Klorheksidin Kullanım Alanları

Üner KAYABAŞ
İnönü Üniversitesi Tıp Fakültesi
İnfeksiyon Hastalıkları ve Klinik Mikrobiyoloji AD
Malatya

- [1,6-bis(4’-chlorophenylbiguanide)hexane]
- Divalan, katyonik, biguanid antiseptik

1950 – Keşif

1954 – İngiltere'de dezenfektan ve topikal antiseptik olarak piyasada

1970'ler – Klorheksidinli el yıkamanın cilt florasını ~ % 90 azalttığı gösterildi

1976 – Diş plaklarını inhibe edebildiği gösterildi.

1981 – İlk klorheksidinli ürolojik kayganlaştırıc ı

1988 – İlk %2 klorheksidin ve alkol kombinasyonu cilt preparasyonu olarak ABD'de piyasaya sürüldü

1992 – İlk klorheksidin bazlı vasküler katater kullanılabilir oldu (klorheksidin ve gümüş sulfadiazin emdirilmiş)

1993 – İlk klorheksidin emdirilmiş sünger pansuman piyasada

2005 – Banyo için ilk klorheksidin bez piyasada

2006 – İlk %3.15 klorheksidin ve alkol cilt preparasyonu FDA onayı

2010 – İlk klorheksidin emdirilmiş kapak piyasada

2010 – İlk klorheksidin bazlı periferik yerleştirilen santral katater antimikrobiyal olarak piyasada

2012 – Klorheksidin bazlı periferik yerleştirilen santral katater antitrombotik endikasyonla piyasada

- Geniş spektrumlu
- Deri proteinlerine çok güçlü bağlanır
  - Antimikrobiyal etkinliği ciltte 48 saat sürer
  - % 3.15 konsantrasyonda ciltte etkinlik 7 gün sürer

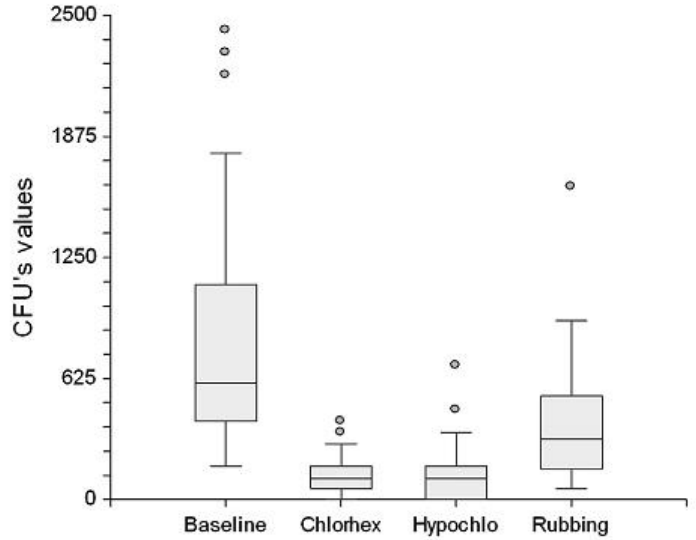


Fig 1. Whisker box plot that shows the comparative colony-forming units/square centimeters values (median, interquartile range and extreme values) for each antiseptic and control.

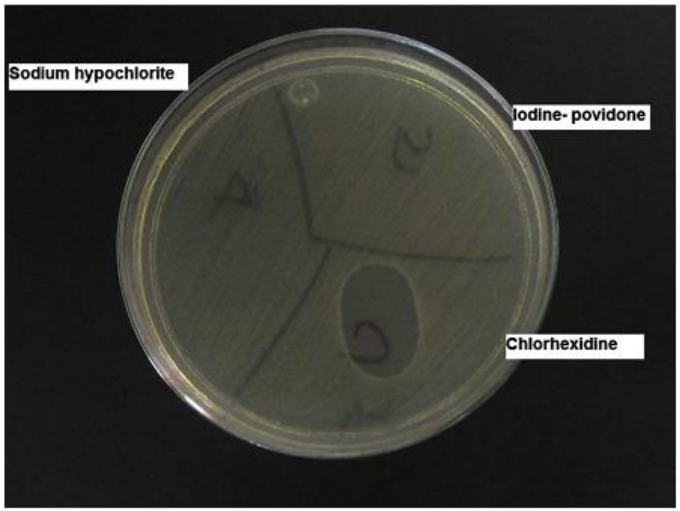


Fig 2. Agar plate in which the substantive effect can be seen. The plate was divided into 3 zones; in each one an antiseptic was tested. The volunteer placed his fingertip in the agar surface and then the agar was inoculated with *Escherichia coli* ATCC25922. Only the zone in contact with skin washed with chlorhexidine showed an inhibition zone.

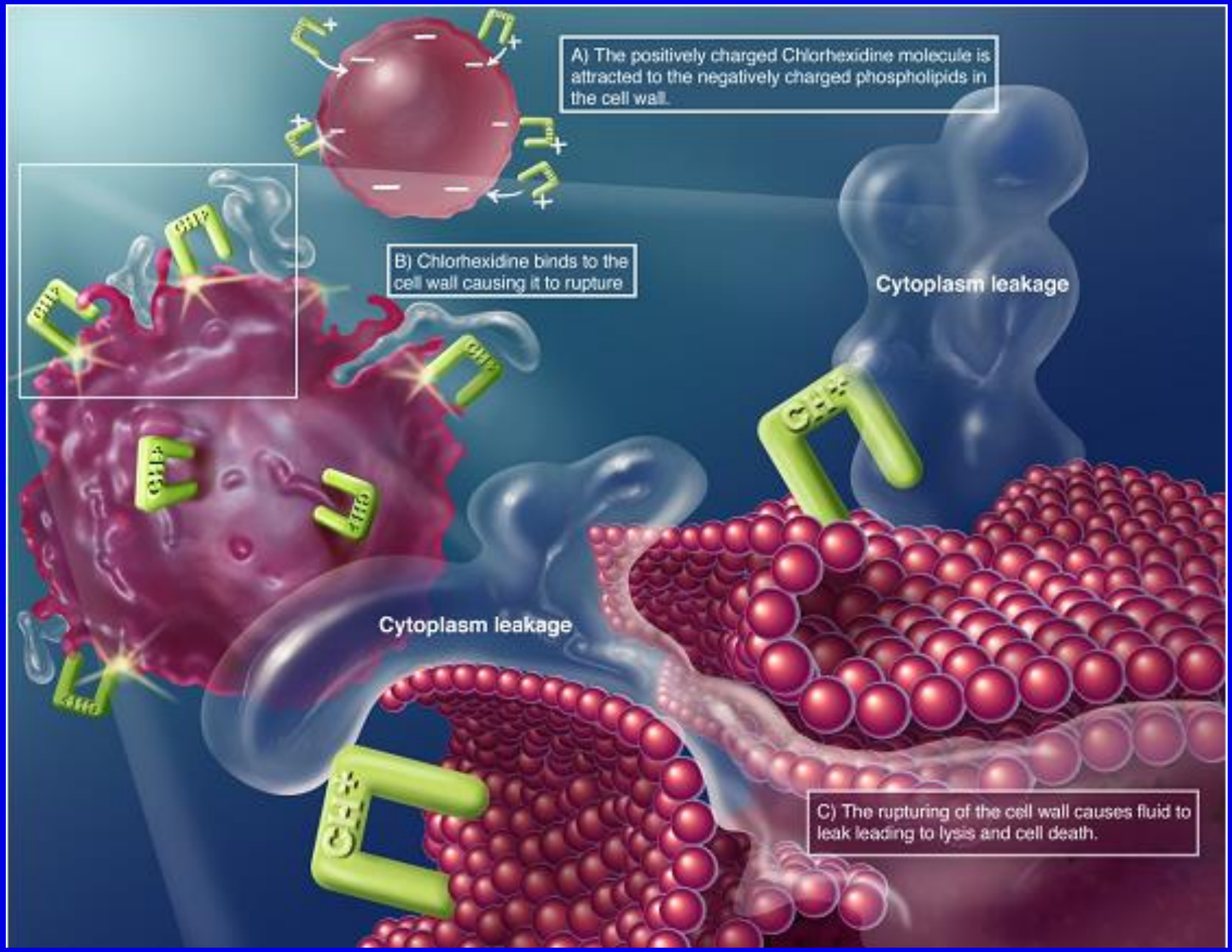
American Journal of Infection Control 41 (2013) 634-7

- Toksisitesi azdır.
- Aktivitesi pH’ya bağlı, organik madde varlığında azalır
- En yaygın olarak % 0.5–4 konsantrasyonlarda suda çözünen glukonat formu kullanılır

Etki mekanizması

- **Pasif difüzyon ile hücre duvarını veya dış zarı geçerek hücre içine girdikten sonra;**
  - **bakterilerde sitoplazma ya da iç zarı**
  - **mantarlarda plazma membranı**

  } hasar
- **Hücre bileşenleri dışarı kaçışı**
- **Yüksek konsantrasyonlarda, sitoplazma bileşenlerinde pıhtılaşma ve membran bağımlı ATPaz inhibisyonu**


A) The positively charged Chlorhexidine molecule is attracted to the negatively charged phospholipids in the cell wall.
B) Chlorhexidine binds to the cell wall causing it to rupture
Cytoplasm leakage
Cytoplasm leakage
C) The rupturing of the cell wall causes fluid to leak leading to lysis and cell death.

Etki spektrumu

- **Gram-pozitif bakterilere karşı en iyi aktivite**
- **Gram-negatif bakteriler,**
- **Anaeroblar,**
- **Mantarlar**
- **Bazı zarflı virüsler**

Etkin

- **Mikobakteriler genellikle yüksek oranda dirençli**
- **Sporlara etkinliği yok**

Chemical agent	MIC (μg/ml) for:		
	S. aureus[b]	*E. coli*	*P. aeruginosa*
Benzalkonium chloride	0.5	50	250
Benzethonium chloride	0.5	32	250
Cetrimide	4	16	64–128
Chlorhexidine	0.5–1	1	5–60
Hexachlorophene	0.5	12.5	250
Phenol	2,000	2,000	2,000
o-Phenylphenol	100	500	1,000
Propamine isethionate	2	64	256
Dibromopropamidine isethionate	1	4	32
Triclosan	0.1	5	>300

Gerald McDonnell and A. Denver Russell
Clin. Microbiol. Rev. 1999, 12(1):147.

Antimicrobial agent[b]	Lethal concn (μg/ml) toward:		
	Yeast (*Candida albicans*)	Molds	
		Penicillium chrysogenum	*Aspergillus niger*
QACs			
Benzalkonium chloride	10	100–200	100–200
Cetrimide/CTAB	25	100	250
Chlorhexidine	20–40	400	200

Gerald McDonnell and A. Denver Russell
Clin. Microbiol. Rev. 1999, 12(1):147.

Klinik Kullanım

Klinik pratikte klorheksidin kullanım alanları

Uygulama	Klorheksidin konsantrasyonu (formu)
El hijyeni Genel Operasyon öncesi	% 0.5 (el losyonu), % 4 (sıvı)
İşlem öncesi cilt dezenfeksiyonu Cerrahi öncesi Damar katateri takılması	% 2, % 70 izopropil alkolde (sıvı)
Damar katateri bakımı	% 2, % 70 izopropil alkolde (jel)
Yoğun bakım hastası banyosu	% 4 (sıvı)
MRSA dekolonizasyonu	% 1 (toz pudra), % 4 (sıvı)
Damar katateri infeksiyonlarının önlenmesi Emdirilmiş katater bölgesi örtüleri Emdirilmiş katater	% 2, % 70 izopropil alkolde (jel) 425 µg/cm
VİP önlenmesi için orofarengeal dekolonizasyon	% 0.12 ve % 2 (çalkalama), % 2 (jel)

Horner C, J Antimicrob Chemother. 2012

Advance pre-operative chlorhexidine reduces the incidence of surgical site infections in knee arthroplasty.

Zywiel MG, Daley JA, Delanois RE, Naziri Q, Johnson AJ, Mont MA.

Int Orthop. 2011 Jul;35(7):1001-6. doi: 10.1007/s00264-010-1078-5. Epub 2010 Jun 20.

Table 2 Surgical wound infection risk categorisation

	Score	
Wound class		
Clean or clean-contaminated	0	
Contaminated, dirty	1	
American Society of Anesthesiologists score		
< 3	0	
3 +	1	
Surgical cut time		
< 2 h	0	
≥ 2 h	1	
Total score	0:	Low risk
	1:	Moderate risk
	2, 3:	High risk

Advance pre-operative chlorhexidine reduces the incidence of surgical site infections in knee arthroplasty.

Zywiel MG, Daley JA, Delanois RE, Naziri Q, Johnson AJ, Mont MA.

Int Orthop. 2011 Jul;35(7):1001-6. doi: 10.1007/s00264-010-1078-5. Epub 2010 Jun 20.

Risk category	Compliance	Knees		
		Total joints operated	Number infected joints	Incidence (%)
Low	Non-compliant	256	4	1.6
	Compliant	52	0	0
Medium	Non-compliant	332	9	2.7
	Compliant	54	0	0
High	Non-compliant	123	9	7.3
	Compliant	30	0	0

Chlorhexidine-Alcohol versus Povidone-Iodine for Surgical-Site Antisepsis.

