance of hand hygiene, the number of relevant studies on this topic rose by 220 per cent during the past decade. In addition to strategies to promote compliance, it is the question of

how to precisely integrate hand hygiene measures into individual medical activities and how to make workflows more efficient that comes to the fore.

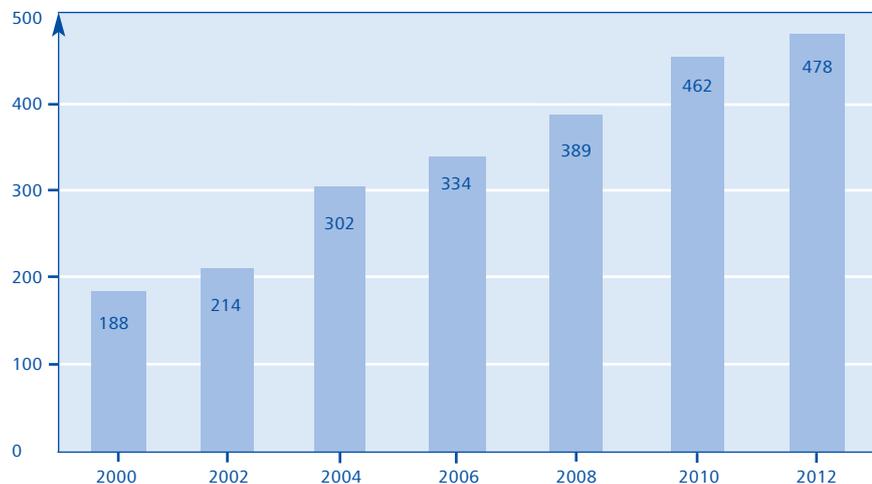
In the following, you will find a selection of the most important studies on hand hygiene that we have compiled and stand for a multitude of additional scientific investigations. Please visit the website of our BODE SCIENCE CENTER at [www.bode-science-center.com](http://www.bode-science-center.com) to read complementary abstracts and detailed information on this subject.

Yours sincerely  
PAUL HARTMANN AG

1. Pittet et al. Effectiveness of a hospital-wide programme to improve compliance with hand hygiene. *Lancet*, 2000, 356: 1307-1312.

2. Gastmeier P. Assoziation von Parametern zur Struktur- und Prozessqualität mit Ergebnis-Qualitäts-Parametern der KISS-Datenbanken (SPE-KISS), ABSCHLUSSBERICHT 2010. Nationales Referenzzentrum für Surveillance von nosokomialen Infektionen am Institut für Hygiene und Umweltmedizin Charité – Universitätsmedizin Berlin.

### Number of worldwide reviews and studies on hand hygiene, 2000-2012



Source: <http://www.ncbi.nlm.nih.gov/pubmed>

## Preventing nosocomial infection by hand hygiene

**Kampf, G./Löffler, H./Gastmeier, P.**

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 studies incl. links to the  
 original articles.

## Hand hygiene for the prevention of nosocomial infections

### Background

Healthcare workers' hands are considered the chief cause for the transmission of nosocomial pathogens. However, only every second hand disinfection procedure necessary is actually carried out on average in clinical practice. Hence, within the framework of its "Clean Care is Safer Care" campaign, the World Health Organization (WHO) has identified the promotion of hand hygiene measures as one of the five most important objectives for increasing patient safety.

### Methods

The authors reviewed and evaluated both scientific literature and evidence-based recommendations of, for example, the Robert Koch-Institute [Germany], WHO and Centers for Disease Control and Prevention.

### Results

During clinical workflows, hands should only be washed when they are visibly soiled or contaminated with bacterial spores (e.g. *C. difficile*), as well as before shift, after using the toilet and after the shift. In other clinical situations, hygienic hand disinfection is the procedure of choice, as it ensures much better antimicrobial efficacy against, for example, *Escherichia coli* and *Staphylococcus aureus*. Additionally, other than what most healthcare pro-

viders believe, alcohol-based hand disinfectants are gentler on the skin than handwashing. Low compliance with hand hygiene is attributed to, for example, lack of time, poor availability of disinfectants at the Point of Care, and physicians being poor role models.

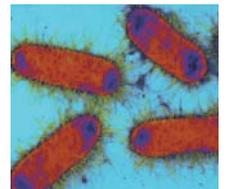
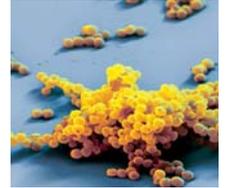
### Conclusion

Improvements in these areas may increase the willingness to perform hand hygiene significantly – and reduce the rate of infections acquired in hospitals by up to 40 %.

Source  
Dtsch Arztebl Int 2009, 106 (40): 649–655

### Practical relevance

Hand hygiene performed in the right situation is the most important hygiene measure to prevent nosocomial infections.



