



Prévention de l'infection liée aux cathéters

Place des pansements imprégnés de chlorhexidine

Jean-François TIMSIT
Medical ICU
Université Grenoble 1 - U 823
Grenoble, France

Tours, 11 Octobre 2011

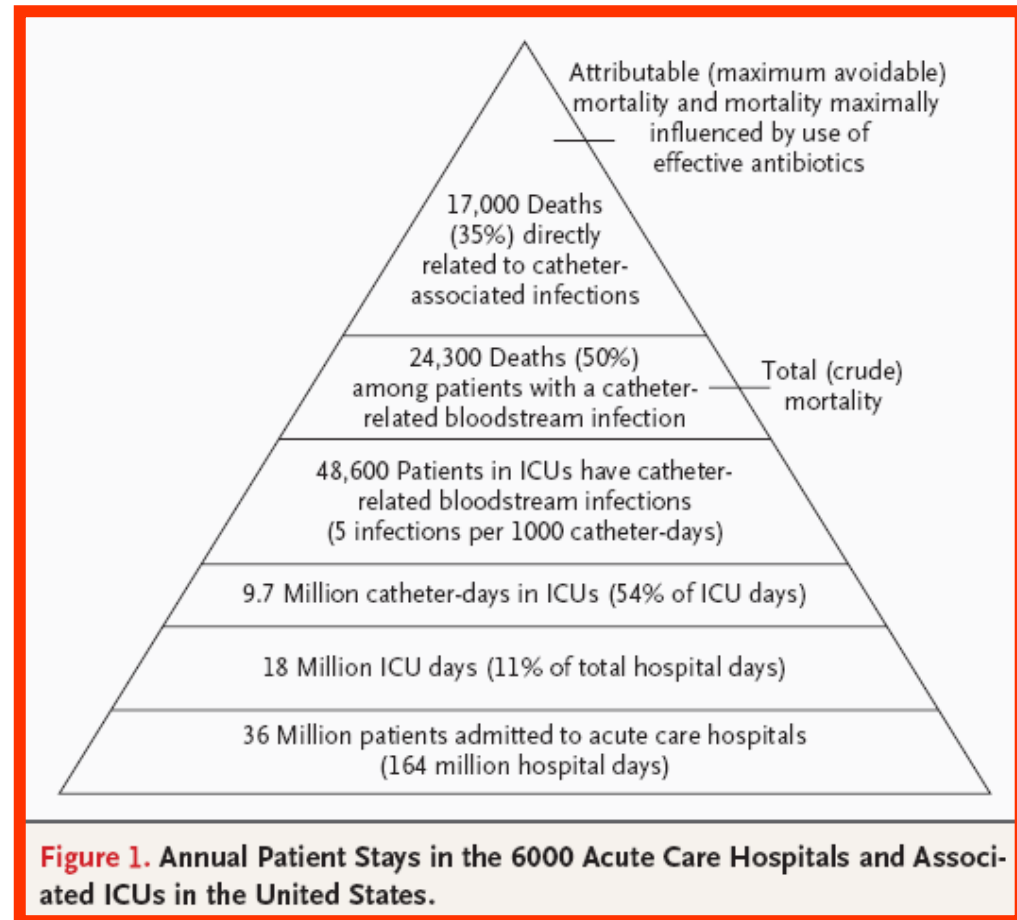


Conflits d'intérêt

- Expertise
 - MSD
 - Astellas
 - Carefusion
- Subvention à des partenaires publics
 - Pfizer
 - 3M
 - Astellas
- Bourses de recherche
 - 3 M
 - Ethicon / Janssen-Cilag
 - MSD
 - Novartis
 - Astra-Zeneca

ILC

- Fréquent
- Sévère
- Liée au matériel
- Évitable



Politique de prévention → Taux de BSI moyen: 1.4/1000 jours-cvc
Pronovost et al - NEJM2006



Règles de base

- Bouquet de mesure
 - Hygiène de main
 - Asepsie chirurgicale
 - Éviter la PVI aqueuse
 - Sous-clavière et radiale préférentielle
 - Retrait précoce
 - Réfection immédiate des pansements souillés ou décollés
- Programme d'amélioration continue de la qualité
- Surveillance, participation à un réseau



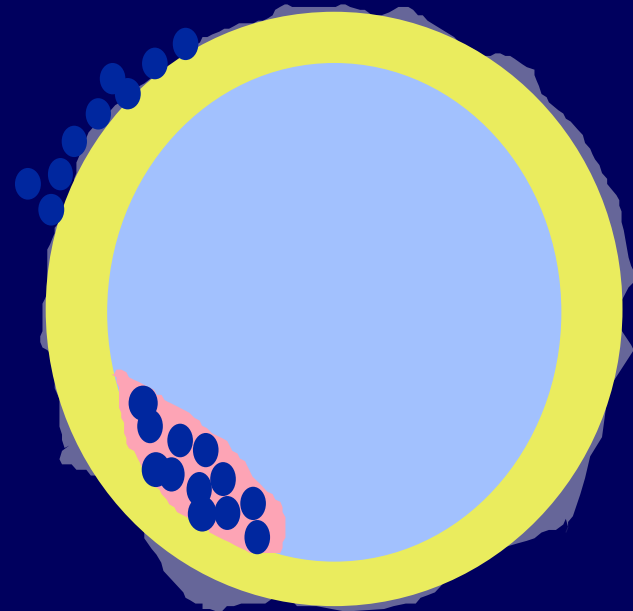
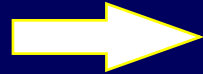
Taux « acceptable » < 4 / 1000 jours
d'infections systémiques

Main routes of catheter contamination

Extraluminal:

Skin infection:

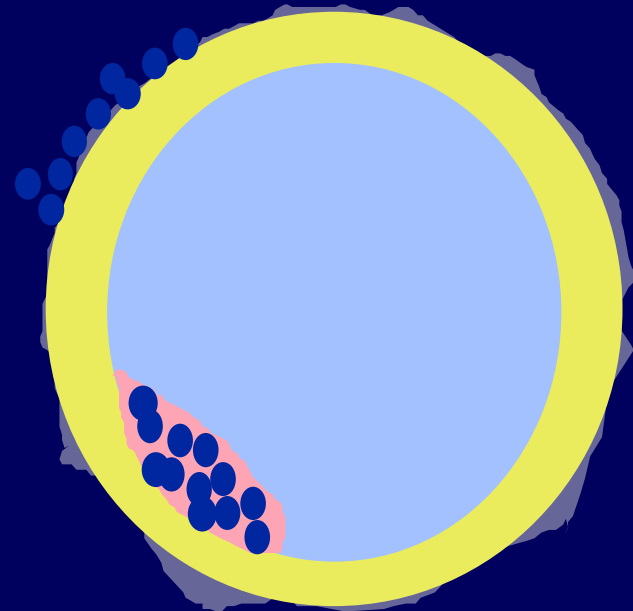
Hematogenous seeding



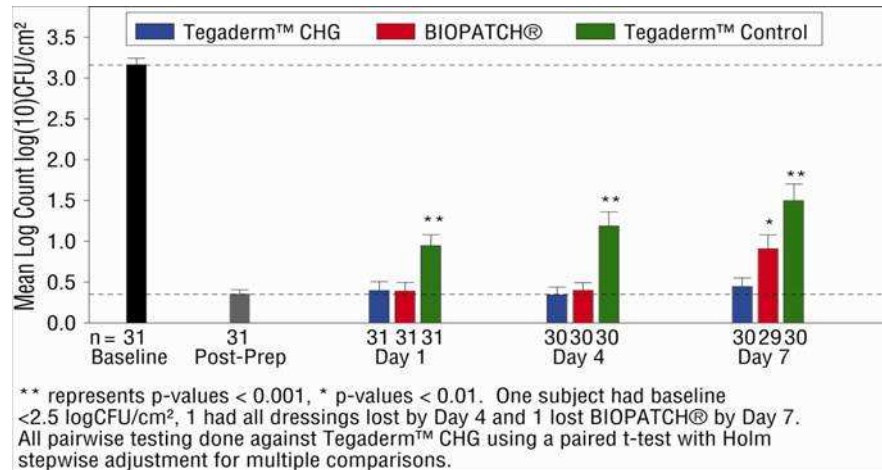
Endoluminal:

Hub contamination

Infusate contamination

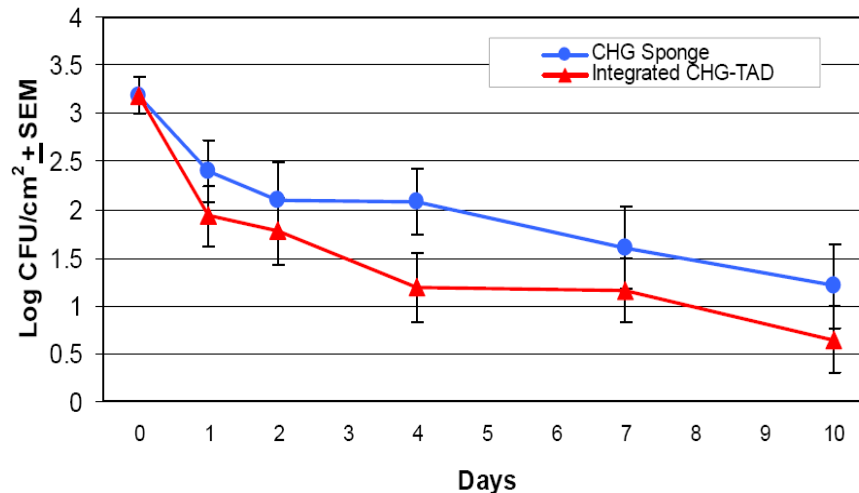


CHG dressings: Bacterial growth on healthy volunteers



There is a bacterial regrowth under occlusive dressing one day after skin disinfection (Chloraprep)

The bacterial regrowth is limited by both CHG-sponge and CHG-gel-dressings



CHG-dressings decrease normal unprepped skin flora for up to 7 days

FIGURE 6. *In Vivo* time kill of normal flora On unprepped skin with the two CHG-impregnated dressings in healthy volunteers.

Biopatch™ (métanalyse)

Ho et al -Journal of Antimicrobial Chemotherapy (2006) 58, 281–287



Catheter colonization

02 Central venous or arterial catheters

Author	Treatment (n/N)	Control (n/N)	OR	95% CI
Chambers ¹⁷	3/58	13/54	8.24	0.17 [0.05, 0.64]
Garland ¹⁵	47/335	82/370	28.35	0.57 [0.39, 0.85]
Hanazaki ⁹	0/25	7/25	2.03	0.05 [0.00, 0.90]
Levy ¹⁶	11/74	21/71	15.81	0.42 [0.18, 0.94]
Maki ¹⁹	109/665	216/736	32.79	0.47 [0.36, 0.61]
Roberts ¹⁸	4/17	3/16	5.53	1.33 [0.25, 7.17]
Subtotal (95% CI)	174/1174 (14.8%)	342/1272 (26.9%)	92.76	0.47 [0.34, 0.65]

Total events: 174 (Treatment), 342 (Control)
 Test for heterogeneity: $\chi^2 = 7.04$, $df = 5$ ($P = 0.22$), $I^2 = 29.0\%$
 Test for overall effect: $Z = 4.58$ ($P < 0.00001$)

CR-BSI

02 Blood stream infection by central venous or arterial catheters

Author	Treatment (n/N)	Control (n/N)	OR	95% CI
Chambers ¹⁷	2/58	7/54	13.51	0.24 [0.05, 1.21]
Garland ¹⁵	12/335	11/370	31.24	1.21 [0.53, 2.79]
Levy ¹⁶	3/74	4/71	14.67	0.71 [0.15, 3.28]
Maki ¹⁹	8/665	24/736	32.12	0.36 [0.16, 0.81]
Roberts ¹⁸	1/17	0/16	4.00	3.00 [0.11, 79.13]
Subtotal (95% CI)	26/1149 (2.26%)	46/1247 (3.69%)	95.54	0.61 [0.30, 1.26]

Total events: 26 (Treatment), 46 (Control)
 Test for heterogeneity: $\chi^2 = 6.48$, $df = 4$ ($P = 0.17$), $I^2 = 38.3\%$
 Test for overall effect: $Z = 1.32$ ($P = 0.19$)

≈ 5/1000 cvc days >>> 1.4/1000 cvc days
 Is it useful with acceptable baseline levels?