Darouiche RO, Wall MJ Jr, Itani KM, Otterson MF, Webb AL, Carrick MM, Miller HJ, Awad SS, Crosby CT, Mosier MC, Alsharif A, Berger DH.

N Engl J Med. 2010 Jan 7;362(1):18-26. doi: 10.1056/NEJMoa0810988.

Table 2. Proportion of Patients with Surgical-Site Infection, According to Type of Infection (Intention-to-Treat Population).

Type of Infection	Chlorhexidine–Alcohol (N=409)	Povidone–Iodine (N=440)	Relative Risk (95% CI)*	P Value†
	no. (%)			
Any surgical-site infection	39 (9.5)	71 (16.1)	0.59 (0.41–0.85)	0.004
Superficial incisional infection	17 (4.2)	38 (8.6)	0.48 (0.28–0.84)	0.008
Deep incisional infection	4 (1.0)	13 (3.0)	0.33 (0.11–1.01)	0.05
Organ-space infection	18 (4.4)	20 (4.5)	0.97 (0.52–1.80)	>0.99
Sepsis from surgical-site infection	11 (2.7)	19 (4.3)	0.62 (0.30–1.29)	0.26

Chlorhexidine-Alcohol versus Povidone-Iodine for Surgical-Site Antisepsis.

Darouiche RO, Wall MJ Jr, Itani KM, Otterson MF, Webb AL, Carrick MM, Miller HJ, Awad SS, Crosby CT, Mosier MC, Alsharif A, Berger DH.

N Engl J Med. 2010 Jan 7;362(1):18-26. doi: 10.1056/NEJMoa0810988.

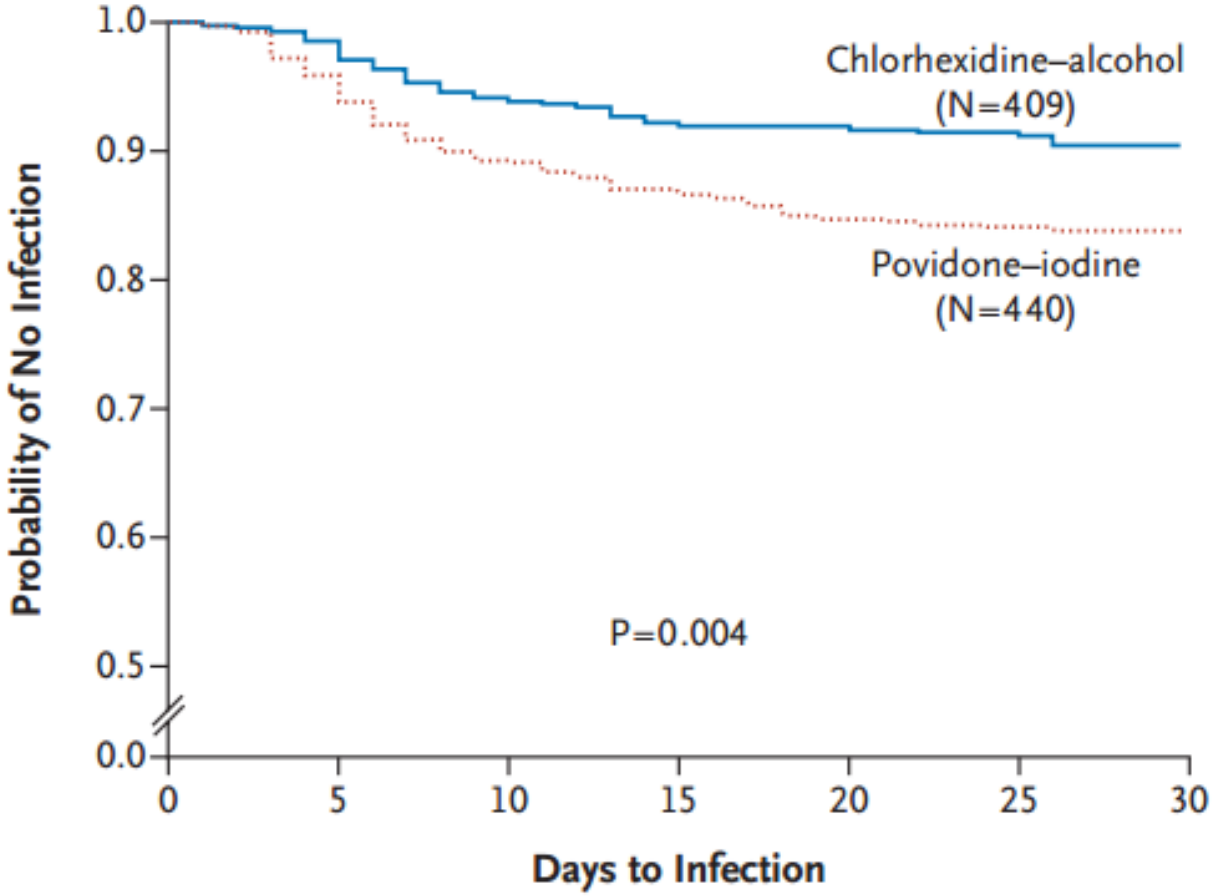


Figure 2. Kaplan–Meier Curves for Freedom from Surgical-Site Infection (Intention-to-Treat Population).

Chlorhexidine-Alcohol versus Povidone-Iodine for Surgical-Site Antisepsis.

Darouiche RO, Wall MJ Jr, Itani KM, Otterson MF, Webb AL, Carrick MM, Miller HJ, Awad SS, Crosby CT, Mosier MC, Alsharif A, Berger DH.

N Engl J Med. 2010 Jan 7;362(1):18-26. doi: 10.1056/NEJMoa0810988.

Table 4. Clinical Adverse Events (Intention-to-Treat Population).

Clinical Adverse Event	Chlorhexidine–Alcohol (N=409)	Povidone–Iodine (N=440)	Absolute Difference*	P Value†
	no. (%)		*percentage points (95% CI)*	
Adverse events in ≥5% of patients in either group	228 (55.7)	256 (58.2)	–2.4 (–9.1 to 4.2)	0.49
Drug-related adverse events‡	3 (0.7)	3 (0.7)	0.1 (–1.1 to 1.2)	>0.99
Serious adverse events in >1% of patients in either group	72 (17.6)	70 (15.9)	1.7 (–3.3 to 6.7)	0.52
Serious drug-related adverse events	0	0	—	—
Death	4 (1.0)	3 (0.7)	0.3 (–0.9 to 1.5)	0.72

Chlorhexidine reduces infections in knee arthroplasty.

Johnson AJ, Kapadia BH, Daley JA, Molina CB, Mont MA.

J Knee Surg. 2013 Jun;26(3):213-8.

Abstract

The purpose of this study was to evaluate the incidence of surgical site infections in total knee arthroplasty patients using a preadmission cutaneous skin preparation protocol compared with a cohort of patients undergoing standard in-hospital perioperative preparation only. Records between 2007 and 2010 were reviewed to identify deep incisional and periprosthetic infections among patients using the chlorhexidine protocol (478 patients) and patients who did not use the protocol (1,735 patients). Patients using the chlorhexidine cloths were given two packets of six chlorhexidine gluconate-impregnated cloths, with instructions for use, the evening before and morning of surgery. A statistically lower incidence of surgical site infection was found in patients using the chlorhexidine cloths (0.6%) compared with patients undergoing in-hospital perioperative skin preparation only (2.2%). On the basis of the results of this study, a preadmission chlorhexidine protocol seems to be an effective method to prevent surgical site infections in total knee arthroplasty procedures.

Pre-admission cutaneous chlorhexidine preparation reduces surgical site infections in total hip arthroplasty.

Kapadia BH, Johnson AJ, Daley JA, Issa K, Mont MA.

J Arthroplasty. 2013 Mar;28(3):490-3.

Abstract

The purpose of this study was to evaluate the incidence of surgical site infections in total hip arthroplasty patients who used an advance pre-admission cutaneous surgical preparation protocol and to compare these results to a cohort of patients who did not use the protocol. Between 2007 and 2010, 557 patients used the chlorhexidine cloths and 1901 patients did not use the cloths. Patient records were reviewed to determine the incidence of deep incisional and periprosthetic infections. A statistically significant lower incidence of infections occurred in patients who used the chlorhexidine cloths (0.5%) when compared to patients undergoing in-hospital perioperative skin preparation only (1.7%). These results confirm prior studies suggesting this as an effective method to prevent periprosthetic hip arthroplasty infections.

Systematic review and meta-analysis of preoperative antisepsis with chlorhexidine versus povidone-iodine in clean-contaminated surgery.

Noorani A, Rabey N, Walsh SR, Davies RJ.

Br J Surg. 2010 Nov;97(11):1614-20.

Abstract

BACKGROUND:

Surgical-site infection increases morbidity, mortality and financial burden. The preferred topical antiseptic agent (chlorhexidine or povidone-iodine) for preoperative skin cleansing is unclear.

METHODS:

A meta-analysis of clinical trials was conducted to determine whether preoperative antisepsis with chlorhexidine or povidone-iodine reduced surgical-site infection in clean-contaminated surgery.

RESULTS:

The systematic review identified **six eligible studies, containing 5031 patients. Chlorhexidine reduced postoperative surgical-site infection compared with povidone-iodine (pooled odds ratio 0.68, 95 per cent confidence interval 0.50 to 0.94; P = 0.019) .**

CONCLUSION:

Chlorhexidine should be used preferentially for preoperative antisepsis in clean-contaminated surgery.

A comparison of chlorhexidine-alcohol versus povidone-iodine for eliminating skin flora before genitourinary prosthetic surgery: a randomized controlled trial.

Yeung LL, Grewal S, Bullock A, Lai HH, Brandes SB. J Urol. 2013 Jan;189(1):136-40.

Abstract

PURPOSE:

We defined the relevant skin flora during genitourinary prosthetic surgery, evaluated the safety of chlorhexidine-alcohol for use on the male genitalia and compared chlorhexidine-alcohol to povidone-iodine in decreasing the rate of positive bacterial skin cultures at the surgical skin site before prosthetic device implantation.

MATERIALS AND METHODS:

In this single institution, **prospective, randomized, controlled study** we evaluated 100 consecutive patients undergoing initial genitourinary prosthetic implantation. Patients were randomized to a standard skin preparation with **povidone-iodine or chlorhexidine-alcohol**. Skin cultures were obtained from the surgical site before and after skin preparation.

RESULTS:

A total of 100 patients were randomized, with 50 in each arm**. Pre-preparation cultures were positive in 79% of the patients. Post-preparation cultures were positive in 8% in the chlorhexidine-alcohol group compared to 32% in the povidone-iodine group (p = 0.0091).** Coagulase-negative staphylococci were the most commonly isolated organisms in post-preparation cultures in the povidone-iodine group (13 of 16 patients) as opposed to propionibacterium in the chlorhexidine-alcohol group (3 of 4 patients). Clinical complications requiring additional operations or device removal occurred in 6 patients (6%) with no significant difference between the 2 groups. No urethral or genital skin complications occurred in either group.

CONCLUSIONS:

Chlorhexidine-alcohol was superior to povidone-iodine in eradicating skin flora at the surgical skin site before genitourinary prosthetic implantation. There does not appear to be any increased risk of urethral or genital skin irritation with the use of chlorhexidine compared to povidone-iodine. Chlorhexidine-alcohol appears to be the optimal agent for skin preparation before genitourinary prosthetic procedures.

Preoperative chlorhexidine shower or bath for prevention of surgical site infection: A meta-analysis

Maciej Piotr Chlebicki MD [a], Nasia Safdar MD, PhD [b,c,d,*], John Charles O'Horo MD [e], Dennis G. Maki MD [b,c]

American Journal of Infection Control 41 (2013) 167-73

Background: Chlorhexidine showering is frequently recommended as an important preoperative measure to prevent surgical site infection (SSI). However, the efficacy of this approach is uncertain.

Methods: A search of electronic databases was undertaken to identify prospective controlled trials evaluating whole-body preoperative bathing with chlorhexidine versus placebo or no bath for prevention of SSI. Summary risk ratios were calculated using a DerSimonian-Laird random effects model and a Mantel-Haenzel dichotomous effects model.

Results: Sixteen trials met inclusion criteria with a total of 17,932 patients: 7,952 patients received a chlorhexidine bath, and 9,980 patients were allocated to various comparator groups. Overall, 6.8% of patients developed SSI in the chlorhexidine group compared with 7.2% of patients in the comparator groups. Chlorhexidine bathing did not significantly reduce overall incidence of SSI when compared with soap, placebo, or no shower or bath (relative risk, 0.90; 95% confidence interval: 0.77-1.05, $P = .19$).

Conclusions: Meta-analysis of available clinical trials suggests no appreciable benefit of preoperative whole-body chlorhexidine bathing for prevention of SSI. However, most studies omitted details of chlorhexidine application. Better designed trials with a specified duration and frequency of exposure to chlorhexidine are needed to determine whether preoperative whole-body chlorhexidine bathing reduces SSI.