### Frequency and persistence of selected nosocomial pathogens on the hands of healthcare workers

Pathogen	Frequent cause of nosocomial...	Frequency on hands	Persistence on hands
<i>Staphylococcus aureus</i>	Surgical site infection, pneumonia, sepsis	10 – 78 %	≥ 150 min
<i>Pseudomonas spp.</i>	Lower respiratory tract infection	1 – 25 %	30 – 180 min
<i>Escherichia coli</i>	Urinary tract infection	Unknown	6 – 90 min
Yeasts including <i>Candida spp.</i>	Lower respiratory tract infection, urinary tract infection, sepsis	23 – 81 %	1 h
Rotavirus	Viral gastroenteritis, particularly in children	20 – 79 %	Up to 4 h
<i>Clostridium difficile</i>	Antibiotic-associated diarrhea	14 – 59 %	Unknown

Hirschmann, H. et al.

## The influence of hand hygiene prior to insertion of peripheral venous catheters on the frequency of complications

### Background

Around two thirds of hospitalised patients receive intravenous infusions via peripheral venous catheters (PVCs). In case hand hygiene is not performed as indicated, this may lead to local or even systemic infections. Systemic complications are not only expensive, but also prolong the hospital stay by an average of eight days.

### Methods

Aim of the prospective study was to investigate the link between different hand hygiene measures before inserting a PVC and the frequency of infectious complications (e.g. local redness, swelling and purulence). The analysis was conducted in three Austrian hospitals and covered a total of 1132 PVCs. For documentation of relevant data, special protocol forms were filled in when catheters were inserted and removed.

### Results

Compared to handwashing, hand disinfection prior to catheterisation and the use of gloves were linked to a significantly lower rate of complications. In addition, there was a significant difference between omitting hand disinfection and handwashing with regard to infectious complications. The frequency of complications depended on the length of PVC dwell time, and was considerably higher

after 49 hours than with short-term catheterisation (up to 24 hours). Furthermore, catheters inserted in the operating room involved fewer complications than catheters inserted in wards or outpatient units.

### Conclusion

Wearing gloves during catheterisation or disinfecting hands before catheter insertion can prevent recontamination of the insertion site by palpating the vein again. The results underline the need for promoting more effective hand hygiene measures.

Source  
Journal of Hospital Infection 2001, 49 (3): 199–203

### Practical relevance

Hand disinfection before inserting a peripheral vascular catheter reduces the rate of local infectious reactions significantly.

### Rate of complications and results of uni- and multivariate logistic regression expressed as relative risks and 95 % confidence intervals (CI) for all indicators (N = 1132)

Hand hygiene measure	N	Rate of complications (%)	Univariate analysis		Multivariate analysis	
			Relative risk	95 % CI	Relative risk	95 % CI
No measure <sup>1</sup>	310	30.3	1.00		1.00	
Hand washing	101	32.7	1.11	0.69 – 1.80	1.12	0.68 – 1.85
Gloves	183	18.0	0.51**	0.32 – 0.79	0.52**	0.33 – 0.85
Hand disinfection	538	21.0	0.61**	0.44 – 0.84	0.65*	0.47 – 0.91

1 = reference category / \* =  $P < 0.05$  / \*\* =  $P < 0.01$

## Getting doctors to clean their hands: lead the followers



### Introduction

Hand hygiene is an important factor to reduce nosocomial infections. But nurses tend to be more compliant with hand hygiene than doctors, because the physician compliance still remains low. Their hand hygiene compliance might be influenced by workload, beliefs, access to hand hygiene products and the structure of medical training and education. This study hypothesized that hand hygiene behavior is affected by the peer pressure among internal medicine teams and the role modeling behavior of the attending physician.

### Methods

This study was performed at a large urban academic medical centre with 659 beds and 320 trainees per year. Nine internal medicine teams were covertly observed by a research assistant. The teams were composed of one attending physician, one post-graduate year 3 resident, two post-graduate year 1 residents, one medical student and one pharmacy student. Team member entry and exit order as well as adherence to hand hygiene were recorded secretly within a 3-month period in autumn 2010. The mean hand hygiene percentage across patient encounters was estimated by the effect of the compliance of the first person entering and exiting an encounter and by the attending physician's hand hygiene compliance.

### Results

718 opportunities prior to contact were observed during 123 patient encounters. Overall, the hand hygiene compliance prior to contact was 52% with a range from 47-67% depending on the training level. There were 133 patient encounters with 744 observed hand hygiene opportunities after contact. Overall, hand hygiene compliance was 70%. The hand hygiene compliance ranged from 64-87% depending on the training level.

Overall, hand hygiene compliance was highest among medical and pharmacy students independent of entering or exiting a room (60.2 % respectively 67.2 % when entering, and 71.2 % respectively 87.0 % when exiting).