CHG-Impregnated sponges (Biopatch™)

- ICU dressing every 2 days vs dressing+Biopatch every 7 days.
- 687 subjects, 1699 catheters → 589 (86%) patients evaluable/ 1401 lines (82%)
- No published intent to treat analysis
- Arterial and central vein catheters

	Control n=736 cath.	Biopatch n=665 cath.	<i>Hazard ratio</i> (95% CI)
Colonization (Maki technique)	216 (29%)	109 (16%)	0.62 (0.49-0.78)
Maki + 1 periph. BC	24 (3.3%)	8 (1.2%)	0.38 (0.16-0.89)

Per patient analysis: CR-BSI: 7/295(2.4%) vs 18/294 (6.1%), patients

Maki et al, 40th ICAAC 2000; 1430, p422 (unpublished)



Jean-François Timsit, MD, PhD
Carole Schwebel, MD, PhD
Lila Bouadma, MD
Arnaud Geffroy, MD
Maïté Garrouste-Orgeas, MD
Sebastian Pease, MD
Marie-Christine Herault, MD
Hakim Haouache, MD
Silvia Calvino-Gunther, RN
Brieuc Gestin, PhD
Laurence Armand-Lefevre, PharmD
Véronique Leflon, PharmD
Chantal Chaplain, PharmD
Adel Benali, MD
Adrien Francais, MSc
Christophe Adrie, MD, PhD
Jean-Ralph Zahar, MD
Marie Thuong, MD
Xavier Arrault, PharmD
Jacques Croize, PharmD
Jean-Christophe Lucet, MD, PhD
for the Dressing Study Group

Chlorhexidine-Impregnated Sponges and Less Frequent Dressing Changes for Prevention of Catheter-Related Infections in Critically Ill Adults A Randomized Controlled Trial





But

- Évaluer l'effet d'éponges imprégnées de CHX (CHX-IS) sur l'ILC quand le niveau du groupe contrôle est à un niveau acceptable
- Évaluer si un changement programmé de pansement tous les 7 jours est suffisant en réanimation pour les cathéters veineux centraux et les cathéters artériels.



Méthodes

- Plan factoriel croisé, évaluateur aveugle
- 7 réanimations/5 hôpitaux (3 CHU-2 CHG-PSPH)
(2 Chir, 2 med, 3 Poly)
- 1:1:1:1 randomisation par patient (blocs de 8 stratifié par centre)
 - 3 jours (standart)
 - 3-jours + CHXIS
 - 7-jours
 - 7-jours + CHXIS
- Financements :
 - PHRC 2005: 327k€ / 9 ETP techniciens de biohygiènes et infirmières de recherche clinique
 - Ethicon™ a fourni gracieusement les Biopatch™



Inclusion/exclusion

- CVC OU KT artériel d'une durée prévisible d'insertion > 48 Heures

- Exclusion:
 - Allergies aux produits (CHX, pansements transparents)
 - PAC, (PICCs, KT recouverts d'antibiotiques ou d'antiseptiques).
 - Mise en place en urgence
 - Refus de consentement

Procédure unique

- Cathéters
 - Aseptie chirurgicale
 - Sous clavière (CVC) et radiale (artère) préférée
 - Désinfection de la peau en 4 temps (PVI scrub + alcool (70%) PVI (5%) (>1mn))
 - Ablation immédiate si inutile ou suspect
- Pansements transparents (Tegaderm 3M Saint Paul MN)
 - PVI-alcool pour la désinfection de la peau
 - Changement immédiat si souillé ou décollé
 - Avec ou sans CHXIS (Biopatch TM Ethicon Inc., Somerville, NJ)
- Suivi continu
 - Enseignement et audit des procédures
 - Coût réel des pansements (micro-costing)
 - Saisie en temps réel sur cahier électronique
- Suivi jusqu'à 48 h après la sortie de réanimation





Critères de jugement

■ Définitions

- (1) colonisation $> 10^3$ cfu/ml (Brun-Buisson 1987)
- (2) ILC bactériémique: une HC + culture pos. + pas d'autres sites expliquant les HC
- (3) ILC systémique non bactériémique: colonisation + sepsis + (pus ou régression au moins partielle à l'ablation)

- Critères principaux co-primaires:
 - 3 j vs 7 jours: (1)= colonisation
 - Effet CHX-IS: (2)+(3)= Infections liées aux cathéters
 - Evaluation aveugle par un panel d'experts indépendant
- Critères secondaires
 - Allergie cutanée ou systémique
 - ILC bactériémique, culture cutanée à l'ablation des KT
 - CMB à la chlorhexidine des souches isolés sur un échantillon randomisé de culture cutanée positive

Nombre de sujets nécessaires

■ Plus de 2 KT par patients

- CHX-IS diminue les ILC systémiques de 60%

Risque de base de 4%, $\alpha=0.05$, $\beta=.2$, (bilatéral)

→ 408 patients (816 cathéters) dans chaque bras

- Pansement tous les 7 jours non inférieurs à tous les 3 jours (colonisation)

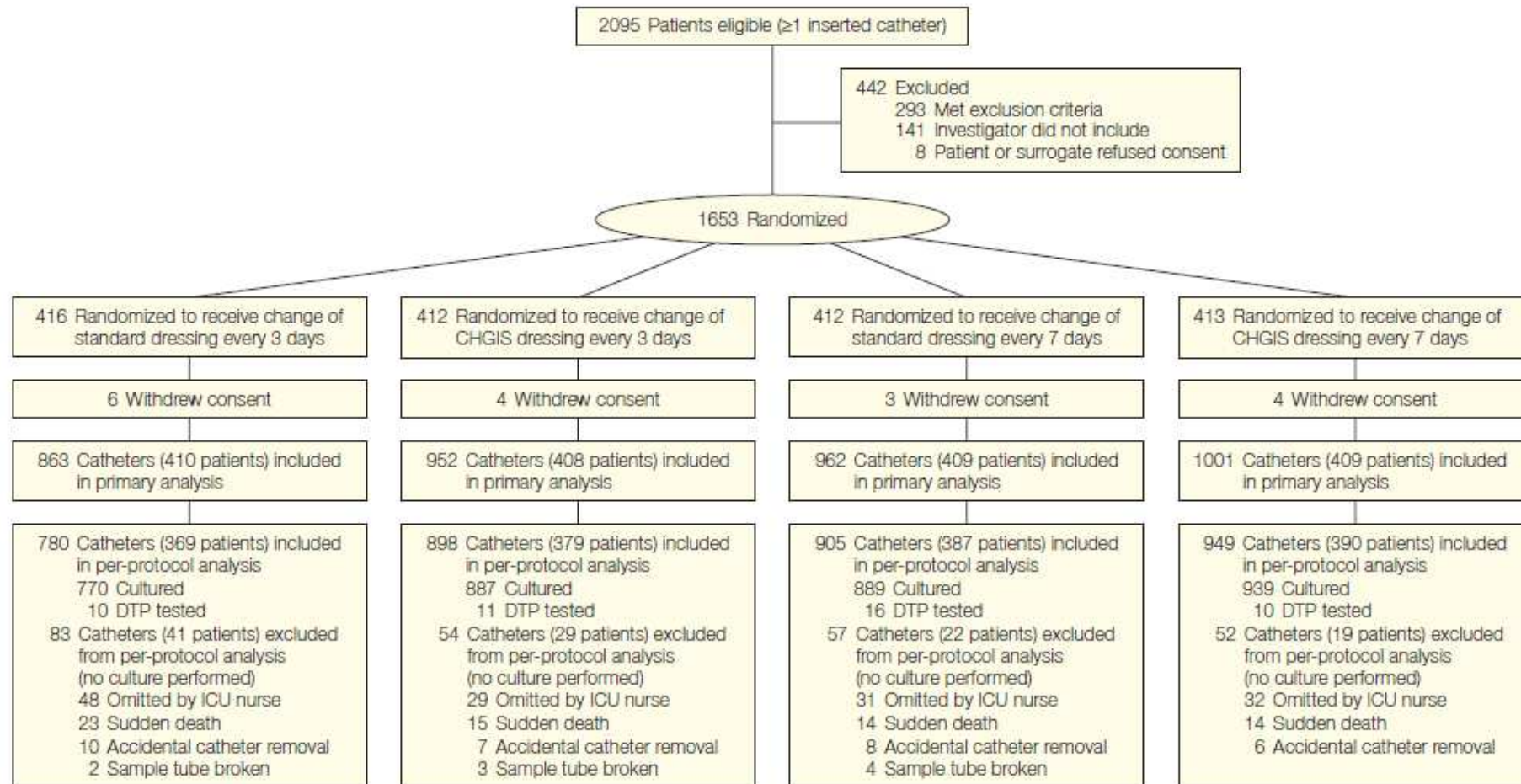
colonisation de 12% dans le bras standard borne supérieure dans le bras 7 jours fixé à 15%, $\alpha=0.05$, $\beta=.2$, (bilatéral)

