

# Studien zur antiseptischen Ganzkörperwaschung und Verwendung von Kitteln und Handschuhen

PD Dr. S. Schulz-Stübner

# Die Idee: Keimlastreduktion

- Auf der Haut des Patienten
  - Grampositive Erreger
  - Gramnegative Erreger
  - Weniger Deviceassoziierte Infektionen
- Auf den Händen des Personals
  - Bessere Wirksamkeit der Händedesinfektion
  - Sonderfall: Sporen
  - Weniger Transmission/Kolonisation

# Universelle versus gezielte Dekolonisation

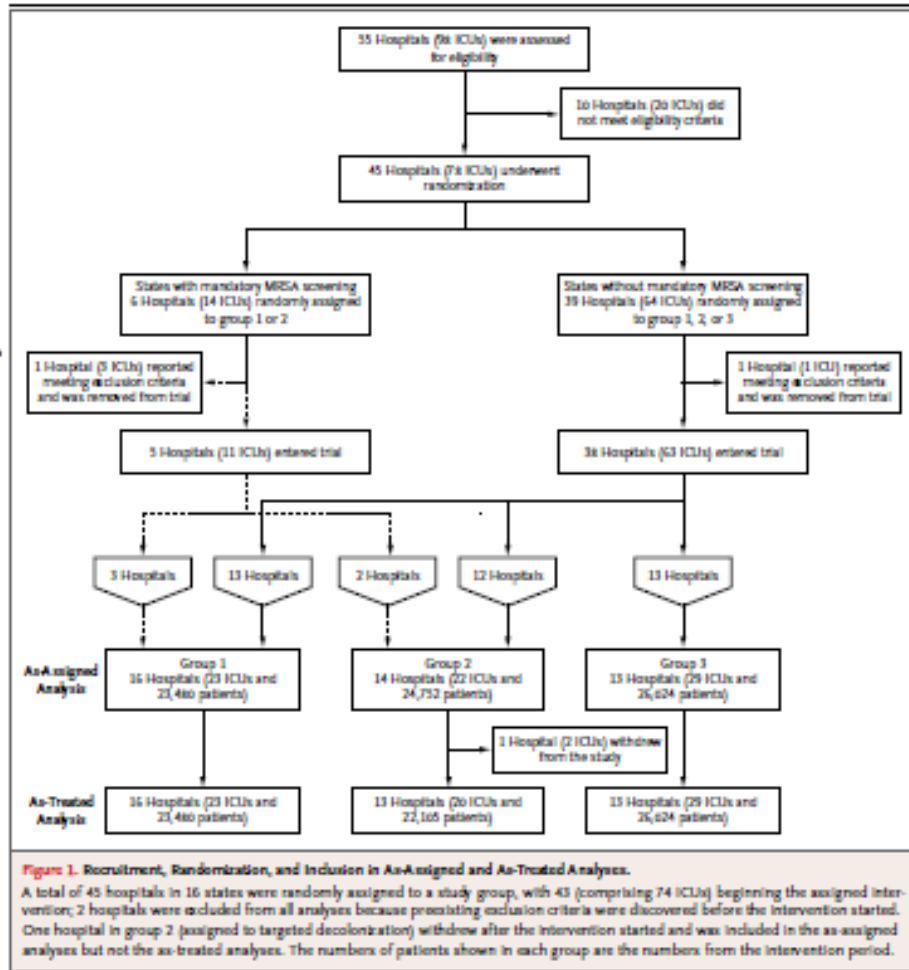
The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

## Targeted versus Universal Decolonization to Prevent ICU Infection

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# Universelle versus gezielte Dekolonisation

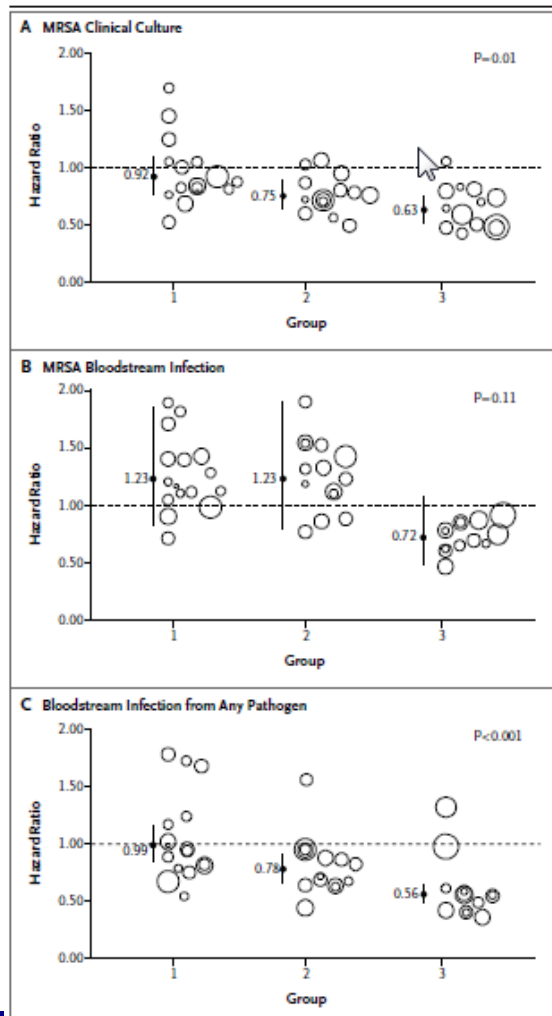


# Universelle versus gezielte Dekolonisation

**Table 1. Characteristics of the Intensive Care Unit (ICU) Population, According to Study Period and Group.\***

Variable	12-Mo Baseline Period (N=48,390)			18-Mo Intervention Period (N=74,256)		
	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3
Admission with ICU stay (no.)	15,816	15,218	17,356	23,480	24,752	26,024
Attributable ICU patient-days (no.)	63,135	57,418	69,668	88,222	92,978	101,603
ICU type (no.)†						
Medical	3	5	5	3	5	5
Surgical	1	2	6	1	2	6
Mixed medical and surgical	19	14	18	19	15	17
Hospital stay (days)						
Median	7	7	8	7	7	7
Interquartile range	5–12	5–12	5–12	5–12	5–12	5–12
ICU stay (days)						
Median	3	3	3	3	3	3
Interquartile range	2–5	2–5	2–5	1–5	2–5	2–5
Age (yr)						
Median	65	66	65	65	66	65
Interquartile range	52–77	53–77	51–77	52–77	53–77	52–77
Female sex (%)‡	47.2	47.2	47.9	47.6	47.2	47.5
Nonwhite race (%)§	25.9	22.1	30.8	25.9	23.5	31.7
Coexisting condition (%)						
Diabetes	31.3	33.0	30.7	31.8	32.7	31.5
Renal failure	20.0	20.4	19.0	20.3	22.2	19.7
Cancer	10.4	10.8	14.1	9.9	10.8	13.0
Liver failure	3.4	4.4	3.9	4.0	4.1	4.2
History of MRSA infection (%)¶	10.2	11.5	10.6	9.7	11.1	3.9
Surgery during hospitalization (%)	40.5	38.6	47.5	38.7	37.7	46.2

# Universelle versus gezielte Dekolonisation



Shown are group-specific hazard ratios and 95% confidence intervals (indicated by vertical lines) for outcomes attributable to the intensive care unit. Results are based on unadjusted proportional-hazards models that accounted for clustering within hospitals. Analyses were based on the as-assigned status of hospitals. Panel A shows hazard ratios for clinical cultures that were positive for methicillin-resistant *Staphylococcus aureus* (MRSA) infection, Panel B hazard ratios for MRSA bloodstream infection, and Panel C hazard ratios for bloodstream infection from any pathogen. Bubble plots of hazard ratios (predicted random effects or exponentiated frailties) from individual hospitals relative to their group effects are shown. The size of the bubble indicates the relative number of patients contributing data to the trial.