Clinical Practice Guideline:
Prevention of Blood Culture Contamination
Full Version

9. Use alcoholic chlorhexidine to clean the skin before drawing blood cultures in patients over 2 months of age. **Level A – High** (Baron, 2005; Benjamin, 2011; Caldeira, 2011; CLSI, 2007; Madeo, 2008; Marlowe, 2010; Mermel, 2009; Tepus, 2008)
10. Use alcohol to clean the skin before drawing blood cultures in children under 2 months of age. **Level C – Weak**. (CLSI, 2007)

Blood Culture Contamination: A Randomized Trial Evaluating the Comparative Effectiveness of 3 Skin Antiseptic Interventions

Author(s): Laraine L. Washer, MD; Carol Chenoweth, MD; Hae-Won Kim, MD; Mary A. M. Rogers, PhD, MS; Anurag N. Malani, MD; James Riddell IV, MD; Latoya Kuhn, MPH; Bernard Noeyack Jr, BS; Harry Neusius, MS; Duane W. Newton, PhD; Sanjay Saint, MD, MPH; Scott A. Flanders, MD

Source: *Infection Control and Hospital Epidemiology*, Vol. 34, No. 1 (January 2013), pp. 15-21

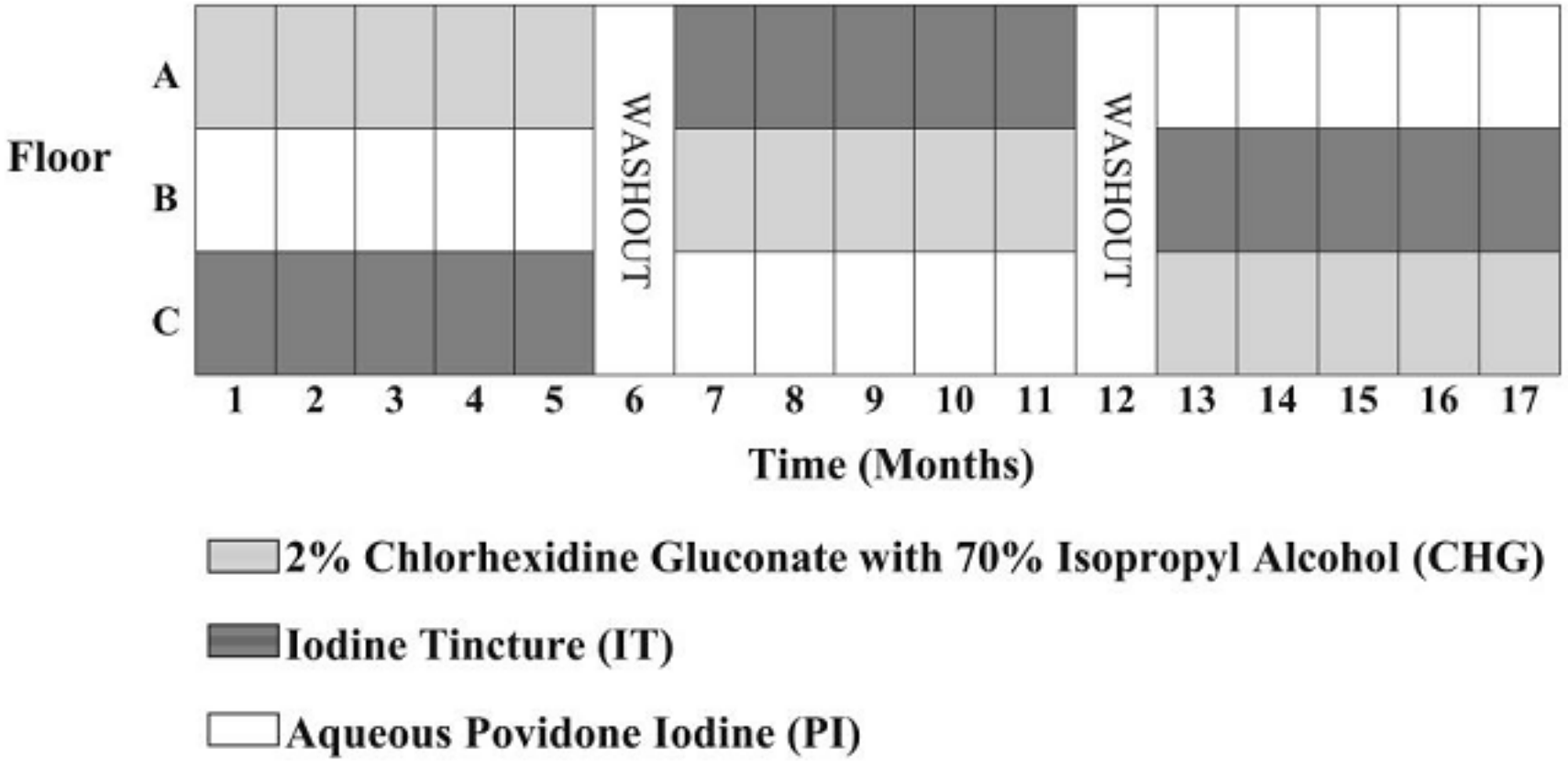


FIGURE 1. Study design: skin antisepsis intervention time line.

Blood Culture Contamination: A Randomized Trial Evaluating the Comparative Effectiveness of 3 Skin Antiseptic Interventions

Author(s): Laraine L. Washer, MD; Carol Chenoweth, MD; Hae-Won Kim, MD; Mary A. M. Rogers, PhD, MS; Anurag N. Malani, MD; James Riddell IV, MD; Latoya Kuhn, MPH; Bernard Noeyack Jr, BS; Harry Neusius, MS; Duane W. Newton, PhD; Sanjay Saint, MD, MPH; Scott A. Flanders, MD

Source: *Infection Control and Hospital Epidemiology*, Vol. 34, No. 1 (January 2013), pp. 15-21

TABLE 2. Microorganisms Isolated from Contaminated Blood Cultures by Antiseptic Agent

Microorganism	Contaminated blood cultures, no. (%)			
	Chlorhexidine gluconate (n = 41)	Povidone iodine (n = 25)	Iodine tincture (n = 32)	Total (n = 98)
Coagulase-negative *Staphylococcus*	31 (75.6)	17 (68.0)	26 (81.2)	74 (75.5)[a]
Micrococcus species	5 (12.2)	3 (12.0)	1 (3.1)	9 (9.2)
Bacillus species	3 (7.3)	2 (8.0)	1 (3.1)	6 (6.1)
Aerobic gram-positive bacilli	1 (2.4)	2 (8.0)	3 (9.4)	6 (6.1)
Streptococci	0 (0)	1 (4.0)	0 (0)	1 (1.0)
Bacteroides species	0 (0)	0 (0)	1 (1.3)	1 (1.0)
Polymicrobial	1 (2.4)	0 (0)	0 (0)	1 (1.0)

[a] For the difference in coagulase-negative *Staphylococcus* organisms across agents, P = .514.

Blood Culture Contamination: A Randomized Trial Evaluating the Comparative Effectiveness of 3 Skin Antiseptic Interventions

Author(s): Laraine L. Washer, MD; Carol Chenoweth, MD; Hae-Won Kim, MD; Mary A. M. Rogers, PhD, MS; Anurag N. Malani, MD; James Riddell IV, MD; Latoya Kuhn, MPH; Bernard Noeyack Jr, BS; Harry Neusius, MS; Duane W. Newton, PhD; Sanjay Saint, MD, MPH; Scott A. Flanders, MD

Source: *Infection Control and Hospital Epidemiology*, Vol. 34, No. 1 (January 2013), pp. 15-21

TABLE 3. Contamination Rates by Type of Antiseptic

Antiseptic	Total no.	Contamination rate, % (95% CI)	*P* value	
			Unadjusted	Adjusted[a]
Povidone iodine	4,286	0.58 (0.38–0.86)	.191	.178
Iodine tincture	4,230	0.76 (0.52–1.07)		
Chlorhexidine gluconate	4,388	0.93 (0.67–1.27)		

NOTE. CI, confidence interval.

[a] For age and race.

Blood Culture Contamination: A Randomized Trial Evaluating the Comparative Effectiveness of 3 Skin Antiseptic Interventions

Author(s): Laraine L. Washer, MD; Carol Chenoweth, MD; Hae-Won Kim, MD; Mary A. M. Rogers, PhD, MS; Anurag N. Malani, MD; James Riddell IV, MD; Latoya Kuhn, MPH; Bernard Noeyack Jr, BS; Harry Neusius, MS; Duane W. Newton, PhD; Sanjay Saint, MD, MPH; Scott A. Flanders, MD

Source: *Infection Control and Hospital Epidemiology*, Vol. 34, No. 1 (January 2013), pp. 15-21

TABLE 4. Adherence to Protocol on the Basis of 118 Phlebotomy Technique Audits

Appropriate technique	No. (%)
Hand hygiene	93 (78.8)
Wearing gloves before prep	115 (97.5)
Correct agent	112 (94.9)
Correct application	96 (81.4)
Correct drying time	100 (84.8)
Cleansed septa	111 (94.1)

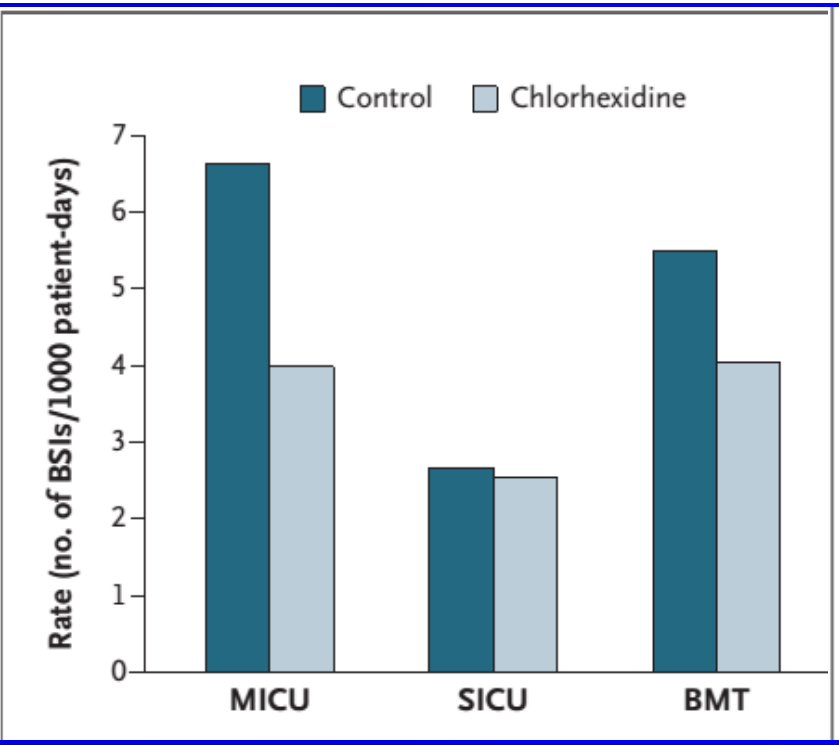
The NEW ENGLAND JOURNAL of MEDICINE

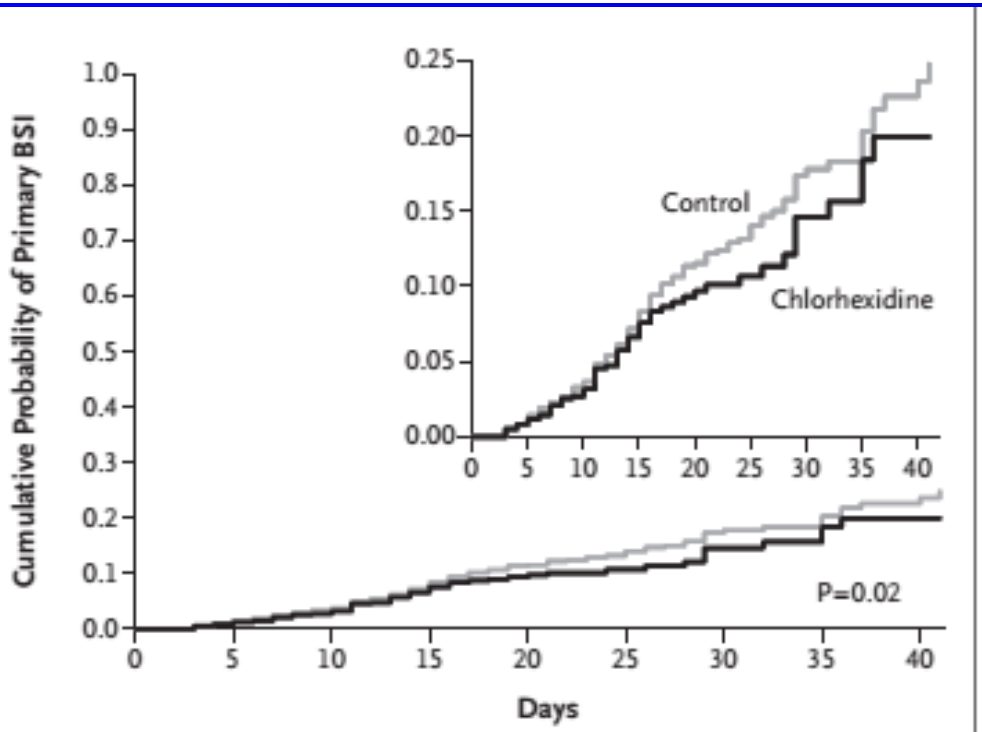
ORIGINAL ARTICLE

Effect of Daily Chlorhexidine Bathing on Hospital-Acquired Infection

Michael W. Climo, M.D., Deborah S. Yokoe, M.D., M.P.H., David K. Warren, M.D., Trish M. Perl, M.D., Maureen Bolon, M.D., Loreen A. Herwaldt, M.D., Robert A. Weinstein, M.D., Kent A. Sepkowitz, M.D., John A. Jernigan, M.D., Kakotan Sanogo, M.S., and Edward S. Wong, M.D.