→ 737 patients (1474 catheters) dans chaque bras

1600 patients (3200 cathéters) prévus

Flow chart

Figure 1. Flow of Patients Through the Study



CHGIS indicates chlorhexidine gluconate-impregnated sponge; DTP, differential time to positivity; ICU, intensive care unit.

3,778 catheters/ 28,931 catheter-days

Patients

Table 1. Patient Characteristics

Characteristic	No. (%)				
	All Patients, ITT Analysis (N = 1636)	Dressing		Dressing Change Interval	
		Control (n = 819)	CHGIS (n = 817)	3 d (n = 818)	7 d (n = 818)
Age, median (IQR), y	62 (50-74)	63 (50-74)	62 (50-73)	62 (50-74)	62 (50-73)
Men	1052 (64.3)	518 (63.2)	534 (65.4)	542 (66.3)	510 (62.3)
≥1 Chronic disease	536 (32.8)	288 (35.2)	248 (30.4)	269 (32.9)	267 (32.6)
Immune deficiency	93 (5.7)	48 (5.9)	45 (5.6)	50 (6.2)	43 (5.3)
Hematologic malignancy	52 (3.2)	28 (3.4)	24 (3)	28 (3.5)	24 (2.9)
Metastatic cancer	64 (3.9)	33 (4)	31 (3.8)	28 (3.5)	36 (4.4)
AIDS	54 (3.3)	30 (3.7)	24 (3)	24 (3)	30 (3.7)
SAPS II, median (IQR) ^a	53 (40-65)	53 (40-67)	52 (40-65)	52 (40-67)	53 (40-65)
SOFA, median (IQR) ^b	12 (9-15)	12 (9-15)	12 (9-15)	12 (9-15)	12 (9-15)
Admission category					
Medical	1143 (69.9)	568 (69.4)	575 (70.4)	578 (70.7)	565 (69)
Scheduled surgery	107 (6.5)	66 (8.1)	41 (5.0)	50 (6.1)	57 (7)
Emergency surgery	386 (23.6)	185 (22.5)	201 (24.6)	190 (23.2)	196 (24)
Main reason for ICU admission					
Septic shock	349 (21.3)	163 (19.9)	186 (22.8)	180 (22)	169 (20.7)
Cardiogenic shock	155 (9.5)	66 (8.1)	89 (10.9)	80 (9.8)	75 (9.2)
De novo respiratory failure	326 (19.9)	167 (20.4)	159 (19.5)	160 (19.6)	166 (20.3)
Coma	225 (13.8)	115 (14)	110 (13.5)	107 (13.1)	118 (14.4)
Trauma	178 (10.9)	84 (10.3)	94 (11.5)	83 (10.1)	95 (11.6)
Mechanical ventilation	1411 (86.9)	693 (85.1)	718 (88.8)	689 (85.3)	722 (88.6)
Length of ICU stay, median (IQR), d	11 (5-22)	10 (5-21)	12 (5-25)	10 (5-22)	11 (5-23)
ICU death	549 (33.6)	280 (34.2)	269 (32.9)	261 (31.9)	288 (35.2)
Hospital death	645 (39.4)	333 (40.7)	312 (38.2)	314 (38.4)	331 (40.5)

Abbreviations: AIDS, acquired immunodeficiency syndrome; CHGIS, chlorhexidine gluconate-impregnated sponge; ICU, intensive care unit; IQR, interquartile range; ITT, intention-to-treat; SAPS II, Simplified Acute Physiology Score II; SOFA, Sequential Organ Failure Assessment.

^aRange of possible scores, 0-162.

^bRange of possible scores, 0-24.