If the first person, entering a patient encounter, performed hand hygiene, the mean compliance of the other team members was 64%, but was only 45%, if the first person failed to perform hand hygiene ( $p=0.002$ ). Upon exiting a patient encounter, the behavior of the first person leaving the room did not appear to influence the others ( $p=0.33$ ).

When the attending physician performed hand hygiene upon entering the patient encounter, the mean compliance was 66%, but only 42 %, if he or she did not perform hand hygiene ( $p<0.001$ ). Similar effects were observed, when the attending physician exits the room ( $p=0.013$ ).

**Conclusion**

There is a strong follower effect for hand hygiene behavior when entering a patient’s room. Regardless the training level, if the first person, entering the room, performs hand hygiene, the others are more likely to perform it, too. This might be due to peer pressure. The attending physician behavior also has affects hand hygiene compliance of the other members after entering and exiting a room, regardless of whether the physician entered the room first or not. Obviously, role modeling impacts the behavior of learners. Senior clinicians should be aware of that and need to do more than just performing the task and expect others to follow. Overall, hand hygiene compliance was greater on exiting encounters, which might be a hint that self-protection is stronger than patient protection.

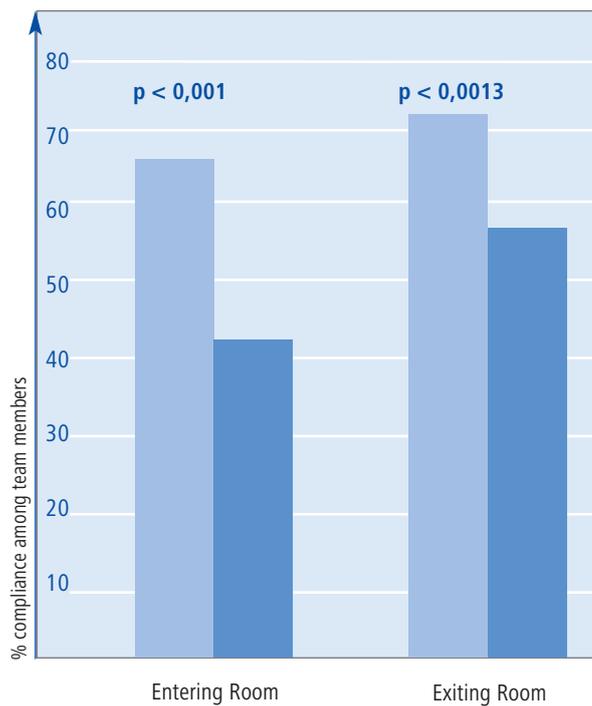
Source  
BMJ Qual Saf 2012;21: 499-502

**Practical relevance**

If the physician leads by example in performing hand disinfection, other employees’ compliance improves as well.

**Impact of the attending physician’s compliance on remaining team members’ hand hygiene adherence**

- if Attending did perform HH
- if Attending did not perform HH



Basically hand hygiene compliance was greater on exiting encounters.

**Compliance: consider the employees’ acceptance when selecting products.**

In its hand hygiene guideline, the Robert Koch-Institute (RKI) emphasises the link between protecting skin and preventing infections: “Skin care on hands and forearms is an occupational duty, as even smallest cracks or microtraumas serve as potential reservoir for pathogens and uncared-for skin cannot be disinfected reliably.” (1)

For strongly promoting compliance, do not only consider efficacy data and moderate prices, but also the personnel’s acceptance when selecting products. Gentle hand disinfectants and excellently

fitting gloves have a share in higher acceptance and increased compliance, too. And compliance in turn is an essential measure for fighting nosocomial infections.

1 Empfehlungen Händehygiene. Mitteilung der Kommission für Krankenhaushygiene und Infektionsprävention am Robert Koch-Institut. Bundesgesundheitsblatt – Gesundheitsforschung – Gesundheitsschutz, 2000, 43: 230-233.

**Research for infection protection.**



Dixit, D. et al.

## Attitudes and beliefs about hand hygiene among paediatric residents: a qualitative study



### Background

In paediatric settings, viral respiratory infections are a frequent reason for admission and are among the diseases that also may be acquired nosocomially in the ward. Pathogens are often transmitted via healthcare providers' hands here. In their qualitative study using interviews, Dixit et al. investigated the attitudes and beliefs about hand hygiene among paediatric residents at a Canadian children's hospital.

### Methods

A qualitative study design was employed to develop themes regarding resident attitudes and beliefs about hand hygiene. Semi-structured, 45 to 60-minute interviews were conducted with 22 residents aged 24 to 40. The interviewees were between the 1st and 4th year of their training. 82 per cent of them were female. The interviews were based on a guide comprising four major themes: habits, group dynamics, basic conditions and models for adhering to hand hygiene.