N Engl J Med 2013;368:533-42.





Effectiveness of Routine Patient Cleansing with Chlorhexidine Gluconate for Infection Prevention in the Medical Intensive Care Unit

Kyle J. Popovich, MD; Bala Hota, MD, MPH; Robert Hayes, BA; Robert A. Weinstein, MD; Mary K. Hayden, MD

INFECTION CONTROL AND HOSPITAL EPIDEMIOLOGY OCTOBER 2009, VOL. 30, NO. 10

TABLE 1. Comparison of Nosocomial Infection Rates in the Medical Intensive Care Unit during 2 Study Periods

	Soap-and-water period		Chlorhexidine gluconate period		
Type of infection or culture	No. of cases	Rate	No. of cases	Rate	*P*
CVC-associated BSI	19	5.31[a]	2	0.69[a]	.006
Contaminated blood culture	47	6.99	23	4.1	.04
Secondary BSI	3	0.45	4	0.71	.48
CDI	6	0.89	2	0.36	.26
VAP	13	5.55[b]	10	6.33[b]	.76
UTI	20	2.97	13	2.32	.78
Clinical culture with drug-resistant bacteria					
Imi-res *A. baumannii*	7	1.04	2	0.36	.18
MRSA	11	1.63	8	1.43	.77
VRE	6	0.89	3	0.53	.47
Total	24	3.57	13	2.32	.21

Chlorhexidine body washing to control antimicrobial-resistant bacteria in intensive care units: a systematic review

Lennie P. G. Derde
Mirjam J. D. Dautzenberg
Marc J. M. Bonten

Study	Patients included (*n*)	Duration (months)	Infection	Colonization
Batra [13]	4,570	51		70 % reduction in acquisition of endemic MRSA strains (rate ratio 0.3), but increased acquisition (rate ratio 3.85) with an outbreak MRSA strain
Bleasdale [10]	836	12	61 % incidence reduction in all-cause primary BSIs; rate difference 6.3/1,000 ptdays 16.8 versus 6.4 BSIs per 1,000 central line-days ($p = 0.01$) No significant reduction in all-cause UTI, VAP, and secondary BSIs	
Camus [14]	256	30	No significant reduction in all-cause ICU-acquired infections ($p = 0.919$)[a] No significant reduction in all-cause total infections[a] No significant reduction in all-cause device-related infections[b]	
Climo [15]	5,043	12	No reduction in MRSA bacteremia[c] 78 % reduction in ICU acquired VRE bacteremias (−2.64 per 1,000 ptdays)[c]	25 % reduction in acquisition of MRSA colonization (−0.66 per 1,000 ptdays)[c] 45 % reduction in acquisition of VRE colonization (−1.51 per 1,000 ptdays)[c]
Gould [16]	2,653	48	No significant reduction in MRSA or MSSA bacteremia	11.4 decrease ($p = 0.005$) in proportion of patients with MRSA (colonization or infection)
Popovich [17]	3,048	24	No significant reduction in ICU-acquired all-cause CLABSIs ($p = 0.57$) Significant decrease in incidence rate of MRSA clinical cultures (0.68 versus 1.03 per 1,000 ptdays, $p = 0.49$) No significant reduction in ICU-acquired other infections (all p values >0.18)	
Raineri [18]	3,978	120	Decrease of MRSA infection rate from 3.5 to 1.7 per 1,000 ptdays ($p = 0.0023$) No significant difference in MRSA-VAP Decrease in MRSA-BSI incidence rate from 1.65 to 0.29 cases per 1,000 ptdays ($p = 0.02$)	

Intensive Care Med (2012) 38:931–939

Catheter-related Bloodstream Infections

Cybele L. Abad, MD

Section of Infectious Diseases
University of Wisconsin
Madison, Wisconsin

Nasia Safdar, MD, PhD

Assistant Professor
Section of Infectious Diseases
Department of Medicine
University of Wisconsin
Madison, Wisconsin

Strategy	Study	Design	Technology	Outcome
Antimicrobial lock solution	Safdar et al, 2006[51]	Meta-analysis	Vancomycin-containing locks vs heparin	50% risk reduction (RR, 0.49; 95% CI, 0.26-0.95)
	Yahav et al, 2008[54]	Systematic review and meta-analysis	Various antibiotics[a] Antibiotic plus antiseptic[b] Antiseptic[c]	**Antibiotic solutions:** RR, 0.44; 95% CI, 0.38-0.5 **Non-antibiotic antiseptic solutions + other prevention methods[d]:** RR, 0.25; 95% CI, 0.13-0.5 **Non-antibiotic antiseptic solutions alone:** RR, 0.9; 95% CI, 0.48-1.69
	Sanders et al, 2008[84]	Double-blind randomized trial	Ethanol-containing locks vs heparin	OR, 0.18; 95% CI, 0.05-0.65

Strategy	Study	Design	Technology	Outcome
Antimicrobial catheters	Veenstra et al, 1999[53]	Meta-analysis	Antiseptic-impregnated CVCs[e]	OR, 0.56; 95% CI, 0.37-0.84
	Ramritu et al, 2008[50]	Systematic review	Antibiotic-impregnated CVCs[f]	RR, 0.39; 95% CI, 0.17-0.92
	Crnich et al, 2002[5]	Meta-analysis	Silver-impregnated CVCs	RR, 0.40; 95% CI, 0.24-0.68
	Ramritu et al, 2008[50]	Systematic review	Antibiotic vs first-generation antiseptic-impregnated CVCs	RR, 0.12; 95% CI, 0.02-0.67[g]
	Hockenhull et al, 2009[81]	Systematic review	Anti-infective CVCs (all types)	OR, 0.49; 95% CI, 0.37-0.64[h]

Strategy	Study	Design	Technology	Outcome
Chlorhexidine dressings	Ho et al, 2006[48]	Meta-analysis	Chlorhexidine-impregnated dressing vs placebo or povidone-iodine dressing	**Catheter or exit-site colonization:** 14.3% vs 27.2%; OR, 0.4; 95% CI, 0.26-0.61 **CRBSIs:** 2.2% vs 3.8%; OR, 0.58; 95% CI, 0.29-1.14; *P*=0.11
	Timsit et al, 2009[80]	Randomized controlled trial	Chlorhexidine-impregnated dressing vs standard dressing	0.4 vs 1.3 CRBSIs per 1,000 catheter days; HR, 0.024; 95% CI, 0.09-0.65; *P*=0.005
Cutaneous antisepsis	Chaiyaku-napruk et al, 2002[47]	Meta-analysis	Chlorhexidine vs povidone-iodine	RR, 0.49; 95% CI, 0.28-0.88[i]
Mupirocin prophylaxis	Tacconelli et al, 2003[52]	Meta-analysis	Mupirocin prophylaxis in dialysis patients[j]	Decrease in *S. aureus* bacteremia in hemodialysis patients by 78%; RR, 0.22; 95% CI, 0.11-0.42
Chlorhex-idine bathing	Silva et al, 2010[90]	Meta-analysis	Daily chlorhexidine bathing (impregnated cloths or solution) compared with soap and water baths	Decrease in risk for bloodstream infection (RR, 0.32; 95% CI, 0.22-0.46; *P*<0.0001, fixed-effects; I^2=17%)

ESPEN Guidelines on Parenteral Nutrition: Central Venous Catheters (access, care, diagnosis and therapy of complications)

Mauro Pittiruti [a], Helen Hamilton [b], Roberto Biffi [c], John MacFie [d], Marek Pertkiewicz [e]

Clinical Nutrition 28 (2009) 365–377

- Using tunneled and implanted catheters (value only confirmed in long-term use)
- Using antimicrobial coated catheters (value only shown in short-term use)
- Using single-lumen catheters
- Using peripheral access (PICC) when possible
- Appropriate choice of the insertion site
- Ultrasound-guided venepuncture
- Use of maximal barrier precautions during insertion
- Proper education and specific training of the staff
- An adequate policy of hand washing
- Use of 2% chlorhexidine as skin antiseptic
- Appropriate dressing of the exit site
- Disinfection of hubs, stopcocks and needle-free connectors
- Regular change of administration sets

Chlorhexidine Bathing to Reduce Central Venous Catheter-associated Bloodstream Infection: Impact and Sustainability

Marisa A. Montecalvo, MD,[a,b] Donna McKenna, MS,[a,b] Robert Yarrish, MD,[c] Lynda Mack, MSN,[a] George Maguire, MD,[d] Janet Haas, DNSc,[a,b] Lawrence DeLorenzo, MD,[d] Norine Dellarocco, MSN,[e] Barbara Savatteri, RN,[f] Addie Rosenthal, MS,[g] Anita Watson, RN,[h] Debra Spicehandler, MD,[g] Qiuhu Shi, PhD,[i] Paul Visintainer, PhD,[j] Gary P. Wormser, MD,[b]

The American Journal of Medicine (2012) 125, 505-511

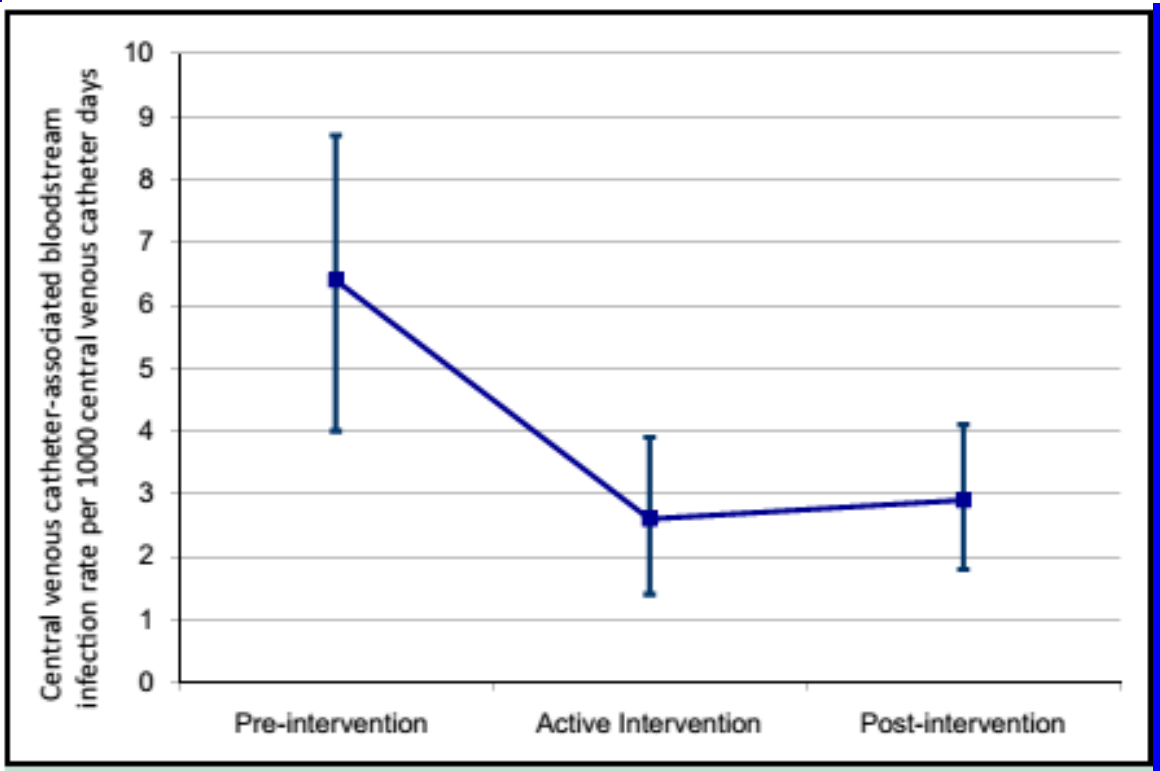


Figure 1 Adjusted rates of central venous catheter-associated bloodstream infection with limits of the 95% CI range for each point estimate.