Modeled hazard ratios for MRSA clinical isolates were 0.92 for screening and isolation (crude rate, 3.2 vs. 3.4 isolates per 1000 days), 0.75 for targeted decolonization (3.2 vs. 4.3 isolates per 1000 days), and 0.63 for universal decolonization (2.1 vs. 3.4 isolates per 1000 days) (P = 0.01 for test of all groups being equal) In the intervention versus baseline periods

# Universelle versus gezielte Dekolonisation

Hazard ratios for bloodstream infection with any pathogen in the three groups were in group 1: 0.99 (crude rate, 4.1 vs. 4.2 infections per 1000 days),  
In group II: 0.78 (3.7 vs. 4.8 infections per 1000 days),  
and in group III: 0.56 (3.6 vs. 6.1 infections per 1000 days),  
( $P < 0.001$  for test of all groups being equal).

➤ NNT um eine Blutstrominfektion zu vermeiden: 58

# Universelle versus gezielte Dekolonisation

- First, chlorhexidine reduces skin colonization by many pathogens, thus protecting patients in the ICU from their own microbiota during a period of heightened vulnerability to infection.
- Second, universal decolonization reduces the environmental microbial burden, reducing
- **Standardhygiene/Basishygiene!?**  
Third, universal decolonization began on the first ICU day, thus avoiding the delay in decolonization pending the results of screening tests.



# Tägliche Chlorhexidinwaschung

**Climo MW, Yokoe DS, Warren DK, Perl TM, Bolon M et al.** Effect of daily chlorhexidine bathing on hospital-acquired infection. *N Eng J Med* 2013; 368:533-42

In der clusterrandomisierten, offenen Crossover-Untersuchung wurden insgesamt 7727 Patienten auf 6 Intensivstationen in den USA im Zeitraum von August 2007 bis Februar 2009 eingeschlossen.

Die Studie musste im Ablauf modifiziert werden, da im Jahre 2008 eine mit *Burkholderia cepacia* kontaminierte Charge der verwendeten chlorhexidingetränkten Fertigwaschlappen zurückgerufen wurde.

# Tägliche Chlorhexidinwaschung

- In der Gruppe der chlorhexidinbehandelten Patienten kam es zu einer Akquisitionsrate von multiresistenten Erregern (MRE) von 5,1 pro 1000 Patiententage versus 6,6 pro 1000 Patiententage in der Gruppe mit normalen Waschlappen ( $p = 0,03$ ).
- Nach Erreger differenziert ergab sich für MRSA eine Akquisitionsrate von 1,89/1000 Patiententage versus 2,32/1000 ( $P = 0,29$ ) und für VRE von 3,21/1000 versus 4,128/1000 ( $P = 0,045$ ) im Vergleich Intervention versus Kontrolle.

# Tägliche Chlorhexidinwaschung

- Die Zahl der im Krankenhaus erworbenen Blutstrominfektionen war 4,78/1000 Patiententage mit Chlorhexidinwaschung versus 6,6/1000 Patiententage in der Kontrollgruppe ( $p = 0,0007$ ).
- Betrachtet man nur die ZVK-assoziierten Blutstrominfektionen (CLABSI), so ergeben sich Raten von 1,55/1000 Kathetertage versus 3,3/1000 Kathetertage ( $P = 0,004$ ) in den respektiven Gruppen.
- Bei der Analyse der unterschiedlichen Erreger der Blutstrominfektionen ergibt sich eine statistisch signifikante Reduktion bei den durch Koagulasenegative Staphylokokken hervorgerufenen Erkrankungen (0,6 versus 1,36/1000 Patiententage,  $p = 0,03$  und bei Pilzinfektionen mit Candida (0,28 versus 0,64/1000 Patiententage,  $p = 0,06$ ) während sich für gramnegative Erreger kein Unterschied nachweisen ließ.

# Tägliche Chlorhexidinwaschung

- Unterschiede bei der Hautverträglichkeit zwischen den Gruppen ließen sich nicht nachweisen.
- Eine ebenfalls durchgeführte Sensitivitätstestung von 713 MRSA-Isolaten und 393 VRE-Isolaten ergab eine etwas höhere Aktivität von Chlorhexidin gegenüber MRSA (MHK in 90% der Stämme 4µg/ml für MRSA versus 8µg/ml für VRE).

# Tägliche Chlorhexidinwaschung bei Kindern

**Milestone AM, Elward A, Song X, Zerr DM, Orschem R et al. for the SCRUB Trial Study Group.** Daily chlorhexidine bathing to reduce bacteraemia in critically ill children: a multicenter, cluster-randomised, crossover trial. Lancet 2013; 381: 1099-1106

10 Pädiatrische Intensivstationen in 5 amerikanischen Krankenhäusern beteiligten sich an der Studie, wobei jeweils ein sechsmonatiges Intervall mit und ohne Chlorhexidin-Waschlappen verglichen wurde.

Eingeschlossen wurden Patienten mit einer Liegedauer von mehr als 2 Tagen und einem Lebensalter über 2 Monaten. Ausgeschlossen wurden Kinder mit einem Epiduralkatheter oder einer Lumbaldrainage, schweren Hautkrankheiten oder Brandverletzungen und solche mit einer bekannten Allergie gegen CHG.

# Tägliche Chlorhexidinwaschung bei Kindern

Als primärer Zielparameter wurden Bakteriämien (definiert als positive Blutkultur unabhängig vom nachgewiesenen Erreger) pro 1000 Patiententage gewählt, da diese häufiger vorkommen als enger umrissene Katheterinfektionen und auch Bakteriämien mit klassischen Hautkeimen wie koagulasenegative Staphylokokken bei pädiatrischen Intensivpatienten mitunter klinisch relevant sind.

Als sekundärer Parameter wurden ZVK-assoziierte Blutstrominfektionen (CLABSI) entsprechend der CDC-Definition ausgewertet. Es wurden eine „intention-to-treat“ (ITT) und eine „per-protocol“ (PP)-Analyse der Daten durchgeführt.

# Tägliche Chlorhexidinwaschung bei Kindern

- 6482 Patienten wurden gescreent, davon 1521 ausgeschlossen weil ihr Aufenthalt unter 2 Tagen lag und in 14 Fällen wurde die Zustimmung zur Studie verweigert.
- 4947 Fälle in der Auswertung
  - ITT-Analyse: nicht signifikante Reduktion der Bakteriämien (3,52/1000 versus 4,93/1000, adjustierte Inzidenzratio 0,71, 95%-Konfidenzintervall 0,42-1,2).
  - Statistische Signifikanz in der PP-Analyse mit 3,28/1000 Bakteriämien in der CHG-Gruppe versus 4,93/1000 in der Standardgruppe mit einer adjustierten Inzidenzratio von 0,64, 95-Konfidenzintervall 0,42-0,98.
  - Der ebenfalls beobachtete Trend einer reduzierten CLABSI-Inzidenz war nicht statistisch signifikant.

# Tägliche Chlorhexidinwaschung bei Kindern

- Bei den Bakteriämien zeigte sich ein deutlicher und statistisch signifikanter Rückgang der grampositiven Erreger 1,93/1000 mit CHG versus 3,56/1000 ohne CHG, Inzidenzratio 0,54, 95% Konfidenzintervall 0,31-0,91) während bei den gramnegativen Erregern kein signifikanter Unterschied beobachtet wurde (0,85/1000 versus 1,6/1000, Inzidenzratio 0,53, 95%-Konfidenzintervall 0,14-1,52).
- Haureaktionen wurden bei 69 Patienten beobachtet (43 in der CHG, 26 in der Kontrollgruppe) wobei lediglich 12 Reaktionen klinisch mit CHG in Zusammenhang gebracht wurden, was einer Inzidenzdichte von 1,12/1000 Expositionstage entspricht.