Cathéters

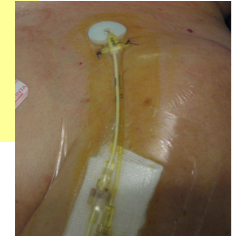
Table 2. Catheter Characteristics

Variable	No. (%)				
	All Catheters, ITT Analysis (N = 3778)	Dressing		Dressing Change Interval	
		Control (n = 1825)	CHGIS (n = 1953)	3 d (n = 1815)	7 d (n = 1963)
Time in place, median (IQR), d	6 (4-10)	6 (4-10)	6 (4-10)	6 (4-10)	6 (4-10)
Experience of the operator					
<50 procedures	2566 (68.4)	1221 (66.9)	1365 (69.9)	1248 (68.7)	1338 (68.2)
≥50 procedures	1195 (30.1)	578 (31.7)	557 (28.5)	544 (30)	591 (30.1)
Junior operator with help from a senior	57 (1.5)	25 (1.4)	31 (1.6)	23 (1.3)	34 (1.7)
Arterial catheter	1727 (45.7)	830 (45.5)	897 (45.9)	821 (45.2)	906 (46.2)
Femoral	708 (41)	355 (42.8)	353 (39.4)	345 (42)	363 (40)
Radial	1019 (59)	475 (57.2)	544 (60.6)	476 (58)	543 (60)
Venous Catheters Only					
Venous catheter	2051 (54.3)	995 (54.5)	1056 (54.1)	994 (54.8)	1057 (53.8)
Jugular	560 (27.3)	248 (24.9)	312 (29.6)	272 (27.4)	288 (27.3)
Subclavian	819 (39.9)	407 (40.9)	412 (39.0)	390 (39.2)	429 (40.6)
Femoral	672 (32.8)	340 (34.2)	332 (31.4)	332 (33.4)	340 (32.2)
Guidewire exchange	85 (4.1)	28 (2.8)	57 (5.4)	47 (4.7)	38 (3.6)
No. of lumens in venous catheters					
0	37 (1.8)	21 (2.1)	16 (1.5)	17 (1.7)	20 (1.9)
2	209 (10.2)	110 (11.1)	99 (9.4)	109 (11)	100 (9.5)
3	1805 (88)	864 (86.8)	941 (89.1)	868 (87.3)	937 (88.6)
Use of lipids	777 (37.9)	379 (38.1)	398 (37.7)	369 (39.2)	388 (36.7)
Use of heparin	708 (34.5)	336 (33.8)	372 (35.3)	341 (34.3)	367 (34.7)
Packed red blood cells transfused	602 (29.4)	266 (26.7)	336 (31.8)	283 (28.5)	319 (30.2)
Tunneled catheters	6 (0.3)	5 (0.5)	1 (0.1)	2 (0.2)	4 (0.4)
All Catheters					
Antimicrobials at catheter insertion	2532 (67)	1208 (66.2)	1324 (67.8)	1199 (66.1)	1333 (67.9)
Transport with catheter(s) in place ^a					
0	3004 (79.5)	1448 (79.3)	1556 (79.7)	1431 (78.8)	1573 (80.1)
1	559 (14.8)	255 (14)	304 (15.5)	277 (15.3)	282 (14.4)
2	160 (4.2)	90 (4.9)	70 (3.6)	78 (4.3)	82 (4.2)
>2	55 (1.5)	32 (1.8)	23 (1.2)	29 (1.6)	26 (1.3)
No. of dressing changes per catheter, median (IQR)	3 (1-5)	3 (1-5)	3 (1-5)	3 (1-5)	2 (1-4)
Local signs at catheter removal					
Normal	3416 (90.4)	1666 (91.3)	1750 (89.5)	1648 (80.8)	1768 (89.1)
Redness	321 (8.5)	139 (7.6)	182 (9.3)	150 (8.3)	171 (8.7)
Pain	10 (0.3)	2 (0.1)	8 (0.4)	7 (0.4)	3 (0.2)
Nonpurulent discharge	42 (1.1)	20 (1.1)	22 (1.1)	18 (1)	24 (1.2)
Purulent discharge	15 (0.4)	6 (0.3)	9 (0.5)	6 (0.3)	9 (0.5)
Catheter removal for suspected infection	667 (17.7)	325 (17.8)	342 (17.5)	325 (17.8)	342 (17.5)

Abbreviations: CHGIS, chlorhexidine gluconate-impregnated sponge; IQR, interquartile range; ITT, intention-to-treat.

^aTransport of patient for imaging studies or surgery with the catheter in place.

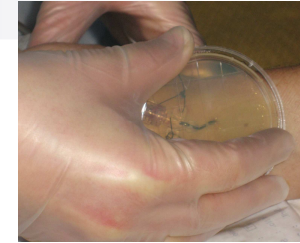
CHG impregnated sponges decrease CRI



Variable	All assessable catheters N=3532	Control dressings n=1685	CHXIS dressings n=1847
Significant catheter colonization	310 (8.8)	213 (12.6)	97 (5.3)
<i>S. aureus</i> **	16	14	2
Coag.-negative staphylococci	153	106	47
Other gram positive cocci	34	28	6
<i>Pseudomonas spp.</i>	53	38	15
<i>Enterobacter spp.</i>	82	54	28
<i>Escherichia coli</i>	15	11	4
<i>Acinetobacter baumannii</i>	15	11	4
Fungi	13	10	3
		15.8 vs 6.3 per 1000 catheter-days Hazard ratio: 0.36 [0.28 to 0.46], P<0.0001	
Catheter-related bloodstream infection	23 (0.7)	17 (1)	6 (0.3)
		1.3 vs 0.40 per 1000 catheter-days Hazard ratio: 0.24 [0.096 to 0.65], P=0.005	
Major catheter-related infections	29 (0.8)	19 (1.1)	10 (0.5)
<i>S. aureus</i> **	5	4	1
Coag.-negative staphylococci	4	2	2
Other gram-positive cocci	1	1	0
<i>Pseudomonas spp.</i>	9	6	3
<i>Enterobacter spp.</i>	14	11	3
<i>Escherichia coli</i>	1	1	0
<i>Acinetobacter baumannii</i>	1	1	0
Fungi	1	0	1
		1.4/1000 vs. 0.6/1000 catheter-days Hazard ratio: 0.39 [0.16 to 0.93], P=0.030	

NNT
117 catheters
(if the duration of insertion is 10 days in mean)

Les CHXIS diminue la colonisation cutanée à l'ablation



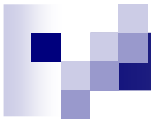
Countact	All N=2903 (629 missing)	Control dressings n=1358 (327 missing)	CHX dressings n=1545 (302 missing)
Sterile	1887 (65.0)	786 (57.8)	1101 (71.3)
1 to 9 cfu	326 (11.2)	148 (10.9)	178 (11.5)
10 to 99 cfu	462 (15.9)	261 (19.2)	201 (13)
Greater or equal than 100 cfu	228 (7.90)	163 (12)	65 (4.2)