Table 3 Microorganisms Isolated in Blood Cultures from Patients with Central Venous Catheter-associated Bloodstream Infection During the Pre-Intervention and Active Intervention Periods of the Study

	Central Venous Catheter-associated Bloodstream Infection	
Microorganism	Pre-Intervention	Active Intervention Chlorhexidine Bathing
Gram-positive bacteria	21	15
Coagulase negative *Staphylococci*	7	2
Staphylococcus aureus (No. = methicillin resistant)	3 (3)	4 (1)
Enterococcus spp. (No. = vancomycin-resistant)	10 (5)	9 (6)
Streptococcus viridians	1	0
Gram-negative bacteria	21	6
Klebsiella spp. (No. = extended spectrum beta-lactamase producer or resistant to multiple antibiotics)	14 (6)	5 (2)
Acinetobacter spp.	0	0
Enterobacter spp., *Escherichia coli, Proteus* spp.	3	1
Pseudomonas spp.	4	0
Candida spp.	11	7
Infections with > 1 microorganism isolated	7	2

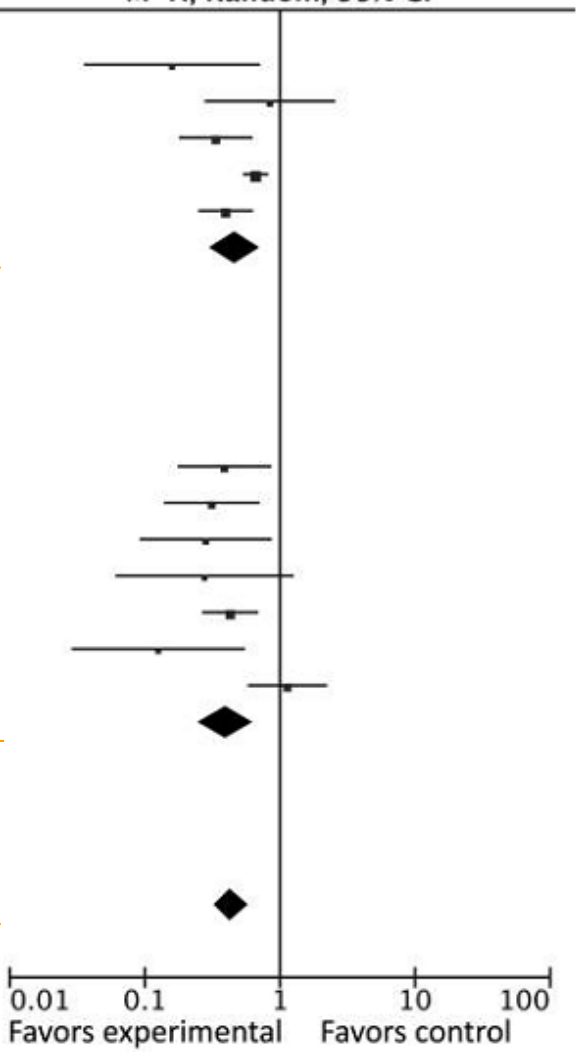
The Efficacy of Daily Bathing with Chlorhexidine for Reducing Healthcare-Associated Bloodstream Infections: A Meta-analysis

Author(s): John C. O'Horo, Germana L. M. Silva, L. Silvia Munoz-Price, Nasia Safdar

Reviewed work(s):

Source: *Infection Control and Hospital Epidemiology*, Vol. 33, No. 3 (March 2012), pp. 257-267

Study or Subgroup	Experimental Events	Experimental Total	Control Events	Control Total	Weight	Odds Ratio M-H, Random, 95% CI
1.2.1 CHG Bathing						
Borer et al, 2007	2	1600	15	1923	3.3%	0.16 [0.04, 0.70]
Camus et al, 2005	6	1991	7	1961	5.3%	0.84 [0.28, 2.52]
Climo et al, 2009	14	15472	41	15225	10.5%	0.34 [0.18, 0.62]
Gould et al, 2007	171	6664	264	6899	17.1%	0.66 [0.54, 0.80]
Munoz-Price et al, 2009	29	7632	59	6210	13.1%	0.40 [0.25, 0.62]
Subtotal (95% CI)		**33359**		**32218**	**49.3%**	**0.47 [0.31, 0.71]**
Total events	222		386			
Heterogeneity: $Tau^2 = 0.12$; $Chi^2 = 11.07$, df = 4 (P = 0.03); $I^2 = 64\%$						
Test for overall effect: Z = 3.53 (P = 0.0004)						
1.2.2 CHG Impregnated Cloths						
Bleasedale et al, 2007	9	2210	22	2119	8.2%	0.39 [0.18, 0.85]
Dixon and Carver, 2010	8	3148	27	3346	8.0%	0.31 [0.14, 0.69]
Evans et al, 2010	4	1785	15	1904	5.2%	0.28 [0.09, 0.85]
Holder and Zellinger, 2009	2	2000	12	3333	3.3%	0.28 [0.06, 1.24]
Montecalvo et al, 2010	27	13864	57	12603	12.8%	0.43 [0.27, 0.68]
Popovich et al, 2009	2	5610	19	6728	3.4%	0.13 [0.03, 0.54]
Popovich et al, 2010	17	5799	19	7366	9.8%	1.14 [0.59, 2.19]
Subtotal (95% CI)		**34416**		**37399**	**50.7%**	**0.41 [0.25, 0.65]**
Total events	69		171			
Heterogeneity: $Tau^2 = 0.19$; $Chi^2 = 12.80$, df = 6 (P = 0.05); $I^2 = 53\%$						
Test for overall effect: Z = 3.78 (P = 0.0002)						
Total (95% CI)		**67775**		**69617**	**100.0%**	**0.44 [0.33, 0.59]**
Total events	291		557			
Heterogeneity: $Tau^2 = 0.13$; $Chi^2 = 26.12$, df = 11 (P = 0.006); $I^2 = 58\%$						
Test for overall effect: Z = 5.39 (P < 0.00001)						
Test for subgroup differences: $Chi^2 = 0.19$, df = 1 (P = 0.66), $I^2 = 0\%$						

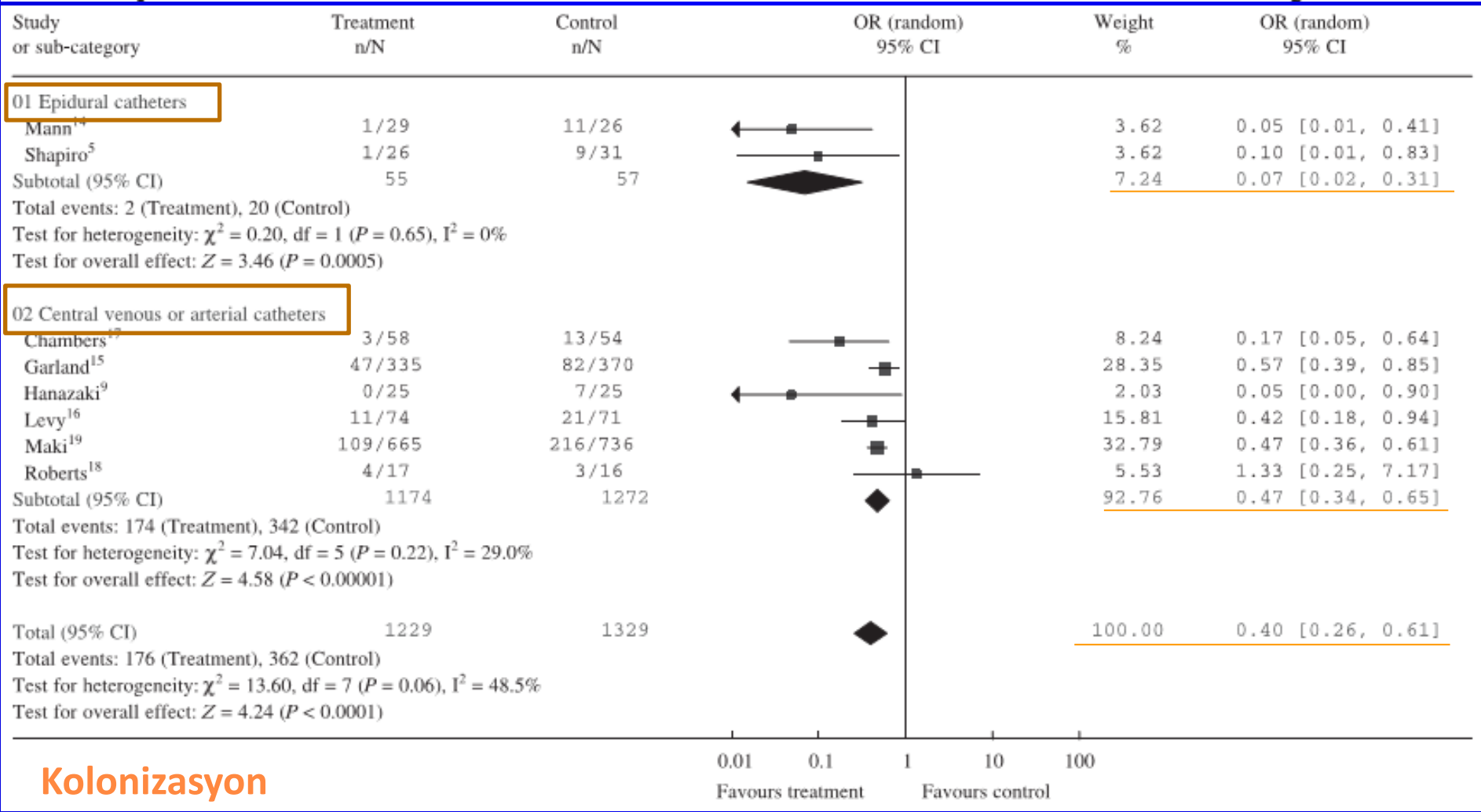


Journal of Antimicrobial Chemotherapy (2006) **58**, 281–287
doi:10.1093/jac/dkl234
Advance Access publication 6 June 2006

JAC

Kwok M. Ho* and Edward Litton

Use of chlorhexidine-impregnated dressing to prevent vascular and epidural catheter colonization and infection: a meta-analysis

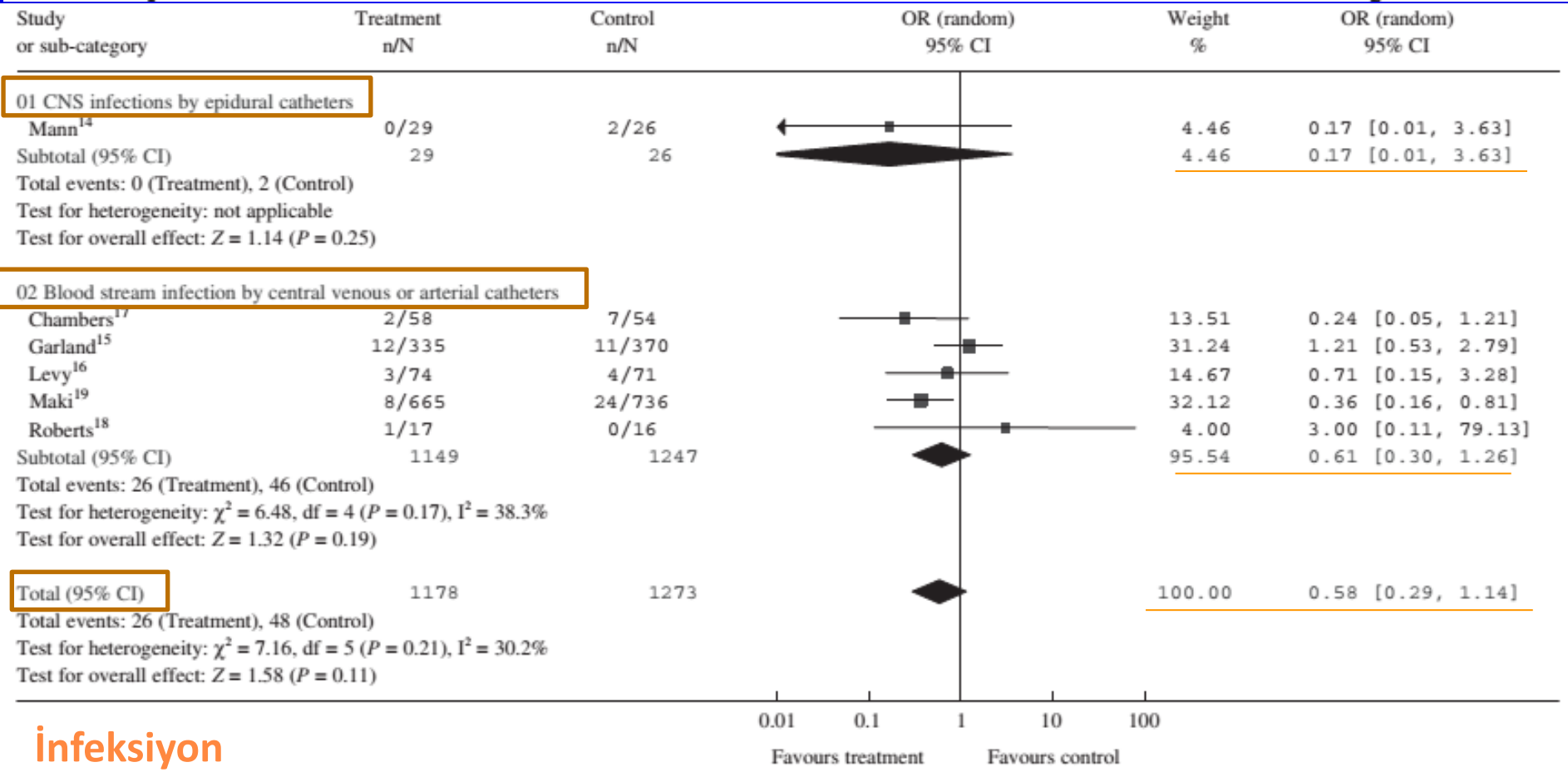


Kolonizasyon

Journal of Antimicrobial Chemotherapy (2006) **58**, 281–287
doi:10.1093/jac/dkl234
Advance Access publication 6 June 2006

JAC

Use of chlorhexidine-impregnated dressing to prevent vascular and epidural catheter colonization and infection: a meta-analysis