# Aber...

Intensive Care Med. 2010 May;36(5):854-8. Epub 2010

**Daily skin cleansing with chlorhexidine did not reduce the rate of central-line associated bloodstream infection in a surgical intensive care unit.**

Popovich KJ, Hota B, Hayes R, Weinstein RA, Hayden MK.  
Source Stroger Hospital of Cook County, Chicago, USA.

## Abstract

**PURPOSE:** Cleansing the skin of intensive care unit (ICU) patients daily with chlorhexidine gluconate (CHG) has been associated with beneficial effects, including a reduction in central-line-associated bacteremias (CLABSIs). Most studies have been done in medical ICUs. In this study, we evaluated the effectiveness of daily chlorhexidine skin cleansing on CLABSI rates in a surgical ICU.

**METHODS:** In Fall 2005, the 30-bed surgical ICU at Rush University Medical Center discontinued daily soap-and-water bathing of patients and substituted skin cleansing with no-rinse, 2% CHG-impregnated cloths. This change was made without research investigator input or oversight. Using administrative, microbiological and infection control practitioner databases, we compared rates of CLABSIs and blood culture contamination during soap-and-water bathing (September 2004-October 2005) and CHG cleansing (November 2005-October 2006) periods. Rates of other nosocomial infections that were not expected to be affected by CHG bathing (secondary bacteremia, Clostridium difficile-associated diarrhea, ventilator-associated pneumonia, urinary tract infection) were included as control variables.

**RESULTS:** There was no significant difference in the CLABSI rate between soap-and-water and CHG bathing periods (3.81/1,000 central line days vs. 4.6/1,000 central line days;  $p = 0.57$ ). Blood culture contamination declined during CHG bathing (5.97/1,000 to 2.41/1,000 patient days;  $p = 0.003$ ). Rates of other nosocomial infections did not change significantly.

**CONCLUSIONS:** In this real-world effectiveness trial, daily cleansing of surgical ICU patients' skin with CHG had no effect on CLABSI rates, but was associated with half the rate of blood culture contamination. Controlled trials in surgical ICUs are needed to determine whether CHG bathing can prevent infections in this setting.

# Metaanalyse

Afonso E, Llaouradó M, Gallart E. The value of chlorhexidine gluconate wipes and prepacked washcloths to prevent the spread of pathogens--a systematic review. Aust Crit Care. 2013 Nov;26(4):158-66

To assess the impact of chlorhexidine washcloths/wipes in preventing the spread of pathogens.

Extensive and structured literature search from studies in Google Academic, Cochrane Library, Web of Science, Pubmed and Cinahl from their inception until November 2012

Final analysis included 15 studies, 9 of which were randomised controlled trials

# Metaanalyse

- In intensive care units, a significant reduction of bloodstream infection was associated with intervention and 3 studies revealed a decrease in blood culture contamination.
- One study showed a decrease in staff and environmental contamination and no increase in chlorhexidine resistance with intervention.
- Positive blood cultures for multiple pathogens also declined with intervention.
- In a paediatric intensive care unit, intervention decreased bacteraemia and catheter-associated bloodstream infection

# Metaanalyse

- In hospital wards, intervention was associated to a 64% reduction of pathogen transmission.
- One study had no statistically significant results.
- Pre-surgical chlorhexidine use significantly decreased bacterial colonisation but had no impact on surgical site infections.
- Regarding maternal and perinatal setting, one study did not show reduction of early onset neonatal sepsis and pathogen transmission.
- Another study of vaginal and neonatal decolonisation with chlorhexidine wiping revealed significant reduction in colonisation.
- One study concluded that single and multiple umbilical cord cleansing reduced the likelihood for a positive swab in 25% and 29%, respectively. Neonatal wiping maintained low levels of skin colonisation for a 24h period, for multiple pathogens.

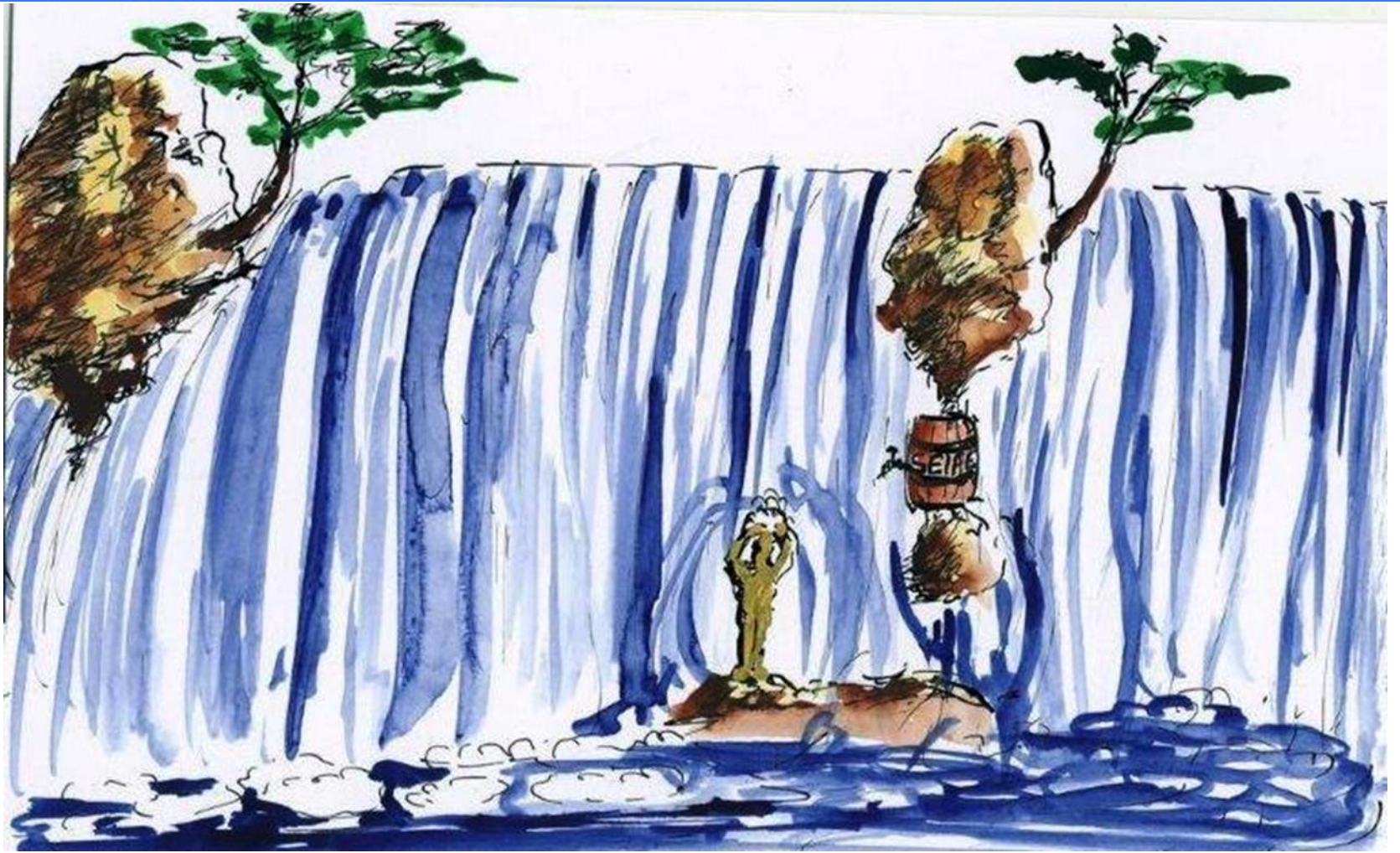
# Metaanalyse

Current evidence supports the **usefulness** of chlorhexidine washcloths and bathing in **intensive care, hospital**

More studies are needed to determine the **effectiveness** for prevention of **colonisation** of patients

Fragen:  
Ziel Infektionsprävention  
und/oder  
Kolonisationsprävention?  
Wen, Wann, womit und wie  
lange?