By dint of qualitative methods of interpretation, the authors identified congruencies and developed a coding system leading to four main themes in additional analyses. To check their accuracy and validity, the residents were then asked if the main themes correspond to their intentions.

### Results

Dixit et al. identified four important factors that influence compliance: senior staff serving as role models; balancing competing priorities, when treating acutely emergent patients; self-protection against infections; and personal habits of carrying out hand hygiene.

### Conclusions

Based on their results, the authors recommend focussing compliance promotion campaigns on training role models such as ward physicians in hand hygiene compliance, as they have a broad impact. Future compliance strategies should also consider the importance of habits and the desire for self-protection.

Source  
BMJ Open 2012;2: e002188. doi: 10.1136/bmjopen-2012-002188

### Practical relevance

For physicians, the awareness of the own role model has a strong influence on hand hygiene behaviour.

Sax, H. et al.

## 'My five moments for hand hygiene': a user-centred design approach to understand, train, monitor and report hand hygiene

### Background

On average, healthcare workers disinfect their hands half as often as indicated. Swiss scientists at the University of Geneva Hospitals believe that one of the main reasons for this noncompliance is the poor quality of training on hand hygiene indications and their integration into routine medical and care activities. Together with American colleagues, the scientists developed the "5 Moments for Hand Hygiene" – a user-centred concept, now being a core element of the World Health Organization (WHO) Global Patient Safety Challenge to improve compliance with hand hygiene.

### Method

For developing their user-centred approach, the authors combined the results of evidence-based risk analyses of healthcare-associated infections and spread of multi-resistant microorganisms with research results from work science, ergonomics, motivation research, social marketing and communication science.

In this model, the risks of pathogen transmission centre on a two-zone concept: the patient zone, comprising the immediate patient surroundings, and the healthcare zone, which goes beyond the patient zone.

The scientists standardised five opportunities and defined them as "5 Moments for Hand Disinfection", dividing the fundamental indications of hand disinfection into five indication groups:

1. **BEFORE** touching a patient (e.g. before shaking hands, measuring vital functions, auscultation and palpation)
2. **BEFORE** aseptic procedures (e.g. before manipulating a vascular catheter, subcutaneous injections, applying wound dressings, preparing medications)
3. **AFTER** body fluid exposure risk (e.g. after treating skin lesions, opening drainage systems, changing dressings, handling medical instruments)
4. **AFTER** touching a patient (e.g. after abdominal palpation, measuring blood pressure, taking the pulse)
5. **AFTER** touching patient surroundings (e.g. after turning ECG alarms, adjusting infusion speed)



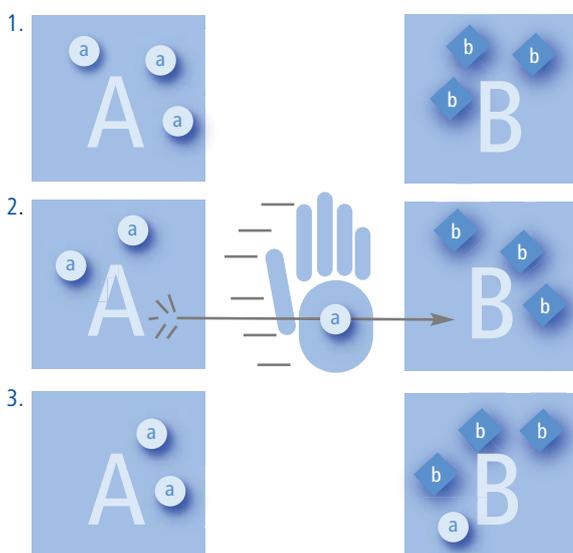
### Conclusions

In a time-space framework, the "5 Moments" model designates the situations when hand disinfection is required to effectively interrupt pathogen transmission during daily clinical routine. The indications are universally valid and apply to a wide range of medical and caregiving activities. According to the authors, the model bridges the gap between scientific evidence for hand hygiene and its practical implementation. It provides a solid and effective basis to understand, properly perform, teach, monitor and assess hand hygiene practices.

Source  
Journal of Hospital Infection, 67 (1): 9-21.

### Practical relevance

The "5 Moments for Hand Hygiene" describe the clinical situations that evidentially require hand hygiene in order to protect patients.



### Core Element of Hand Transmission

1. Donor surface 'A' contains micro-organism 'a'; receptor surface 'B' micro-organism 'b'.
2. A hand picks up micro-organism 'a' from donor surface 'A' and carries it over the receptor surface, no hand hygiene action performed.
3. Receptor surface 'B' is now cross-contaminated with micro-organism 'b'. The arrow marks the opportunity for hand hygiene, e. g. the time period and geographical dislocation within which hand hygiene will prevent cross-transmission, the indications for hand hygiene are determined by the need to protect surface 'B' against colonization with 'a' – the preventable negative outcome in this example.