İnfeksiyon

CHLORHEXIDINE, TOOTH BRUSHING, AND PREVENTING VENTILATOR ASSOCIATED PNEUMONIA IN CRITICALLY ILL ADULTS Cindy L. Munro, Mary Jo Grap, Deborah J. Jones, Donna K. McClish, Curtis N. Sessler

AMERICAN JOURNAL OF CRITICAL CARE, September 2009, Volume 18, No. 5

Comparison of baseline and day 3 outcomes by treatment

Outcomes	All patients (n = 192)			Patients without pneumonia at baseline (n = 87)		
	Day 1	Day 3	*P*[a]	Day 1	Day 3	*P*[b]
Clinical Pulmonary Infection Score, mean (SD)						
Chlorhexidine			.29			.02[c]
Yes	5.36 (2.17)	5.26 (2.44)		3.56 (1.29)	4.36 (2.11)	
No	5.70 (2.35)	5.78 (2.20)		3.36 (1.16)	5.36 (2.08)	
Toothbrushing			.95			.30
Yes	5.66 (2.38)	5.58 (2.34)		3.49 (1.30)	5.02 (2.28)	
No	5.41 (2.16)	5.48 (2.33)		3.43 (1.17)	4.66 (2.01)	
Pneumonia, %						
Chlorhexidine			.13			.006[c]
Yes	51.1	41.3		—[d]	24	
No	58.0	55.0		—	52	
Toothbrushing			.86			.54
Yes	55.7	49.5		—	40	
No	53.7	47.4		—	36	

Comparison of baseline and day 5 outcomes by treatment

Outcomes	All patients (n = 116)		P^a	Patients without pneumonia at baseline (n = 51)		P^b
	Day 1	Day 5		Day 1	Day 5	
Clinical Pulmonary Infection Score, mean (SD)						
Chlorhexidine			.48			.94
Yes	5.32 (2.32)	5.71 (2.39)		3.33 (1.36)	5.26 (2.21)	
No	5.65 (2.26)	5.72 (2.49)		3.33 (1.27)	5.25 (2.21)	
Toothbrushing			.37			.84
Yes	5.63 (2.37)	5.52 (2.22)		3.43 (1.44)	5.35 (2.21)	
No	5.37 (2.22)	5.89 (2.61)		3.25 (1.20)	5.18 (2.21)	
Pneumonia, %						
Chlorhexidine			.24			.84
Yes	51.8	53.6		—[c]	44	
No	60.0	48.3		—	42	
Toothbrushing			.27			.23
Yes	57.4	55.6		—	52	
No	54.8	46.8		—	36	

Comparison of baseline and day 7 outcomes by treatment

Outcomes	All patients (n = 76)		P^a	Patients without pneumonia at baseline (n = 37)		P^b
	Day 1	Day 7		Day 1	Day 7	
Clinical Pulmonary Infection Score, mean (SD)						
Chlorhexidine			.35			.59
Yes	5.11 (2.49)	5.36 (2.29)		3.21 (1.58)	4.89 (2.69)	
No	5.70 (2.14)	6.15 (2.33)		3.78 (1.00)	5.33 (1.78)	
Toothbrushing			.77			.87
Yes	5.59 (2.46)	5.85 (2.18)		3.56 (1.41)	5.12 (2.09)	
No	5.29 (2.21)	5.71 (2.46)		3.43 (1.33)	5.10 (2.45)	
Pneumonia, %						
Chlorhexidine			.46			.52
Yes	47	53		—	53	
No	55	50		—	33	
Toothbrushing			.21			.25
Yes	53	59		—	56	
No	50	45		—	33	

Topical application of chlorhexidine to neonatal umbilical cords for prevention of omphalitis and neonatal mortality in a rural district of Pakistan: a community-based, cluster-randomised trial

Sajid Soofi, Simon Cousens, Aamer Imdad, Naveed Bhutto, Nabeela Ali, Zulfiqar A Bhutta

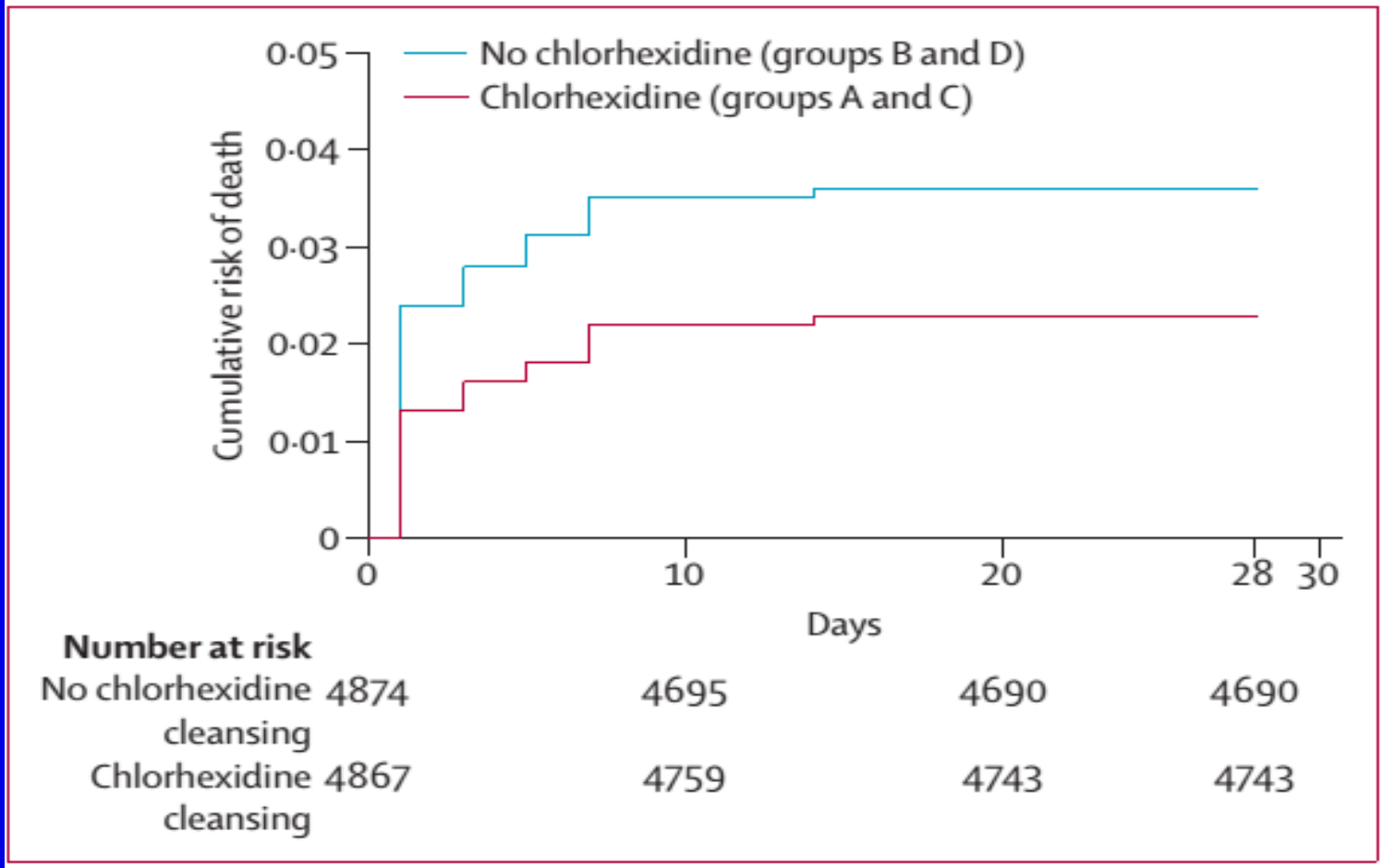


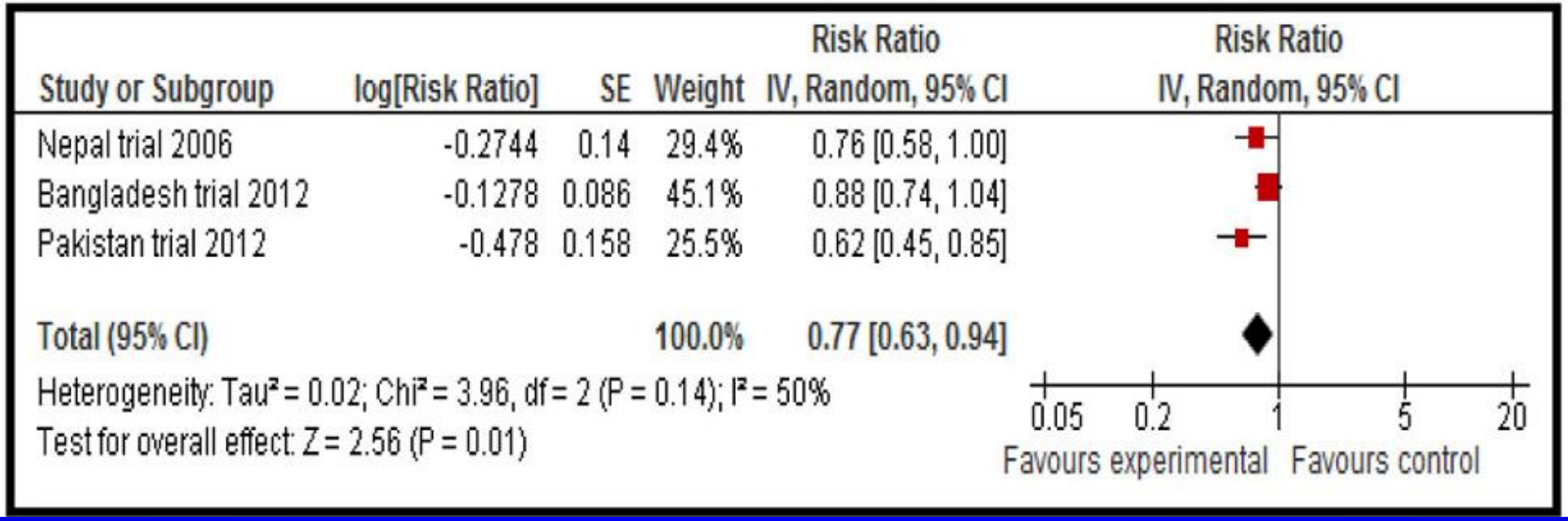
Figure 2: **Cumulative risk of neonatal mortality**

Lancet 2012; 379: 1029–36

The effect of umbilical cord cleansing with chlorhexidine on omphalitis and neonatal mortality in community settings in developing countries: a meta-analysis

Aamer Imdad[1], Luke C Mullany[2], Abdullah H Baqui[2,3], Shams El Arifeen[3], James M Tielsch[2], Subarna K Khatry[2,4], Rasheduzzaman Shah[2], Simon Cousens[5], Robert E Black[2], Zulfiqar A Bhutta[1*]

Imdad *et al. BMC Public Health* 2013, **13**(Suppl 3):S15



Hospital-acquired infections and thermally injured patients: Chlorhexidine gluconate baths work

Janet A. Popp MSN(c), RN [a], A. Joseph Layon MD [b,*], Robert Nappo DNP(c), ARNP [a], Winston T. Richards MD [c], David W. Mozingo MD [c]

American Journal of Infection Control 42 (2014) 129-32

Background: Thermally injured patients are at high risk for infections, including hospital acquired infections (HAIs). We modeled a twice-daily chlorhexidine gluconate (CHG) bath protocol aimed at decreasing HAIs.

Methods: Bathing with a 0.9% CHG solution in sterile water was provided twice daily as part of routine care. Institutional HAI prevention bundles were in place and did not change during the study. Baseline HAI rates were collected for 12 months before the quality study implementation. Centers for Disease Control and Prevention definitions for HAIs were used; our blinded Infection Control physician made each determination. This was an Institutional Review Board–exempt protocol.

Results: The study cohort included 203 patients before the quality trial and 277 patients after the quality trial. The median burn area was 25% of total body surface area. Baseline HAI rates were as follows: ventilator-associated pneumonia, 2.2 cases/1,000 ventilator-days; cathether-associated urinary tract infection, 2.7 cases/1,000 catheter-days; central line–associated bloodstream infection, 1.4 cases/1,000 device-days. With implementation of this protocol, the rates dropped to zero and have stayed at that level with the exception of 1 cathether-associated urinary tract infection. There were no untoward effects or observed delays in wound healing with this protocol. All of these changes were clinically significant, although not statistically significant; the study was not powered for statistical significance.

Conclusions: Using this nurse-driven protocol, we decreased, in a sustainable manner, the HAI rate in our intensive care unit to zero. No integumentary difficulties or wound healing delays were related to this protocol.

A randomized clinical trial of chlorhexidine in the maintenance of oral candidiasis-free period in HIV infection.

Nittayananta W, DeRouen TA, Arirachakaran P, Laothumthut T, Pangsomboon K, Petsantad S, Vuddhakul V, Sriplung H, Jaruratanasirikul S, Martin MD.

Oral Dis. 2008 Oct;14(7):665-70. doi: 10.1111/j.1601-0825.2008.01449.x. Epub 2008 Jun 21.