P < 10⁻⁴ Cochran Armitage test for trend

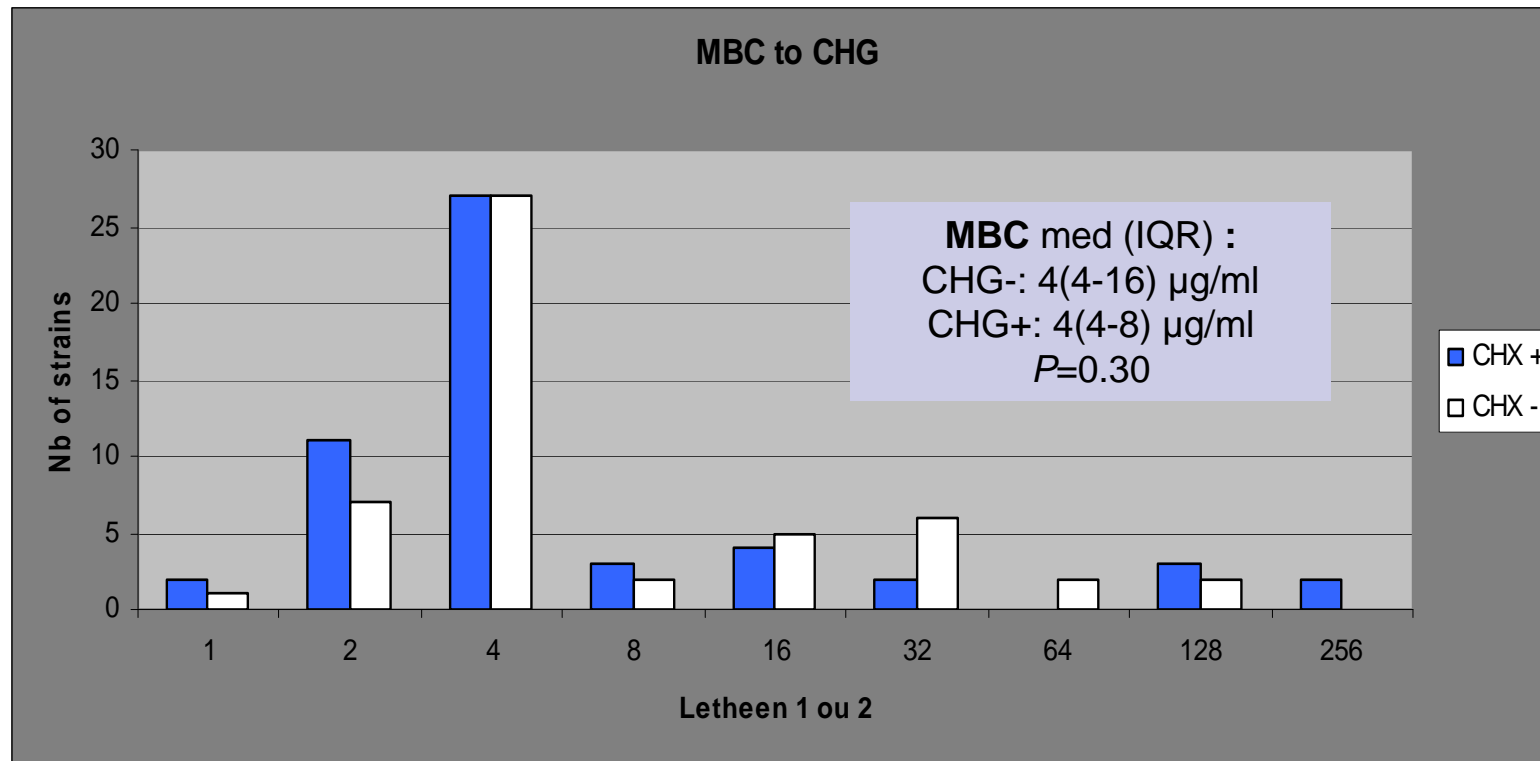
La CMB à la chlorexidine des bactéries persistant sur la peau n'est pas plus élevée:

Contrôle: mediane (IQR) 4(4-16) µg/ml

CHXIS : Mediane (IQR) 4(4-8) µg/ml *P*=0.30



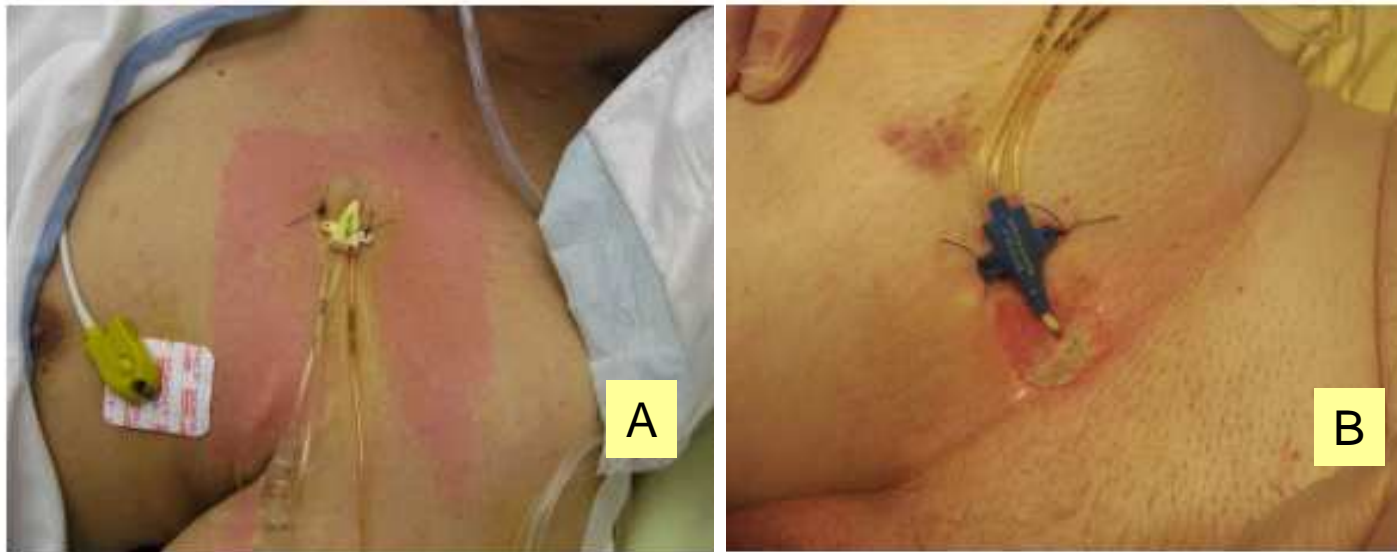
MBC of strains recovered in a panel of positive contact in CHG and control dressings n=106*



(*) A random sample of positive strains recovered from 25 skin cultures in each study group

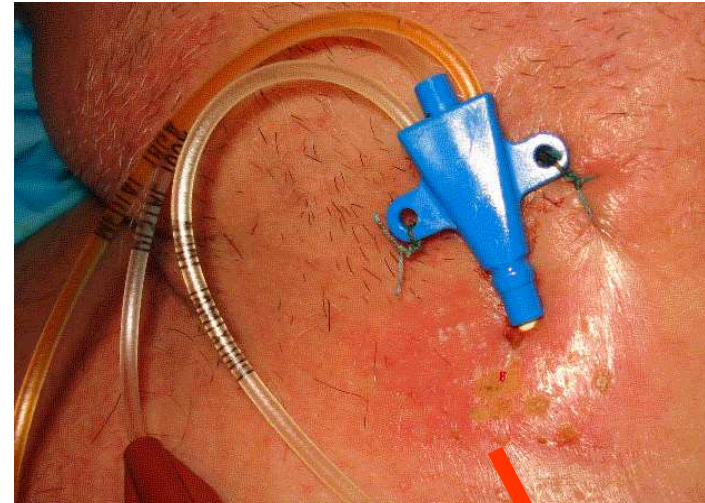
Effets indésirables

- Score ICDRG significativement plus élevé dans les bras CHXIS (98/6484, 1.51%) que dans les bras contrôle (62/5875, 1.06%, $P=0.03$)
- Dermatite de contact sévère chez 8 CHXIS patients
 - 10 cathéters, 10.4/1000 patients and 5.3/1000 catheters)