Son, C. et al.

# Practically speaking: Rethinking hand hygiene improvement programs in healthcare settings



## Background

Hand hygiene is known to be the single most effective means to reduce health care infections. It includes hand-washing with either soap and water or the use of an alcohol-based hand rub before entering and after exiting a room. Increased hand hygiene compliance is now required from leadership at both the individual hospital level and outside regulatory agencies. Despite the existence of hand hygiene guidelines, few concrete and practical strategies are available and most studies are limited to intensive care unit settings. The Memorial Sloan-Kettering Cancer Center in New York City developed a new approach to measuring, monitoring and increasing hand hygiene compliance. They implement a more sustainable program for peer-based direct observations of hand hygiene across all inpatient, outpatient and regional sites throughout their institution.

## Methods

Multidisciplinary teams were assembled with representation from nurses, physicians, patient care technicians and environmental service staff. Each team comprised between five and ten health care workers, one quality assessment representative and one or more infection prevention practitioners. These teams set up their own hand hygiene compliance goal, based on the WHO hand hygiene guidelines. Within a time frame of twelve weeks they diagrammed detailed workflows of several of their most common patient care tasks like blood sample collection, physical assessment and bathing. Wherever hand hygiene was indicated, the workflow was marked with a number corresponding to one or more of the WHO's 5 moments for hand hygiene.

At the end of the 12-week period, staff members were trained to observe each other and began officially collecting and submitting data to infection prevention. Trained observers performed direct observations once per quarter on a random, unannounced day within a designated month. All staff members were observed for either 15 minutes or 5 complete patient encounters.

## Results

To date, approximately 50 hand hygiene teams have completed the project and now perform quarterly observations. The program was implemented across the institution between 2008 and 2010. Between 2006 and 2008 the average hand hygiene compliance of the Memorial Sloan-Kettering Cancer Center held steady at 65%. After the new program was launched in 2008, compliance reached 97% and remained steady at this level ever since.

## Conclusion

The implementation of workflow-diagrams, including the feedback of hand hygiene compliance rates, may help health care institutions to increase a sustainable compliance.

Source  
American Journal of Infection Control. 2011; 39(9): 716-24

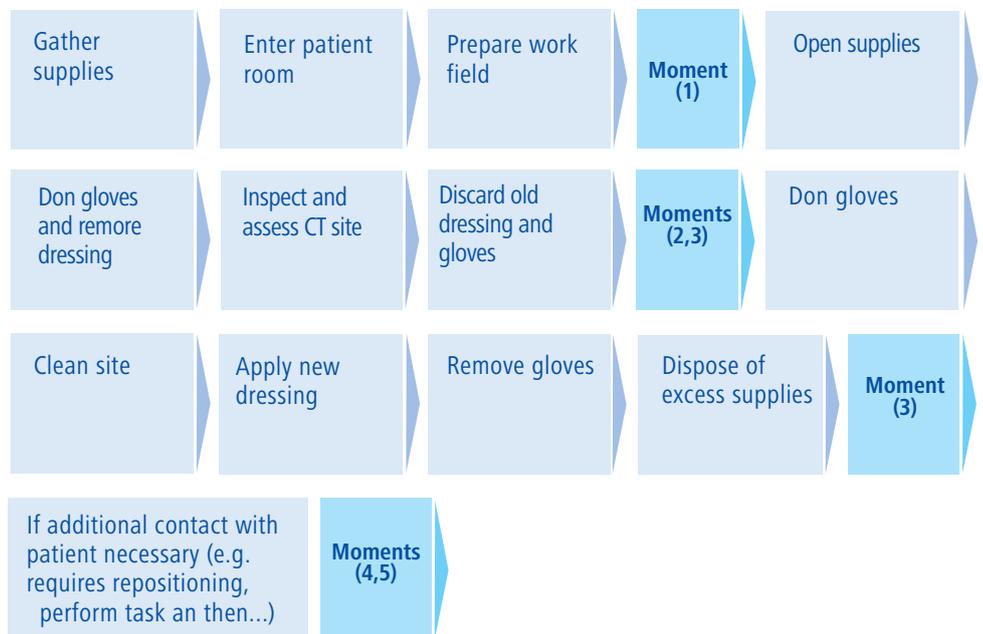
## Practical relevance

Development and awareness of reasonable clinical workflows effectively promotes compliance with hand hygiene.

## Workflow diagrams including Hand Hygiene Moments

### WHO 5 Moments of Hand Hygiene:

1. **Before** patient contact
2. Immediately **before** aseptic task
3. Immediately **after** body fluid exposure risk
4. **After** patient contact when leaving
5. **After** contact with patient surroundings when leaving



Maury, E. et al.