So viel zum täglichen Baden...





...sonst noch was?

Camus C, Salomon S, Bouchigny C, Gacouin A, Lavoué S, Donnio PY, Javaudin L, Chapplain JM, Uhel F, Le Tulzo Y, Bellissant E.

Short-term decline in all-cause acquired infections with the routine use of a **decontamination regimen combining topical polymyxin, tobramycin, and amphotericin B with mupirocin and chlorhexidine** in the ICU: a single-center experience.

Crit Care Med 2014; 42:1121-30

## ...sonst noch was?

- In a multicenter, placebo-controlled, randomized, double-blind trial, we showed that acquired infections in intubated patients were reduced by the combination of topical polymyxin plus tobramycin and nasal mupirocin plus chlorhexidine body wash. Because intubated patients are particularly at risk for acquired infections, we reassessed the impact of this protocol as a routine procedure to control acquired infections in the ICU.
- Nonrandomized study comparing acquired infections in ICU patients during two 1-year periods: the last year before (group A, n = 925) and the first year after the implementation of the protocol (group B, n = 1,022). Acquired infections were prospectively recorded



## ...sonst noch was?

- Administration of polymyxin/tobramycin/amphotericin B in the oropharynx and the gastric tube plus a mupirocin/chlorhexidine regimen (Group B) in intubated patients and standard care in the other patients (Group A).
  - Infection rates were lower in group B compared with group A (5.3% vs 11.0%;  $p < 0.001$ ),
  - as were the incidence rates of total acquired infections (9.4 vs 23.6 per 1,000 patient-days;  $p < 0.001$ ),
  - intubation-related pneumonia (5.1 vs 17.1 per 1,000 ventilator-days;  $p < 0.001$ ),
  - and catheter-related bloodstream infections (1.0 vs 3.5 per 1,000 catheter-days;  $p = 0.03$ )

## ...sonst noch was?

- There were fewer acquired infections caused by ceftazidime-resistant Enterobacteriaceae (0.8‰ vs 3.6‰;  $p < 0.001$ ),
- ciprofloxacin-resistant Enterobacteriaceae (0.8‰ vs 2.5‰;  $p = 0.02$ ),
- ciprofloxacin-resistant *Pseudomonas aeruginosa* (0.5‰ vs 1.6‰;  $p = 0.05$ ),
- and colistin-resistant Gram-negative bacilli (0.7‰ vs 1.9‰;  $p = 0.04$ ).
- Fewer patients got acquired infections due to multidrug-resistant aerobic Gram-negative bacilli ( $p = 0.008$ ).

# Antiseptisches Waschen zweiter Teil: Präoperativ



# Postoperative Wundinfektionen?

Webster J, Osborne S



Preoperative bathing or showering with skin antiseptics to prevent surgical site infection

2012 The Cochrane Collaboration.

# Cochrane-Review 2012

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Surgical site infection	4	7791	Risk Ratio (M-H, Fixed, 95% CI)	0.91 [0.80, 1.04]
2 Surgical site infection (high quality studies)	2	6302	Risk Ratio (M-H, Fixed, 95% CI)	0.95 [0.82, 1.10]
3 Allergic reaction	2	3589	Risk Ratio (M-H, Fixed, 95% CI)	0.89 [0.36, 2.19]

## Comparison 2. Chlorhexidine 4% versus bar soap

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Surgical site infection	3	1443	Risk Ratio (M-H, Random, 95% CI)	1.02 [0.57, 1.84]

## Comparison 3. Chlorhexadine 4% versus no wash

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Surgical site infection	3	1142	Risk Ratio (M-H, Random, 95% CI)	0.82 [0.26, 2.62]

# Aber bei Endoprothesen?

Clin Orthop Relat Res. 2013 Mar 16. [Epub ahead of print]

## **No Infection Reduction Using Chlorhexidine Wipes in Total Joint Arthroplasty.**

Farber NJ, Chen AF, Bartsch SM, Feigel JL, Klatt BA.

University of Pittsburgh School of Medicine, Pittsburgh, PA, USA.

### BACKGROUND:

Surgical site infection (SSI) after total joint arthroplasty (TJA) is a rare but devastating complication. Various skin antiseptic applications are used preoperatively to prevent SSI. Recent literature suggests 2% chlorhexidine gluconate (CHG) wipes reduce microbial content at surgical sites, but it is unclear whether they reduce rates of SSI.

### QUESTIONS/PURPOSES:

We compared the SSI rates between TJAs with and without CHG wipe use (1) with all TJAs in one group and (2) stratified by surgical subgroup (THA, TKA).

### METHODS:

We retrospectively reviewed all 3715 patients who underwent primary TJA from 2007 to 2009. CHG wipes were introduced at our facility on April 21, 2008. We compared SSI of patients before (n = 1824) and after (n = 1891) the introduction of CHG wipes. The wipes were applied 1 hour before surgery. There were 1660 patients with THA (845 CHG, 815 no CHG) and 2055 patients with TKA (1046 CHG, 1009 no CHG). Infections were diagnosed based on the Musculoskeletal Infection Society Guidelines for periprosthetic joint infection. All patients were tracked for 1 year.

### RESULTS:

SSI incidences were similar in patients receiving (1.0%, 18 of 1891) and not receiving (1.3%, 24 of 1824) CHG wipes. In patients with THA, there was no difference in SSI between those receiving (1.2%, 10 of 845) and not receiving (1.5%, 12 of 815) CHG wipes. In patients with TKA, there also was no difference in SSI between those receiving (0.8%, eight of 1046) and not receiving (1.2%, 12 of 1009) CHG wipes.

### CONCLUSIONS:

**Introduction of CHG-impregnated wipes in the presurgical setting was not associated with a reduced SSI incidence. Our analysis suggests CHG wipes in TJA are unnecessary as an adjunct skin antiseptic, as suggested in previous smaller studies.**

...welche Rolle spielt die Nase?

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Preventing Surgical-Site Infections in Nasal Carriers  
*of Staphylococcus aureus*

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Diana Bogaers, I.C.P., Christina M.J.E. Vandenbroucke-Grauls, M.D., Ph.D., Robert Roosendaal, Ph.D.,  
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Alex van Belkum, Ph.D., Henri A. Verbrugh, M.D., Ph.D., and Margreet C. Vos, M.D., Ph.D.



# Mupirocin-Nasensalbe plus Chlorhexidinwaschung

- From October 2005 through June 2007, a total of 6771 patients were screened on admission.
- A total of 1270 nasal swabs from 1251 patients were positive for *S. aureus*.
- We enrolled 917 of these patients in the intention-to-treat analysis, of whom **808** (88.1%) underwent a surgical procedure. All the *S. aureus* strains identified on PCR assay were susceptible to methicillin and mupirocin.
- The rate of *S. aureus* infection was 3.4% (17 of 504 patients) in the mupirocin–chlorhexidine group, as compared with 7.7% (32 of 413 patients) in the placebo group (**relative risk of infection, 0.42**; 95% confidence interval [CI], 0.23 to 0.75).
- The effect of mupirocin–chlorhexidine treatment was most pronounced for deep surgical-site infections (relative risk, 0.21; 95% CI, 0.07 to 0.62).
- There was no significant difference in all-cause in-hospital mortality between the two groups.
- The time to the onset of nosocomial infection was shorter in the placebo group than in the mupirocin–chlorhexidine group ( $P = 0.005$ ).