A- Allergie aux pansements transparents avec « protection par l'éponge Biopatch

B- Dermatite de contact observant motivant l'ablation du cathéter, cicatrisation en moins d'une semaine



- Site

Radial : 3

Femoral : 3

Jugular : 2

Sub-clavian: 2

- Delay of occurrence : 14 days (3 – 27 days)

- Skin healing : 3 to 7 days

- Underlying conditions:

oedema – delicate skin– long-term steroids – multiple organ failure





Conclusion

- L'intervalle entre 2 pansements de cathéter central ou artériel en réanimation peut être étendu à 7 jours sans risque à condition de détecter et de refaire immédiatement tous les pansements souillés ou décollés
- Les éponges imprégnées de chlorhexidine (Biopatch TM) diminue le risque d'infection liées aux cathéters même si le risque de base est déjà inférieur à 2 pour 1000 jour-catheter.

Cost-effectiveness study





Economic evaluation of chlorhexidine-impregnated sponges for preventing catheter-related infections in critically ill adults in the Dressing Study

Carole Schwebel, MD, PhD; Jean-Christophe Lucet, MD, PhD; Aurélien Vesin; Xavier Arrault, PD; Silvia Calvino-Gunther, RN; Lila Bouadma, MD, PhD; Jean-François Timsit, MD, PhD



Methods

- Ancillary study
- Evaluation of the prolongation of ICU stay using a multistate model (Beyersmann J et al (2006) ICHE; 27: 493-9.)
- Micro-costing technique (hospital point of view)
 - Cost of dressing
 - Cost of one infection
- Univariate sensitivity analysis about the cost of one infection, the incidence of infection, the rate of unplanned dressings

Global cost of dressings (146 audits)

Centre	Nurses	Material	Global	Nb of dressings per centers
01	\$10,4	\$2,7	\$13,1	1142
02	\$2,8	\$4,0	\$6,8	4251
03	\$3,8	\$3,8	\$7,6	1121
04	\$4,2	\$4,7	\$8,8	1713
05	\$6,9	\$1,9	\$8,8	1213
06	\$9,1	\$2,5	\$11,5	2973
07	\$6,6	\$3,2	\$9,8	524