## Availability of an alcohol solution can improve hand disinfection compliance in an intensive care unit

### Background

The French study investigated whether the availability of an alcohol-based preparation increases compliance with hand disinfection in a medical intensive care unit.

### Methods

The study was conducted in a 14-bed medical intensive care unit during two consecutive 5-week periods and included 53 employees. Hand hygiene comprised both hand-washing and hand disinfection. Opportunities for hand hygiene were clearly defined: personal reasons; treatment of patients with and without exposure to body fluids. During the first period (P1), hand hygiene could only be performed with soap; during the second period (P2), there additionally was an alcohol-based hand disinfectant available. Performance of hand hygiene measures was determined by direct observation. In addition, participating healthcare workers received an anonymous questionnaire to rate their personal perception of the alcohol-based rub-in product. After four months, compliance was assessed again.

### Results

The average compliance rate during P1 was 42.4 %, and increased to 60.9 % during P2. Nursing staff improved from 45.3 % to 66.9 %, senior physicians from 37.2 % to 55.5 %, and residents from 46.9 % to 59.1 %. After four months, the compliance was still higher than in P1 (51.3 % vs. 42.4 %), but lower than during P2 (51.3 % vs. 60.9 %). The increase was significant.

### Conclusions

The study demonstrates a positive and lasting effect of the alcohol-based rub-in preparation on hand hygiene compliance. Senior staff and residents achieved the highest rates of increase. This group also preferred using the alcohol-based hand disinfectant. In this respect, the authors also recommend using pocket bottles that allow hand disinfection to be carried out when indicated despite high mobility.

Source  
American Journal of Respiratory and Critical Care Medicine 2000, 162: 324–327

### Practical relevance

Compliance with hand disinfection is higher, if the preparation is available where it is actually needed.



### Distribution of use of handwashing and alcohol rubbing during study phase 2 according to health care worker categories and handwashing categories

Professional group or type of activity	Global Compliance	Opportunities During Which Washing Was Performed	Opportunities During Which Rubbing Was Performed
Paramedical staff	66.9 %	32,9 %	34 %
Physicians	55.5 %	13,2 %	42,3 %
Residents	59.1 %	14,6 %	44,5 %
Personal gestures (e.g. after eating)	49.2 %	12,9 %	36,3 %
Care without exposure to body fluids	63.4 %	18,9 %	44,5 %
Care with exposure to body fluids	61,3 %	35 %	26,3 %

Pittet, D. et al.

## Effectiveness of a hospital-wide programme to improve compliance with hand hygiene



### Background

Hand hygiene in particular hand disinfection with preparations based on alcohol is considered the most important measure to prevent hospital-acquired infections (HAI). However, compliance with hand hygiene protocols is commonly poor. Pittet et al. conducted a study in the University Hospitals Geneva, Switzerland, to improve the compliance rate and assess its effect on the HAI rate.

### Method

The 5-year study, which started in 1995, included the implementation of a multimodal campaign for improving hand hygiene compliance. The campaign's emphasis was on strategically displayed posters developed by healthcare workers to remind employees of hand hygiene measures. In addition, the campaign focussed on promoting the use

of alcohol-based disinfectants, which were easily accessible in dispensers next to all patient beds and in pocket bottles. Compliance with hand hygiene protocols were monitored before (December 1994) and throughout the campaign (twice yearly, in June and December, from 1995 to 1997) by direct observation. More than 20,000 opportunities for hand hygiene were observed and evaluated. Additionally, the prevalence of HAI was recorded.

### Results

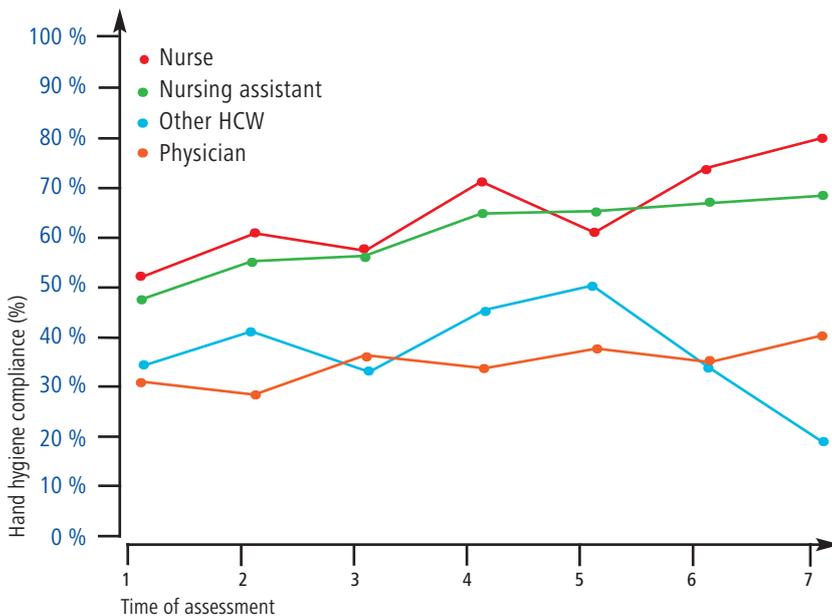
Throughout the course of the study, the compliance rate increased from 48 % in 1994 to 66 % in 1997. This improvement was clearly associated with the increase in compliance with hand disinfection, which rose from 13.6 % to 37 %; compliance achieved through standard hand-washing with soap and water remained stable at around 30 %. At the same time, the HAI rate significantly decreased from 16.9 % to 9.9 %.