# Zu Risiken und Nebenwirkungen....

## High Prevalence of Reduced Chlorhexidine Susceptibility in Organisms Causing Central Line–Associated Bloodstream Infections

TABLE 2. Proportion of Organisms with Reduced Chlorhexidine Gluconate (CHG) Susceptibility in Patients Who Did and Did Not Receive Daily CHG Bathing

Organism	CHG bathing		No CHG bathing		<i>P</i> <sup>b</sup>
	No. of isolates tested	No. (%) of isolates with reduced susceptibility <sup>a</sup>	No. of isolates tested	No. of isolates with reduced susceptibility <sup>a</sup>	
Gram positive	16	13 (81)	65	34 (52)	.036
Gram negative	12	11 (92)	29	26 (90)	.843
Total	28	24 (86)	94	60 (64)	.028

<sup>a</sup> Reduced CHG susceptibility was defined as a minimum inhibitory concentration greater than or equal to 4 µg/mL.

<sup>b</sup> The test of 2 proportions was used to compare the proportion of organisms with reduced CHG susceptibilities in patients with and without daily CHG bathing.

# Zu Risiken und Nebenwirkungen....

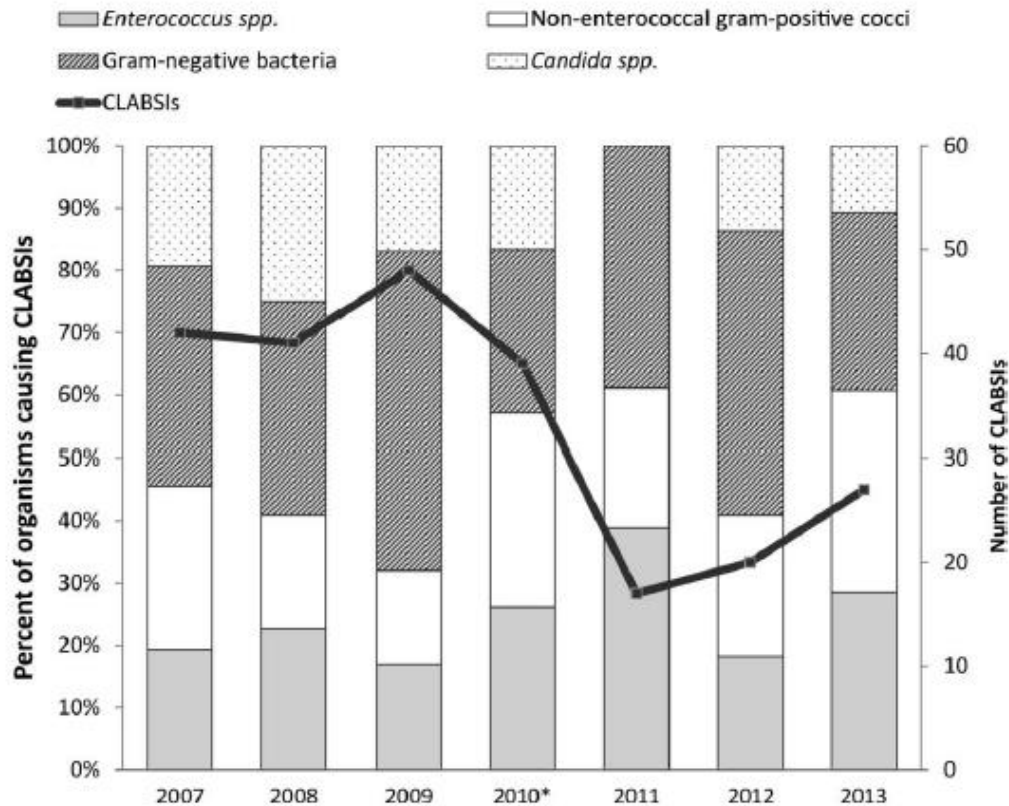


FIGURE 1. Distribution of organisms causing central line-associated bloodstream infections (CLABSIs) and number of CLABSIs between January 2007 and December 2013 in all intensive care units (ICUs) except the neonatal ICU. \*Daily CHG bathing was introduced in all ICUs except the neonatal ICU between February 2010 and January 2011. Three ICUs participated in clinical trials of CHG bathing for up to 12 months between 2007 and 2010.

## Zu Risiken und Nebenwirkungen....

“Our data do not suggest that CHG bathing is changing the microbial ecology of organisms causing CLABSIs, as there was no change in the distribution of organisms over time.”

“One previous study found selection of an MRSA strain with reduced CHG susceptibility in an environment with high CHG exposure, but whether this clonal selection was caused by CHG exposure or was simply associated with CHG exposure is unknown.

- Continued surveillance of clinical isolates is warranted to identify an epidemiologically significant trend toward decreasing antiseptic susceptibility.

# Handschuhe

Jun Yin, Marin L. Schweizer, Loreen A. Herwaldt, MD, Jean M. Pottinger and Eli N. Perencevich.

## Benefits of **Universal Gloving on Hospital-Acquired Infections in Acute Care Pediatric Units.**

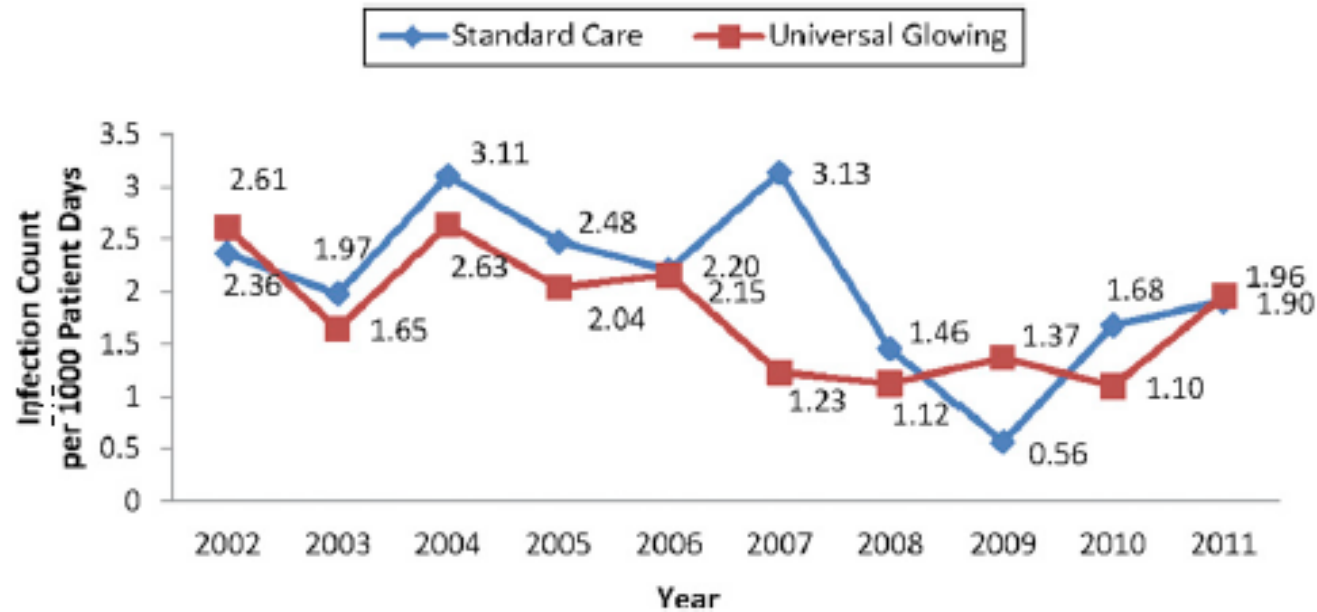
Patients admitted to pediatric units with respiratory symptoms are placed on contact and droplet precautions until a respiratory panel is complete; precautions are adjusted on the basis of the results of the diagnostic tests.

During RSV season, all health care workers in the pediatric units must wear a new pair of gloves every time they see a patient. They must remove the gloves and perform hand hygiene before leaving the patient's room. Therefore, universal gloving was used during RSV season but not during non-RSV season.