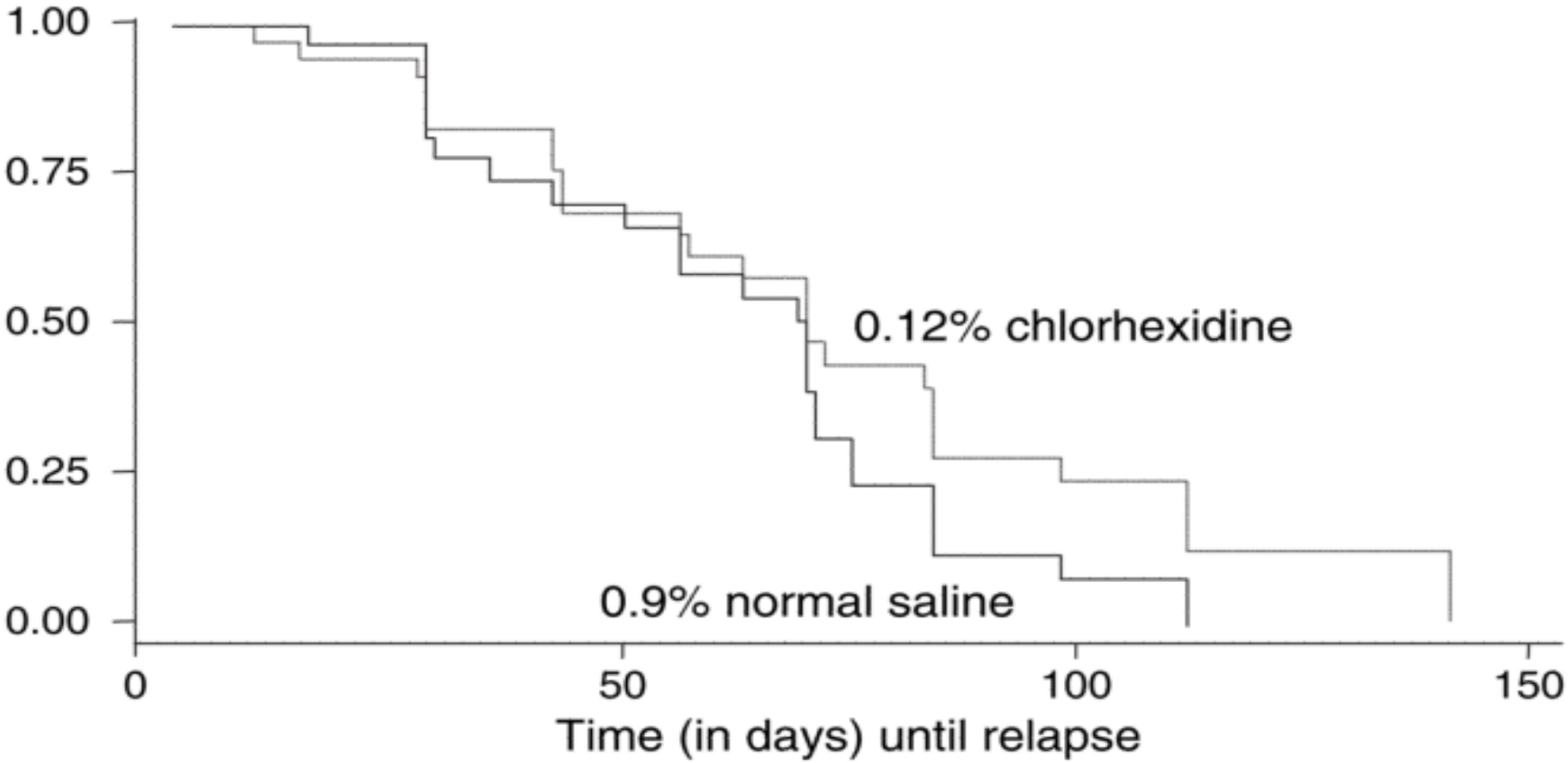
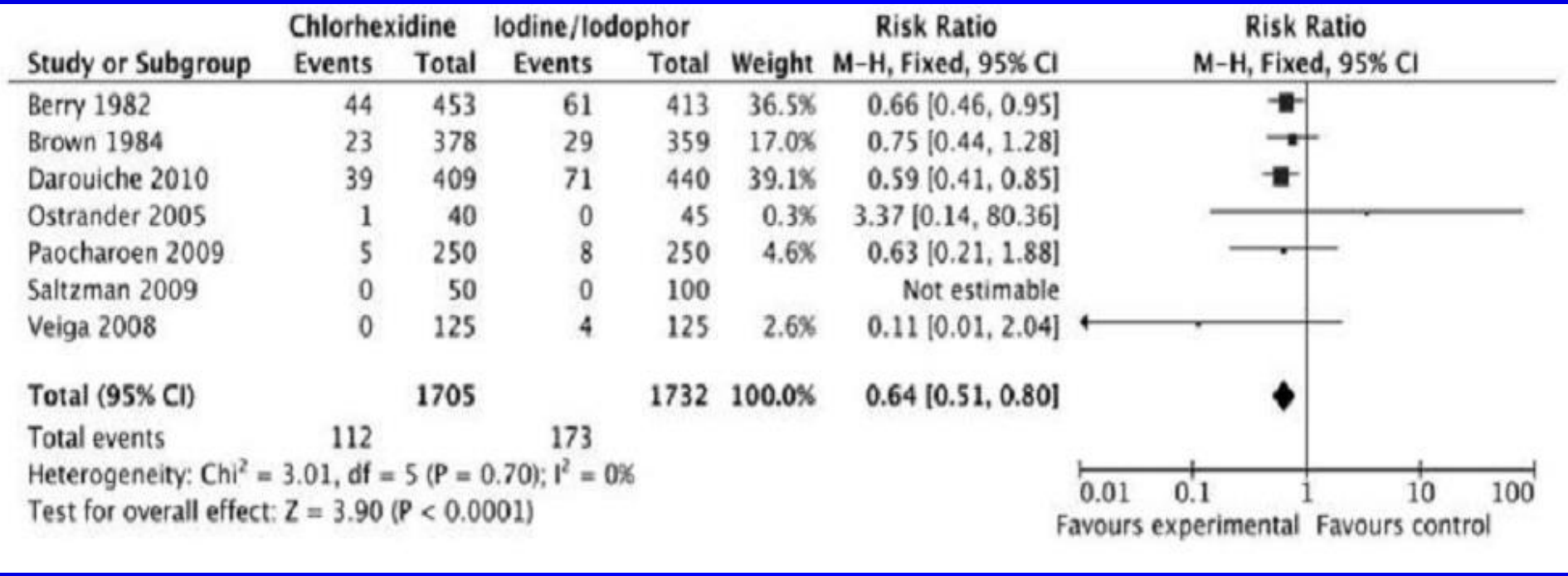


Figure 1.
Kaplan–Meier survival estimates, by type of mouth-rinse

Systematic Review and Cost Analysis Comparing Use of Chlorhexidine with Use of Iodine for Preoperative Skin Antisepsis to Prevent Surgical Site Infection

Infect Control Hosp Epidemiol. 2010 December ; 31(12)

Ingi Lee, MD, MSCE, **Rajender K. Agarwal, MD, MPH**, **Bruce Y. Lee, MD, MBA**, **Neil O. Fishman, MD**, and **Craig A. Umscheid, MD, MSCE**



Study or Subgroup	Chlorhexidine Events	Chlorhexidine Total	Iodine/Iodophor Events	Iodine/Iodophor Total	Weight	Risk Ratio M-H, Fixed, 95% CI
Berry 1982	44	453	61	413	36.5%	0.66 [0.46, 0.95]
Brown 1984	23	378	29	359	17.0%	0.75 [0.44, 1.28]
Darouiche 2010	39	409	71	440	39.1%	0.59 [0.41, 0.85]
Ostrander 2005	1	40	0	45	0.3%	3.37 [0.14, 80.36]
Paocharoen 2009	5	250	8	250	4.6%	0.63 [0.21, 1.88]
Saltzman 2009	0	50	0	100		Not estimable
Veiga 2008	0	125	4	125	2.6%	0.11 [0.01, 2.04]
Total (95% CI)		**1705**		1732	**100.0%**	**0.64 [0.51, 0.80]**
Total events	112		173			

Heterogeneity: $Chi^2 = 3.01$, $df = 5$ ($P = 0.70$); $I^2 = 0\%$

Test for overall effect: $Z = 3.90$ ($P < 0.0001$)

Economic impact of use of chlorhexidine-impregnated sponge dressing for prevention of central line-associated infections in the United States.

Ye X, Rupnow M, Bastide P, et al.Am J Infect Control. 2011

Background: The economic impact of adding chlorhexidine gluconate (CHG)-impregnated sponge dressing to standard care (ie, chg-impregnated sponge dressing + skin preparation and transparent film dressing vs skin preparation and transparent film dressing) for the prevention of central-line infections was evaluated.

Methods: Clinical and economic data were obtained from peer-reviewed published studies to populate the decision model. The efficacy of reducing catheter-related bloodstream infection (CR-BSI) incidence with CHG-impregnated sponge dressing came from 2 recent randomized controlled trials. One-way and two-way sensitivity analyses were performed on key clinical and economic parameters.

Results: Based on model calculations, a hypothetical 400-bed hospital inserting 3,078 central venous catheters (CVCs) per year is expected to avoid an average of 35 CR-BSIs, 145 local infections, and 281 intensive care unit days annually with the systematic use of CHG-impregnated sponge dressing. Potential hospital net cost savings (mainly because of reduced CR-BSIs with use of the dressing) would be $895,000 annually. Results were robust across a range of values in sensitivity analyses.

Conclusion: CHG-impregnated sponge dressing is a cost-effective CR-BSI prevention treatment option for patients requiring CVCs. The importance of these results should be considered in the context of federal government and insurance company policies that no longer permit enhanced reimbursement for CR-BSI.

Chlorhexidine Gluconate Bathing: Does it Decrease Hospital-Acquired Infections?

Deana Sievert, Rochelle Armola and Margo A. Halm

Am J Crit Care 2011;20:166-170 doi: 10.4037/ajcc2011841

Reference	No. of patients/ population	Design/ Intervention(s)	Central catheter–associated blood-stream infections	Acquisition/ decolonization	Surgical site infections
Munoz-Price et al[8]	405/long-term acute care	Quasi-experimental	+ Weekly 2% CHG baths (vs soap/water)		
Bleasdale et al[9]	836/MICU	Cross-over (concurrent control group)	+ CHG (after 5 days) vs soap/water		
Popovich et al[10]	318/MICU	Quasi-experimental	+ 2% CHG cloths (vs soap/water)		
Climo et al[11]	5320/MICU, SICU, MICU, CCU, CVSICU	Quasi-experimental	+ 4% CHG (vs soap/water) reduced VRE bacteremia	+ MRSA decreased 32% + VRE decreased 50%	
Popovich et al[12]	254/SICU	Quasi-experimental	0 CHG vs soap/ water bathing		
Ridenour et al[13]	1581/CCU, MICU	Prospective interventional cohort		+ 4% CHG bathing for 7 days and 2% mupirocin ointment twice daily for 5 days	

Reference	No. of patients/ population	Design/ Intervention(s)	Central catheter–associated blood-stream infections	Acquisition/ decolonization	Surgical site infections
Wendt et al[15]	114/university hospital nursing homes	Randomized controlled trial		0 4% CHG solution in water (vs placebo); all received mupirocin nasally and CHG oral rinse + CHG for groin area eradication	
Sandri et al[16]	2200/general ICU (364 general ICU inpatients with positive MRSA screens)	Retrospective cohort with consecutive patients		+ CHG solution in water (no % specified) daily for 3 days and 2% mupirocin intranasally 3 times daily for 5 days	
Batra et al[17]	4570/general ICU	Quasi-experimental		+ 1% CHG to nostrils, around mouth and tracheostomy site 4 times a day; 1% CHG acetate powder to groin, axillae, and skinfolds 2 times daily, and 4% CHG in water bathing	
Darouiche et al[18]	849/general surgery (clean-contaminated)	Randomized controlled trial			+ CHG-alcohol[a] (vs povidone-iodine)

Reference	No. of patients/ population	Design/ Intervention(s)	Central catheter–associated blood-stream infections	Acquisition/ decolonization	Surgical site infections
Dizer et al[22]	82/abdominal	Experimental (non-randomized)			+ CHG bath/clippers (vs routine preoperative skin preparation/shaving)
Swenson et al[23]	3209/general surgery	Randomized controlled trial			0 2% CHG (vs povidone-iodine, 70% isopropyl alcohol, or isopropyl alcohol)
Edmiston et al[24]	30/healthy volunteers	Randomized controlled trial			+ 2% CHG-impregnated cloth (vs 4% CHG skin preparation)
Webster and Osborne[25]	10,157/7 randomized controlled trials	Systematic review			0 4% CHG showering (vs placebo)
Veiga et al[19]	150/plastic surgery (clean)	Randomized controlled trial			0 CHG shower (vs placebo/control)
Paocharoen et al[20]	500/general surgery (clean; clean-contaminated, contaminated)	Randomized controlled trial			+ CHG (vs povidone iodine)
Eiselt[21]	1463/orthopedics	Quasi-experimental			+ 2% CHG no-rinse cloth (vs povidone-iodine)

Yan etkileri

Yan etki	Sıklık
Dermatit	Nadir
Hipersensitivite reaksiyonu ve anaflaksi	Olgu sunumu
Ototoksisite	Olgu sunumu
Kornea hasarı	Olgu sunumu

Milstone AM, CID 2008

Chlorhexidine gluconate–impregnated central access catheter dressings as a cause of erosive contact dermatitis: a report of 7 cases.