### Conclusions

The study could demonstrate that a hospital-wide programme can improve hand hygiene compliance effectively and also decrease the rate of nosocomial infection significantly. The increase in compliance greatly depended on the easier accessibility of alcohol-based hand disinfectants.

Source  
Lancet, 2000, 356: 1307-1312

### Hand hygiene compliance trends in seven consecutive hospital-wide surveys according to Type of HCW



Type of HCW: Level of activity at time of observation refers to the number of opportunities for hand hygiene per h of care (activity index).

### Practical relevance

Increased compliance with hand disinfection can reduce the rate of nosocomial infections by more than 40 %.

Scheithauer, S./Lemmen, S.W.

## How can compliance with hand hygiene be improved in specialized areas of a university hospital?

### Background

In recent years, essential prerequisites for performing hand hygiene measures (e.g. adequate availability of disinfectant dispensers in all wards, and regular training) have been created. Nevertheless, compliance rates among healthcare providers in hospitals are still not high enough.

### Methods

The authors reviewed several strategies for promoting hand hygiene compliance documented in the scientific literature and assessed them for their strengths and weaknesses.

### Results

Surveillance systems may considerably contribute to reducing nosocomial infections. The German Hospital Infection Surveillance System (KISS), for example, allows standardised measurement of hand disinfectant consumption. However, higher consumption levels do not necessarily involve improved compliance quality. Another approach is direct observation of healthcare workers' hand hygiene behaviour, ideally including direct feedback. New technologies – for example, disinfectant dispensers equipped with counters or introduction of sensor-controlled dispensers – may help reduce expenses for measuring hand hygiene compliance.

### Conclusion

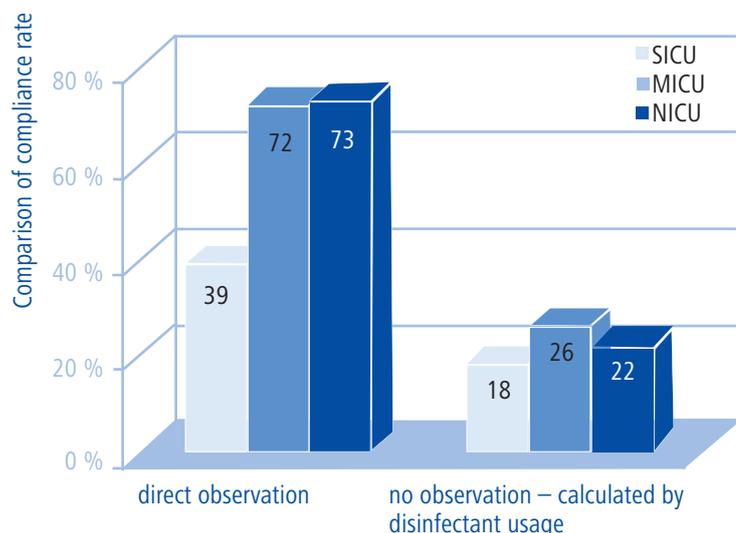
The authors consider those concepts of particular value which integrate hand hygiene into clinical workflows easily and effectively and thus increase the willingness to disinfect hands. Evaluation should comprise a combination of measuring the consumption and direct observation. Hospital teams should not implement these measures alone, but also involve employees from respective clinical areas. The support of the hospital management is of crucial importance here.

Source  
J Hosp Infect 2013, 83 (S 1): 17–22

### Practical relevance

Hand hygiene should be integrated into clinical routine or workflows as easily and efficiently as possible.

### Comparison of compliance rates (CR)



Direct observation versus disinfectant usage calculation. Intensive Care Units (ICUs): SICU (surgical); MICU (medical); NICU (neurological).

Kampf, G. et al.

## Influence of rub-in technique on required application time and hand coverage in hygienic hand disinfection



### Background

For hygienic hand disinfection, World Health Organization (WHO), Centers for Disease Control and Prevention (CDC) and Robert Koch-Institute (RKI) recommend a rub-in time that is long enough (mostly 30 seconds). However, several data indicate that hand disinfectants available on the market can achieve sufficient activity against bacteria according to EN 1500 within 15 seconds. The study verified, whether this short application time is enough to ensure good coverage of both hands.