# Handschuhe

- During the study period, 686 HAIs occurred during 363 782 patient-days.
- The risk of any HAI was 25% lower during mandatory gloving periods compared with during nongloving periods (relative risk [RR]: 0.75; 95% confidence interval [CI]: 0.69–0.93;  $P = .01$ ), after adjusting for long-term trends and seasonal effect.
- Mandatory gloving was associated with lower risks of bloodstream infections (RR: 0.63; 95% CI: 0.49–0.81;  $P = .001$ ), central line–associated bloodstream infections (RR: 0.61; 95% CI: 0.44–0.84;  $P = 0.003$ ), and hospital-acquired pneumonia (RR: 0.20; 95% CI: 0.03–1.25;  $P = 0.09$ ).
- The reduction was significant in the PICU (RR: 0.63; 95% CI: 0.42–0.93;  $P = .02$ ), the NICU (RR: 0.62; 95% CI: 0.39–0.98;  $P = .04$ ), and the Pediatric Bone Marrow Transplant Unit (RR: 0.52; 95% CI: 0.29–0.91,  $P = .02$ )

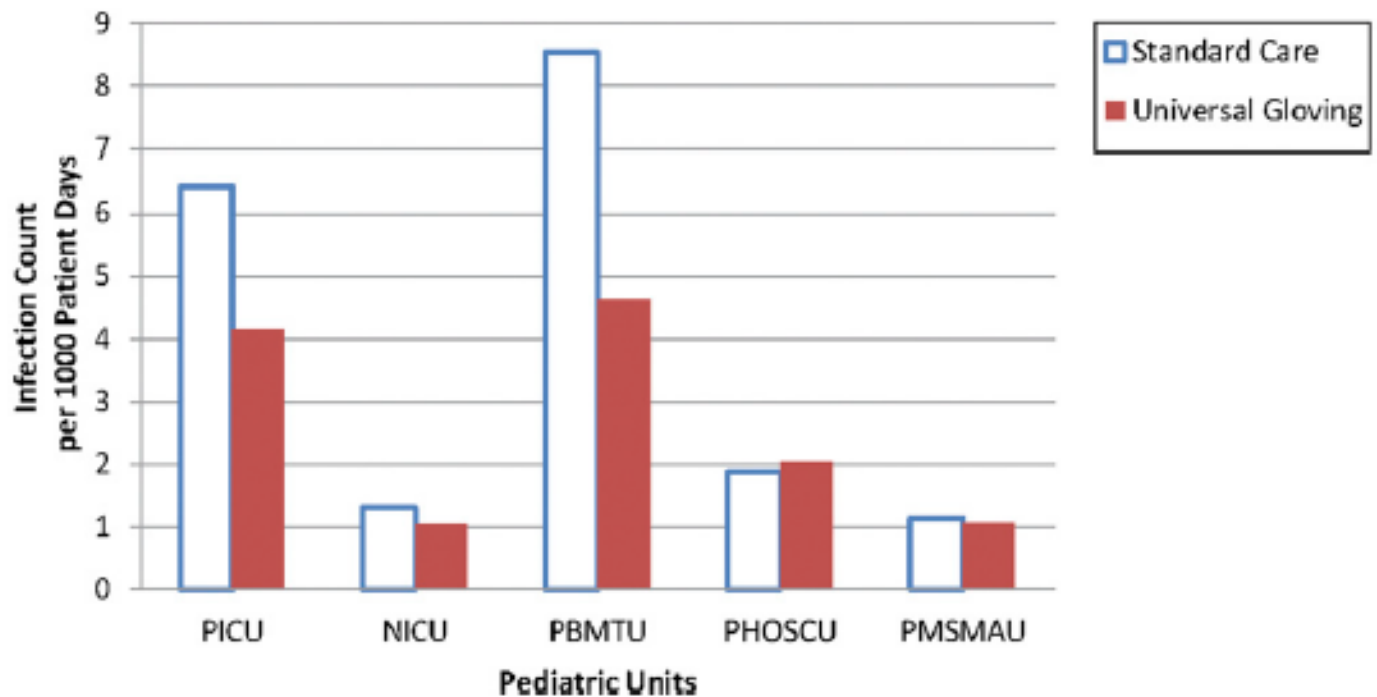
# Handschuhe



**FIGURE 1**

Incidence rates of all HAIs in all pediatric units during standard care periods and universal gloving periods.

# Handschuhe



**FIGURE 2**  
Average HAI rates in individual pediatric units.

*JAMA*. 2013 October 16; 310(15): 1571–1580. doi:10.1001/jama.2013.277815.

## **Universal Glove and Gown Use and Acquisition of Antibiotic resistant bacteria in the ICU: A Randomized Trial**

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<sup>1</sup> University of Maryland School of Medicine, Baltimore, MD



# Kittel und Handschuhe

- Cluster-randomized trial in 20 medical and surgical ICUs in 20 US hospitals from January 4, 2012, to October 4, 2012.
- The primary outcome was acquisition of MRSA or VRE based on surveillance cultures collected on admission and discharge from the ICU.
- Secondary outcomes included individual VRE acquisition, MRSA acquisition, frequency of health care worker visits, hand hygiene compliance, health care–associated infections, and adverse events.
- From the 26 180 patients included, 92 241 swabs were collected for the primary outcome.

# Kittel und Handschuhe

- Intervention ICUs had a decrease in the primary outcome of MRSA or VRE from 21.35 acquisitions per 1000 patient-days (95% CI, 17.57 to 25.94) in the baseline period to 16.91 acquisitions per 1000 patient-days (95% CI, 14.09 to 20.28) in the study period, whereas control
- ICUs had a decrease in MRSA or VRE from 19.02 acquisitions per 1000 patient-days (95% CI, 14.20 to 25.49) in the baseline period to 16.29 acquisitions per 1000 patient-days (95% CI, 13.48 to 19.68) in the study period, a difference in changes that was not statistically significant (difference,  $-1.71$  acquisitions per 1000 person-days, 95% CI,  $-6.15$  to  $2.73$ ;  $P = .57$ ).

# Kittel und Handschuhe

- There was no difference in VRE acquisition with the intervention (difference, 0.89 acquisitions per 1000 person-days; 95% CI, -4.27 to 6.04,  $P = .70$ )
- For MRSA, there were fewer acquisitions with the intervention (difference, -2.98 acquisitions per 1000 person-days; 95% CI, -5.58 to -0.38;  $P = .046$ ).

# Kittel und Handschuhe

- Universal glove and gown use decreased health care worker room entry (4.28 vs 5.24 entries per hour, difference,  $-0.96$ ; 95% CI,  $-1.71$  to  $-0.21$ ,  $P = .02$ ),
- increased room-exit hand hygiene compliance (78.3% vs 62.9%, difference, 15.4%; 95% CI, 8.99% to 21.8%;  $P = .02$ )
- no statistically significant effect on rates of adverse events (58.7 events per 1000 patient days vs 74.4 events per 1000 patient days; difference,  $-15.7$ ; 95% CI,  $-40.7$  to 9.2,  $P = .24$ ).