Weitz NA, Lauren CT, Weiser JA, LeBoeuf NR, Grossman ME, Biagas K, Garzon MC, Morel KD.

JAMA Dermatol. 2013 Feb;149(2):195-9.

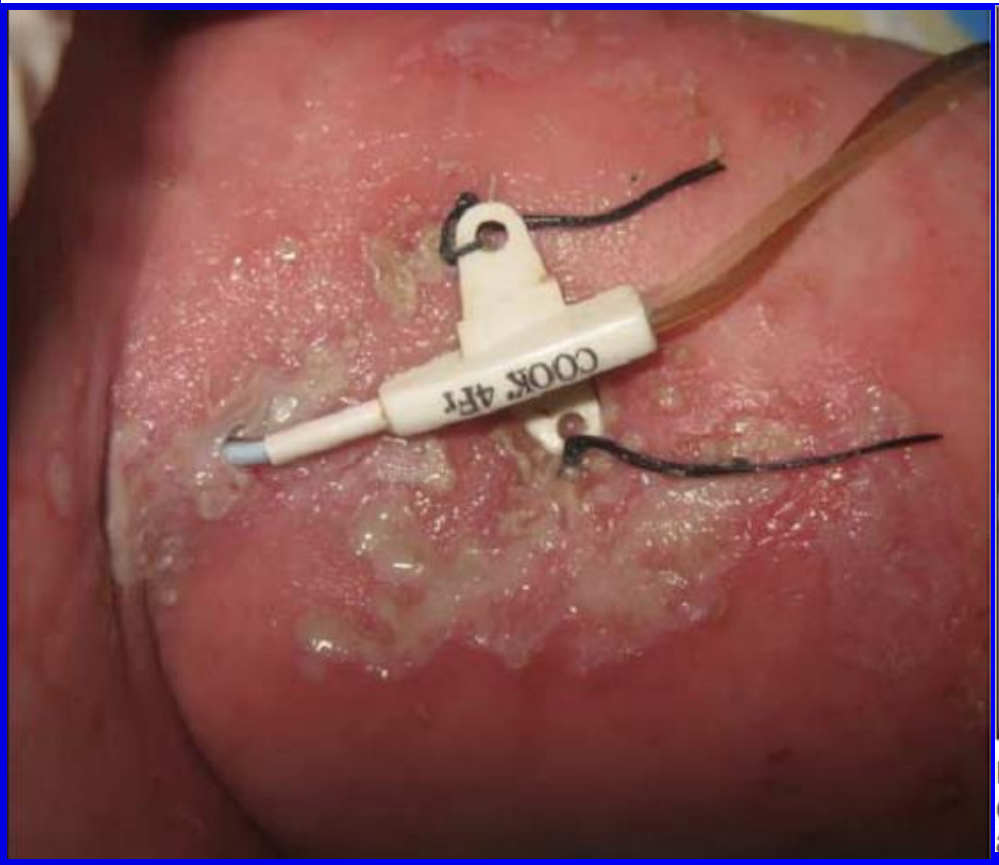
Table. Summary of Clinical Features in the Present Case Series[a]

Case No./ Sex/Age	Site	Duration of CAC Before Dermatitis Discovery, d	Comorbidities	Immunosuppression	BP Support	Wound Care	Wound Outcome/ Time, d
1/M/6 mo	L groin	12	CHD repair	No	Yes	Topical antibiotics, nonadherent dressings	Lesions resolved/7
2/M/2 y	L groin	30	CHD repair, pulmonary HTN	No	Yes	Topical antibiotics, nonadherent and silver-impregnated dressings	Lesions resolved/10
3/M/4 mo	L groin	22	CHD, heart Tx, sepsis	Yes	Yes	CAC removed, topical antibiotics, petroleum jelly, nonadherent dressings	Lesions resolved/4
4/F/2 y	R aspect of neck	17	CHD, heart Tx, Tx rejection	Yes	Yes	Topical antibiotics, nonadherent dressings	Lesions resolved/6
5/F/1 y	R groin	13	CHD, heart Tx, graft failure, stroke, osteomyelitis	Yes	Yes	Topical antibiotics, silicone- and silver-impregnated dressings	Lesions resolved/NS
6/M/5 mo	L groin	16	CHD, sepsis, DIC	No	Yes	Alcohol and povidone-iodine cleansing, silver-impregnated dressings, transparent dressing	Lesions resolved/NS
7/M/62 y	L groin, L aspect of neck, R wrist	8	Dermatomyositis and PF after lung Tx, Tx rejection, PNA, renal failure	Yes	Yes	L femoral CAC removed, topical antibiotics, nonadherent dressings, paper tape	Lesions resolved/NS

Chlorhexidine gluconate–impregnated central access catheter dressings as a cause of erosive contact dermatitis: a report of 7 cases.

Weitz NA, Lauren CT, Weiser JA, LeBoeuf NR, Grossman ME, Biagas K, Garzon MC, Morel KD.

JAMA Dermatol. 2013 Feb;149(2):195-9.



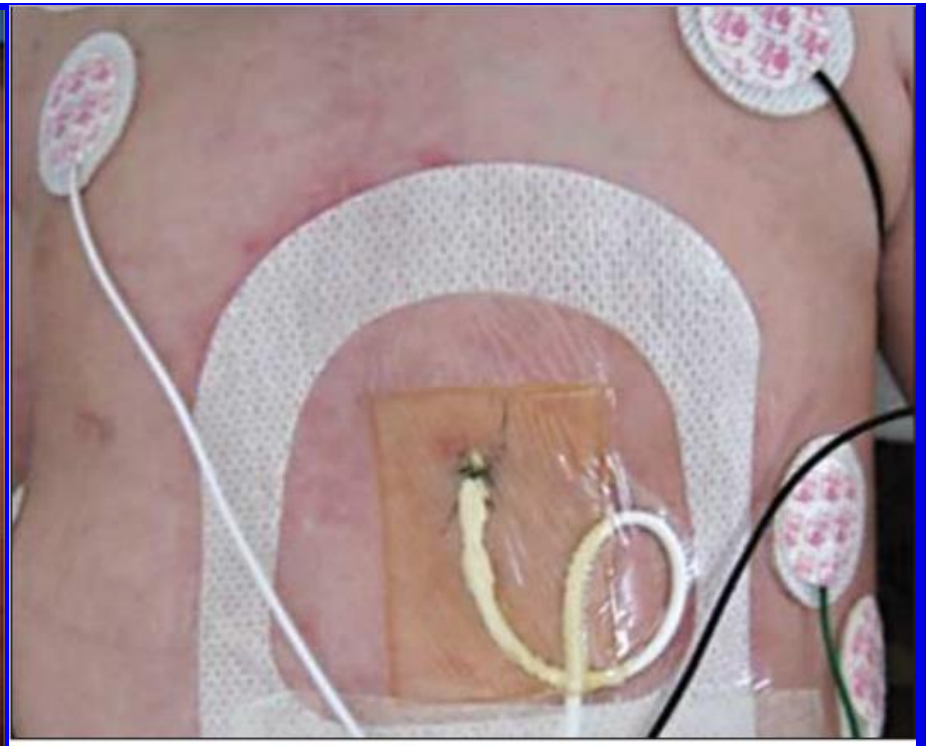


Figure 1. A transparent chlorhexidine gluconate–impregnated gel pad dressing (Tegaderm CHG; 3M) covering a central line on the abdomen of an infant.

Klorheksidinin infeksiyon kontrolü için kullanım önerileri

Kullanım	Etkinlik (Kanıt düzeyi)
Cilt antisepsisi	
Cerrahi el yıkama	El florasında % 86-92 azalma (A)
Genel cilt temizliği	Normal cilt florası, gram-negatif organizmalar ve Staphylococcus aureus'da anlamlı azalma (A)
YBÜ hastalarında günlük banyo	YBÜ hastalarında VRE edinim oranlarının azaltılması (RR, 0.4) (B) Çevresel VRE kontaminasyonunun azaltılması (B) MRSA (%32) ve VRE (%30) edinim oranlarının azaltılması (B) Kan dolaşımı infeksiyonu sıklığının azalması (B)

Kullanım	Etkinlik (Kanıt düzeyi)
Cilt antisepsisi	
S. aureus dekolonizasyonu	Klorheksidinle birlikte mupirosin kullanımı hemodiyaliz hastalarının %69'unda 12 haftada eradikasyon (B) Klorheksidinle birlikte mupirosin, doksisiklin ve rifampin kullanımı hastaların %74'ünde 3 ayda eradikasyon (B) Klorheksidinle birlikte mupirosin kullanımı YBÜ'de nozokomiyal S. aureus enfeksiyonu insidansını, 4 yılda % 66 oranında azaltmıştır (B) Klorheksidinle birlikte mupirosin kullanımı salgın kontrolünde yardımcıdır (A)

Kullanım	Etkinlik (Kanıt düzeyi)
Preoperatif banyo	Cilt mikroorganizma yükünde anlamlı azalma (A) CAİ azalmasında net kanıt yok (C)
Preoperatif yıkama	Cerrahi alanda cilt florasının azalmasında diğer antiseptiklere üstün (A) CAİ oranı azalmasında net kanıt yok (C)
Santral venöz katater bölgesi hazırlanması	Klorheksidin povidon-iyota göre katater kolonizasyonunda %50 azaltır (A) Klorheksidinli cilt antiseptikleri povidon-iyotlu olanlara göre kan dolaşımı infeksiyonunu %49 azaltır (A)

Kullanım	Etkinlik (Kanıt düzeyi)
Emdirilmiş malzemeler	
Damar katateri örtüleri	Katater kolonizasyonunda azalma (RR, 0.5–0.6) (A); kan dolaşımı infeksiyonunda anlamlı azalma yok (C)
Epidural katater örtüleri	Katater kolonizasyonunda azalma (RR, 0.08–0.13) (A); kateter ilişkili enfeksiyonlarda azalmada ikna edici veri yok (C)
Damar kataterleri	Katater kolonizasyonunda azalma (HR, 0.45) (A); yüksek risk gruplarında katater ilişkili infeksiyonlarda azalma (OR, 0.56) (B)

Kullanım	Etkinlik (Kanıt düzeyi)
Orofarinks antisepsisi	
VİP önlenmesi	Rasgele etki modelleri kullanılarak azalma (RR, 0.58–0.7) (B); kardiyotorasik cerrahi uygulanan hastalarda yararı kesin. Bu yarar mekanik ventilasyon süresi ile ilişkili olabilir (B).
Cerrahi alan infeksiyonu önlenmesi	Cerrahi alan infeksiyonu oranlarında genel azalma kanıtı yok (C); elektif kardiyotorasik cerrahi sonrası derin CAİ'de %36 azalma (B)
İmmün sistemi baskılanmış hastalar	Mukozitin önlenmesi veya tedavisi için kesin kanıt yok (C)

Kullanım	Etkinlik (Kanıt düzeyi)
Diğer antisepsiler	
Yanık	Klorheksinle birlikte gümüş sulfadiazin kullanımı S. aureus cilt kolonizasyonunu azaltır (A); sekonder infeksiyonların azalmasına yönelik kesin kanıt yok (C)
Vajinal	Neonatal veya maternal infeksiyonların azalmasına yönelik kesin kanıt yok (C)

Klorheksidin cilt preparasyonları

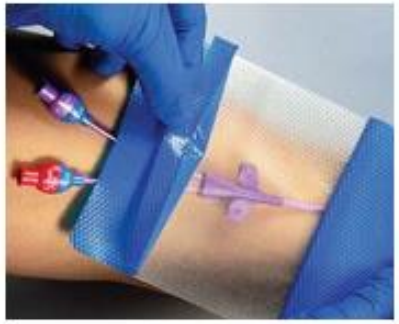
- ChloraPrep® by CareFusion
  - 2% Chlorhexidine and 70% Isopropyl Alcohol

- ChloraScrub™ by PDI
  - 3.15% Chlorhexidine and 70% Isopropyl Alcohol

Klorheksidin örtüler ve damar aletleri

- BioPatch® by Ethicon (Chlorhexidine Sponge)
- Tegaderm CHG® by 3M (Chlorhexidine Gel)
- IV Clear™ by Covalon (Chlorhexidine/Silver Dressing)
- GuardIVa™ by Hemcon (Chlorhexidine/Hemostatic Dressing)






- ARROWg+ard Blue® by ARROW – 1st Generation
  - Chlorhexidine Acetate/Silver Sulfadiazine (Externally Impregnated Only)
- ARROWg+ard Blue PLUS® by ARROW – 2nd Generation
  - Chlorhexidine Acetate/Silver Sulfadiazine (3 Times the Chlorhexidine Impregnated Externally and Chlorhexidine Only Internally)
- Chlorag+ard® by ARROW – 3rd Generation
  - Chlorhexidine Acetate (Impregnated Internally and Externally)

Klorheksidinli iğne konnektörleri

- InVision-Plus CS® by RyMed
  - Chlorhexidine & Silver impregnated septum

TEŞEKKÜRLER