### Methods

The study comprised four sets of experiments and was conducted with 15 test persons and 20 healthcare workers to investigate the coverage of hands after the application of the hand disinfectant with various rub-in techniques and different exposure times. The percentage of completely covered hands and the average rub-in time was assessed. To determine gaps in coverage, the authors used fluorescent solution in combination with a UV light box. Examined rub-in procedures included the reference procedure with 5 repetitions of 6 special steps, which are used in accordance with EN 1500 to assess the efficacy of hand disinfectants for hygienic hand disinfection. Further sets of experiments included modifications of this reference method and the responsible application without specification of special steps.

### Results

One-time performance of the 6 steps required 17 seconds only, but led to gaps in coverage with all test persons. With every additional repetition of the 6 steps, the coverage became better, but required an application time of up to 37 seconds. The responsible rub-in technique yielded the best results in coverage and required between 25 and 28 seconds.

### Conclusions

High-quality hand disinfection cannot be achieved within 15 seconds. It is recommended to maintain the 30-second exposure time. The known six rub-in steps based on the reference method in accordance with EN 1500 are not suitable for clinical practice. The authors advocate responsible application and emphasise the importance of training with UV light and individual feedback.

Source  
BMC Infectious Diseases 2008, 8: 149.

### Practical relevance

The responsible application yields best results in coverage and should be implemented in clinical practice.

### Influence of the rub-in technique on the quality of hand coverage

Rub-in method	Technique	Average duration	Gaps in coverage (relative frequency)
Six steps once	3 ml; 6 specific steps; each performed once	17 seconds	100 %
Six steps five times	3 ml; 6 specific steps; each performed five times	37 seconds	67 %
Reference procedure EN 1500	3 ml; 6 specific steps; each performed five times; complete procedure repeated	75 seconds	53 %
Responsible application / test subjects	3 ml; thorough wetting without specifications	25 seconds	53 %

The known rub-in steps basing on the reference method according to EN 1500 yielded the worst result, and therefore are hardly suitable for clinical practice. The responsible rub-in method yielded the best results.

Löffler, H. et al.

## Primary prevention in healthcare employees: a prospective intervention study with a 3-year training period

### Background

Morphological skin changes due to wet work are part of many healthcare providers' everyday lives. Frequent hand-washing damages the skin's barrier, which may lead to the development of irritant contact dermatitis. Often, healthcare apprentices do not exactly know how to perform hand hygiene measures correctly.

### Methods

The study investigated the effects of a special training programme on healthcare apprentices. A total of 521 test persons from 14 German nursing schools were randomised into two groups: an intervention groups (with a training programme on primary prevention) and a control group (without training). The general nursing, geriatric and paediatric apprentices were 22 years of age on average. Over a time period of three years, (1999 - 2002), the authors evaluated, for example, morphological changes on the hands.

### Results

In the intervention group, the skin condition was significantly better: over three years, morphological skin changes occurred in two-thirds (66.7 %) of this group's test persons. The value was 89.3 % in the control group. This difference is primarily due to the two group's different hand hygiene behaviour. Compared to the control group, the intervention group reduced the amount of handwashing; hand disinfection measures and amount of skincare cream used did not differ significantly between the two groups.

### Conclusions

This study shows that training measures to prevent skin diseases, which are conducted during apprenticeship, may reduce the risk of irritant skin changes among healthcare apprentices. Hence, continuous teaching of correct hand hygiene including preventive measures should be compulsory part of healthcare apprenticeships.

Source  
Contact Dermatitis 2006, 54: 202–209

### Practical relevance

The transfer of optimal hand hygiene right at the beginning of the apprenticeship significantly reduces the incidence of occupational skin irritations.



### Development of prevalence of irritant skin changes (hand dermatitis) in health care trainees during the 3 years lasting training period

Prevalence	All, n = 325 (%)	Intervention, n = 156 (%)	Control, n = 169 (%)
Before training	30.1 (17.2)	30.1 (17.3)	30.2 (17.2)
After 1 ½ years	56.5 (40.9)	48.4 (33.3)	63.9 (47.9)
After 3 years	50.5 (27.7)	31.4 (16.0)	68.1 (38.5)
Prevalence of all 3 years	78.5 (56.9)	66.7 (46.8)	89.3 (66.3)



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In the EU member states alone, nosocomial infections involve 16 million additional hospital days and 37 000 deaths each year. The direct additional costs are estimated at 7 billion euros per year.

Source: The Burden of Health Care-Associated Infection Worldwide. A Summary. WHO Patient Safety – a World Alliance for Safer Healthcare. 2010.

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