# MRSA, MRSA, MRSA

	Trial design	Setting	Screening and isolation	Gloves and gowns	Hand hygiene	Decolonisation		Masks
						Universal	Targeted	
Robicsek et al (2008) <sup>13</sup>	Observational study	Hospital-wide	Effective as part of a bundle*	--	--	--	Effective as part of a bundle	Not included in bundle
Hareath et al (2008) <sup>7</sup>	Prospective interventional cohort study	Surgical wards	Not effective*	--	--	--	Not effective	--
Jain et al (2011) <sup>14</sup>	Observational study	Hospital-wide	Effective as part of a bundle†	Effective as part of a bundle†	Effective as part of a bundle†	--	--	--
Huskins et al (2011) <sup>15</sup>	RCT	ICUs	Not effective‡	Not effective	--	--	--	Not included in bundle
Huang et al (2013) <sup>20</sup>	RCT	ICUs and stem-cell transplantation units	Not effective	--	--	Effective	Effective§	--
Harris et al (2013) <sup>21</sup>	RCT	ICUs	--	Effective¶	--	--	--	--
Lee et al (2013) <sup>16</sup>	Prospective interventional cohort study	Surgical wards	Not effective alone	--	Not effective alone**	--	--	Not included in bundle
Climo et al (2013) <sup>22</sup>	RCT	ICUs	--	--	--	Effective	--	--
Derde et al (2014) <sup>23</sup>	Hybrid prospective interventional cohort study and RCT††	ICUs	Not effective	--	Effective as part of a bundle	Effective as part of a bundle	--	Not included in bundle

--intervention was not assessed. ICU=intensive-care unit. MRSA=meticillin-resistant *Staphylococcus aureus*. RCT=randomised controlled trial. \*Interventions included also rapid PCR testing and decolonisation of MRSA carriers. †Hand hygiene was the single most important factor in an independent post-hoc analysis.<sup>16</sup> ‡Screening results did not return in reasonable time. §Targeted decolonisation was effective, but less effective than universal decolonisation. ¶No intervention effect on the primary outcome was noted (acquisition of both vancomycin-resistant *Enterococcus* and MRSA), whereas universal glove and gown use had a significant effect on the secondary outcome (MRSA acquisition alone). ||On clean surgerywards, the strategy was effective. \*\*Both strategies together were effective. ††The study was only randomised for the comparison of rapid screening versus conventional screening, but not for other interventions.

**Table: Evidence from controlled studies for the effects of specific interventions to control MRSA transmission and infection**

# MRSA, MRSA, MRSA

“With the tide of MRSA receding and improved treatment options for the infection, a window of opportunity now exists to reassess whether masks, gowns, gloves, single rooms, and cohort nursing add anything to hand hygiene and decolonisation, and to find a proper balance between effectiveness and harm. Recommendations and guidelines should clearly state the uncertainties in this field, and legal mandates dictating specific infection-control practices for MRSA should be abandoned.”

# Falsche Sicherheit...

Munoz-Price et al.: Randomized crossover study evaluating the effect of hand sanitizer dispenser on the frequency of hand hygiene among anesthesiology staff in the operating room.

1. Gruppe: Nur wandmontierter Spender
2. Gruppe: Wandmontierter Spender plus Spender am Narkosearbeitsplatz

Insgesamt 40 Teilnehmer/80 Operationen beobachtet

Nutzungsfrequenz: 0,5/h in G 1, 0,8/h in G 2 ( $p = 0,01$ )

# Falsche Sicherheit...

## Weitere Beobachtungen:

- 425 intravenöse Medikamentengaben: Nur 19x (4,5%)  
Desinfektion des Zuspritzportes mit Alkohol
- 121 Atemwegskontakte: 120 x Handschuhe, aber  
**kein einziges Mal** Händedesinfektion nach Ausziehen  
der Handschuhe
- 65 Kontakte mit Blut mit Handschuhen: **0 x**  
Händehygiene nach dem Ausziehen
- 13 Kontakte mit Urin mit Handschuhen: **0 x**  
Händehygiene nach dem Ausziehen



# Falsche Sicherheit...

Effect of open and closed endotracheal suctioning on cross-transmission with Gram-negative bacteria: A prospective crossover study\*

Irene P  
Ben Sp

Hypothese: Weniger Umgebungskontamination und Transmission bei geschlossener Absaugung

Objec  
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antibiotic resistance in intensive care units. Respiratory tracts of mechanically ventilated patients are frequently colonized with Gram-negative bacteria and endotracheal suctioning may facilitate cross-

and 525 with open suction systems), acquisition for selected Gram-negative bacteria was 35.5 and 32.5 per 1,000 patient-days at risk during closed suction period and open suction period,

transmiss

compared

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both systems

Setting: Two intensive care units from a university hospital and two from a teaching hospital participated in the trial between January 2007

Patient

>24 hrs

Interv

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during 6

per intensive care unit.

Measurements and Main Results: Acquisition and cross-transmission rates of selected Gram-negative bacteria were deter-

Überraschung: Weniger Umgebungskontamination aber erhöhte Transmission bei geschlossener Absaugung

cross-transmission during closed suction period 0.9 (0.4–1.9) for *P. aeruginosa*, 6.7 (1.5–30.1) for *Acinetobacter*, and 0.3 (0.03–2.7) for *Enterobacter* species. Overall cross-transmission rates were

Der Grund: Niedrigere Händehygiene compliance bei geschlossener Absaugung

KEY WORDS. suction, intensive care, mechanical ventilation, cross infection; antibiotic resistance; infection control; cross-transmission

# Das Handschuhproblem: Studienergebnisse aus dem OP

- Dreiwegehahnkontamination fand sich in 23 % der Fälle (126 von 548).
- Dabei ließen sich 14 Transmissionen von Fall zu Fall (vom ersten auf den zweiten Patienten des Tages) und 30 Transmissionen innerhalb des Falles sicher nachweisen.
- Als Risikofaktoren für eine Dreiwegehahnkontamination wurde die OP als zweiter Programmpunkt mit einer OR (=Odds-Ratio?) von 6,82 ermittelt (95 % Konfidenzintervall 4,03–11,5,  $p < 0,001$ ).
- Eine Kontamination der Hände des Patienten oder des Anästhesisten war mit dem Auftreten von postoperativen Infektionen assoziiert, und **in 30 % der 20 Infektionen mit positivem Erregernachweis war der gleiche Erreger auch in den intraoperativen Proben nachweisbar.**

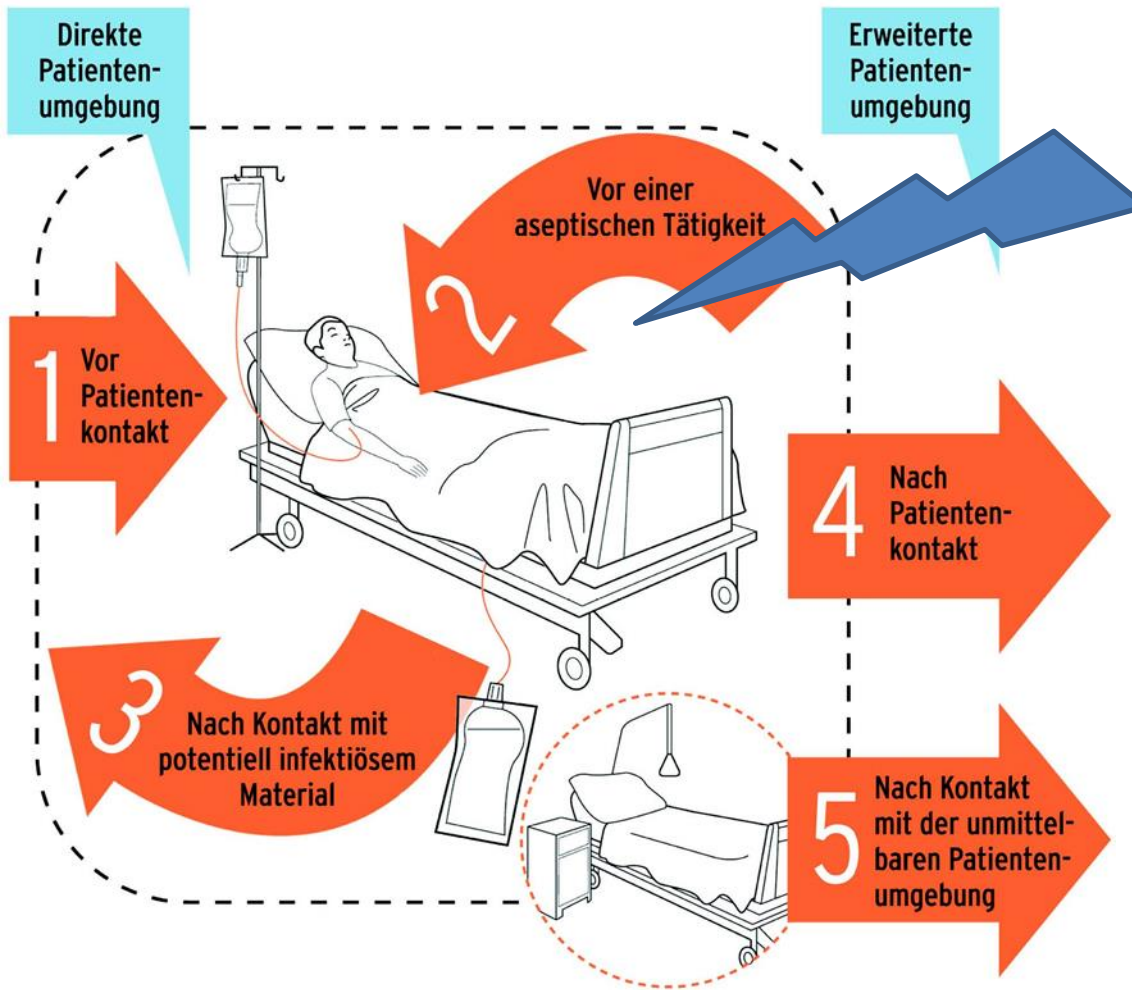
# Das Handschuhproblem: Studienergebnisse aus dem OP

- Vermehrte intraoperative Händehygiene schützte vor bakterieller Kontamination der Dreiwegehähne mit einer OR von 0,6 (95 % Konfidenzintervall 0,49–0,88,  $p=0,005$ ).
- Als Nebenparameter wurde der Handschuhgebrauch beobachtet, und es fanden sich 1.586 Handschuhverwendungen (im Durchschnitt  $2,39 \pm 1,6$  pro Patient), wobei in 40 % der Anwendungen keine adäquate Händehygiene nach Ausziehen der Handschuhe erfolgte

# Was bedeutet eigentlich Standardhygiene?

- Standardhygienemaßnahmen (auch Basishygienemaßnahmen genannt) werden bei allen Patienten unabhängig von ihrem Kolonisations- oder Infektionsstatus (diagnoseunabhängig) durchgeführt, um eine Übertragung von Erregern auf den Patienten und das Personal zu verhindern und das Risiko einer nosokomialen Weiterverbreitung von (potentiellen) Krankheitserregern zu minimieren.
- Hierzu gehören vor allem die hygienische Händedesinfektion und der situationsbedingte Einsatz von speziellen Barrieremaßnahmen sowie die sichere Injektions- und Infusionstechnik, die ordnungsgemäße Aufbereitung von Medizinprodukten, aber auch der vollständige Impfschutz des Personals.
- Konsequenterweise angewendet schützen Standardhygienemaßnahmen auch vor Übertragung bei unerkannt mit multiresistenten Erregern besiedelten Patienten.

# Händehygiene



## Infektionsschutz

# Handschuhe

- Handschuhe tragen, wenn Kontakt mit Blut oder anderen potenziell infektiösen Substanzen, Schleimhaut, nicht intakter Haut oder potenziell kontaminierter intakter Haut zu erwarten ist (z. B. bei stuhl- oder urininkontinenten Patienten).
- Passform und Strapazierfähigkeit der Handschuhe müssen an die jeweilige Tätigkeit angepasst sein, z. B. Einmal-Untersuchungshandschuhe für die direkte Patientenversorgung und begrenzte Flächendesinfektionsmaßnahmen (z. B. Arbeitsflächen vor dem Richten von Infusionen)
- Handschuhe nach Kontakt mit einem Patienten und/oder der Patientenumgebung (einschl. Medizinprodukten) unter Beachtung der richtigen Technik ausziehen, um eine Händekontamination zu vermeiden, anschließend hygienische Händedesinfektion.

# Schutzkittel

- Bei der Patientenversorgung und anderen Maßnahmen, bei denen Kontakt mit Blut, Körperflüssigkeiten, Sekreten oder Ausscheidungen zu erwarten ist, Schutzkittel tragen, um eine Verunreinigung oder Kontamination von Haut und Kleidung zu verhindern.
- Vor Verlassen der Patientenumgebung Schutzkittel ausziehen und Händehygiene durchführen.
- Schutzkittel nicht wieder verwenden (auch bei wiederholtem Kontakt mit demselben Patienten).

# Atem- und Augenschutz

- PSA zum Schutz von Augen-, Nasen- und Mundschleimhaut tragen, falls mit Verspritzung von Blut, Körperflüssigkeiten, Sekreten oder Ausscheidungen zu rechnen ist.
- Auswahl von Atemschutz (FFP-Maske), Schutzbrille, Visier je nach dem zu erwartenden Expositionsrisiko





# Wann Keimlastreduktion beim Patienten?

## Ziel festlegen:

- Kolonisationsprävention?
- Infektionsprävention?
  - Wundinfektionen?
  - Deviceassoziierte Infektionen, insbesondere CLABSI?
  - Bakteriämien allgemein



# Wann Keimlastreduktion beim Patienten?

## Ein pragmatischer Ansatz: Wundinfektionen

- vor herzchirurgischen Eingriffen und Implantation großer Fremdkörper (z.B. Hüft- oder Knie-TEP)
- Einrichtungsspezifische Risikooperationen
- Kein universelles Screening
- Mit antiseptischer Nasensalbe (z.B. Octenidin), ggf. Mupirocin (Cave: Resistenz steigt!)
- Mit antiseptischer Waschung (z.B. Octenidin, Polyhexanid, Chlorhexidin)

# Wann Keimlastreduktion beim Patienten?

Ein pragmatischer Ansatz: Deviceassoziierte Infektionen

Bei Patienten mit zu erwartendem Intensivaufenthalt von mehr als 72 Stunden:

- Initial 5 Tage Behandlung mit Octenidin-Nasensalbe
- Täglich aseptische Ganzkörperwaschung für die Dauer des Aufenthaltes
- Aseptische Mundspülung bei Beatmungspatienten (ET oder Tracheostoma) alle 4-8 Stunden

# Mikrobiologisches Monitoring

Nasen-Rachen-Abstrich, gepoolter Hautabstrich (ggf. zusätzlich gezielt Deviceeintrittsstellen und Wunden) und Rektalabstrich bzw. Stuhlprobe: Kultur auf pathogene Keime, Art der Darmflora (erfasst MRSA, VRE, MRGN)

- Bei Aufnahme
- Dienstag und Freitag

während des Intensivaufenthaltes

# Ggf. plus Keimlastreduktion im Darm

Modifizierte Darmdekontamination bei Nachweis von Überwucherungsflora (Klebsiella spp., Enterobacter spp., Citrobacter spp., Proteus mirabilis, Morganella morganii, Serratia marcescens, Acinetobacter baumannii, Pseudomonas aeruginosa) im Nasen-Rachen-Raum oder Rektalabstrich/Stuhl (critical illness–related carriage in overgrowth concentrations (CIRCO) und prophylaktisch bei Patienten mit Anastomoseninsuffizienz nach Magen-Darm-Eingriffen, bei Darmischämie, ECMO, Schwerstverbrannten und neurochirurgischen Patienten mit Barbituratsedierung. 100 mg Colistin, 80 mg Tobramycin und 500 mg Amphotericin B (bei MRSA-Nachweis im Stuhl zusätzlich 500 mg Vancomycin) oral oder über die Ernährungssonde. Pause nach 7 Tagen und mikrobiologische Kontrollen

# Das Wesentliche im Blick behalten



Wer noch nicht genug hat, ist herzlich eingeladen:

**6<sup>th</sup> nwaac**  
World Anesthesia Convention  
Networking

**2015**  
Vancouver, Canada  
April 29 - May 2



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