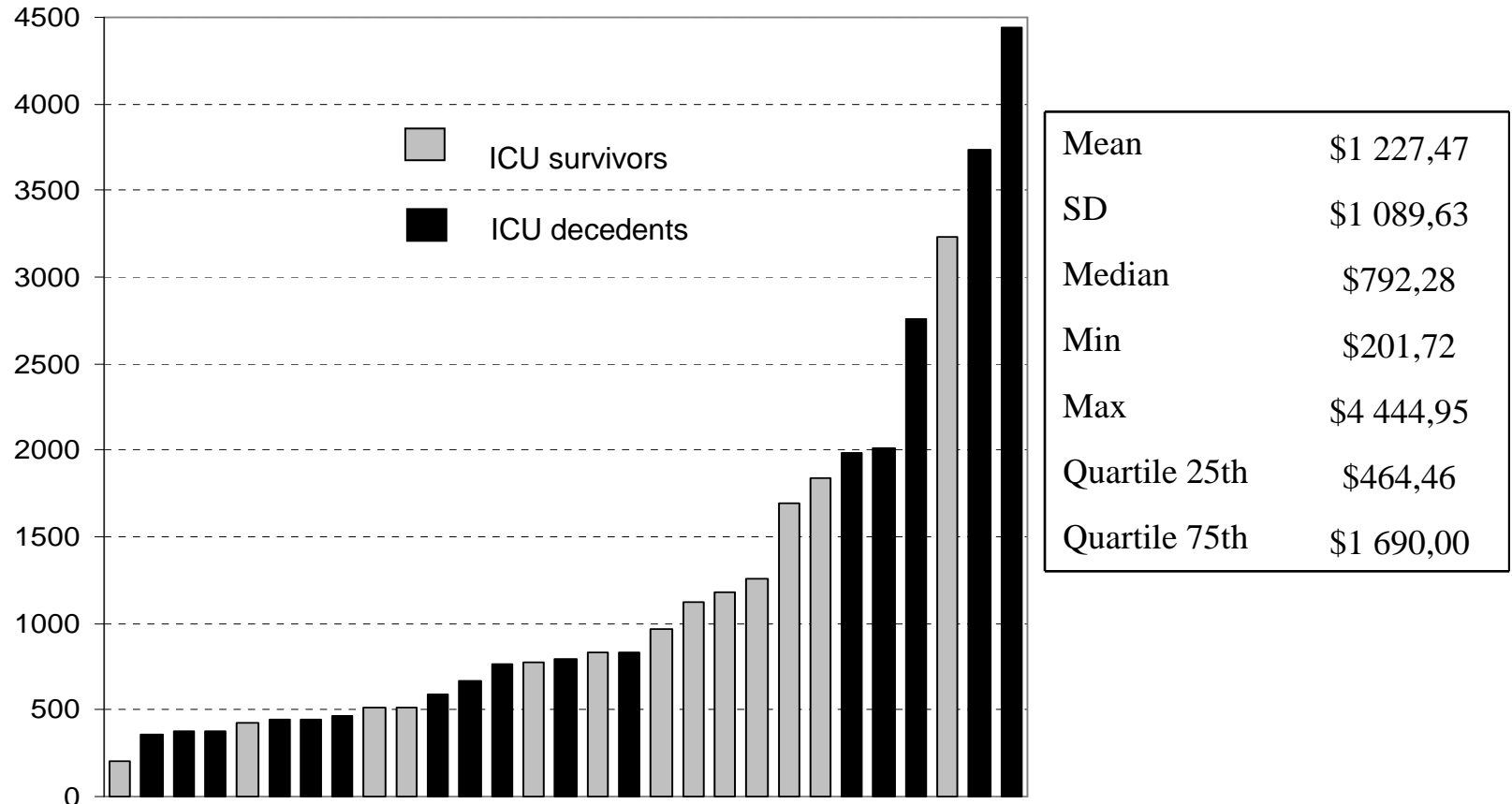
9.08 \$

+



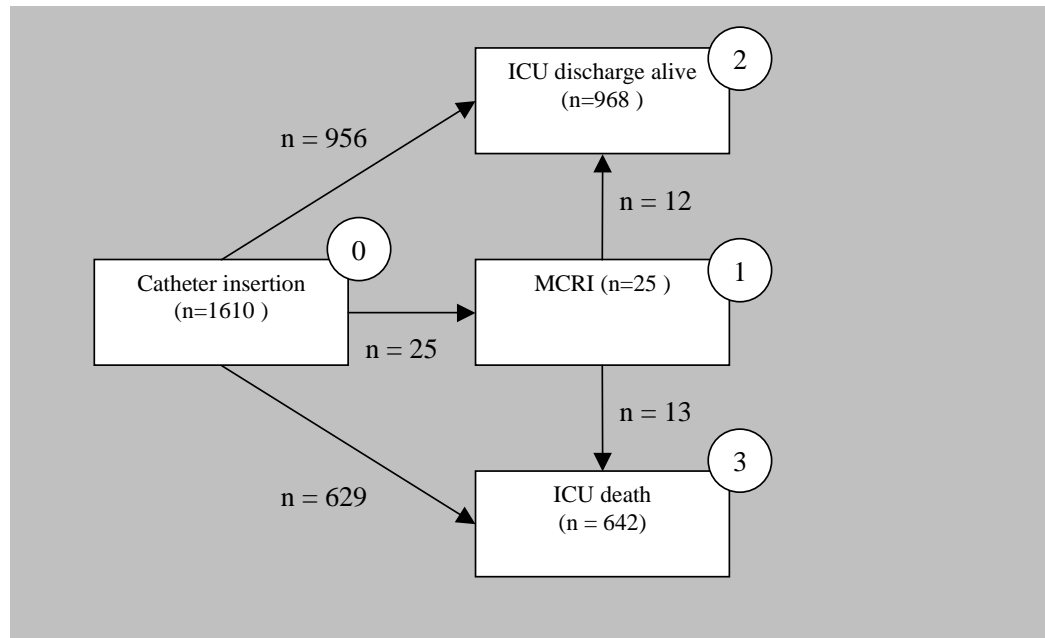
29 CRI (23 CR-BSI)

\$US



Direct costs of the Catheter-related infection in the dressing study:
 cost of drugs delivery, dosage and exams were only taken into account

Increase in the duration of ICU stay due to CRI



- Progressive disability model (*Beyersmann J et al (2006) ICHE; 27: 493-9.*)

11 days 95% CI [-2 ; 26]

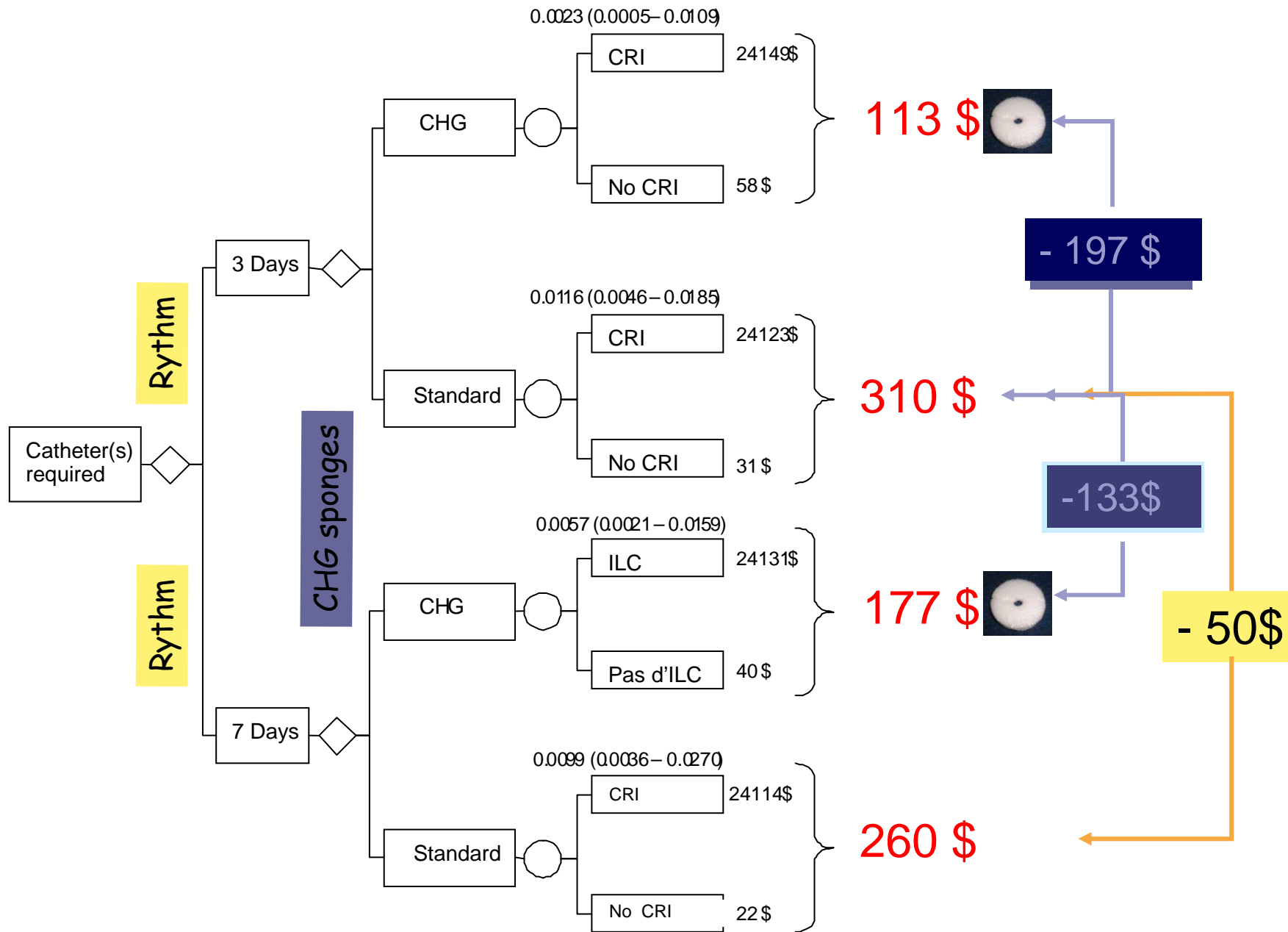
- Cost of one ICU day (national cost database : 2118\$)
 - *Were excluded biological, and radiological exams and operative procedures*

Overall cost : 23 298 \$ [-4236 \$; 55 068 \$]

- Literature :
 - Mean cost \$36 941 compris entre \$3 124 et \$60 536

Warren et al Crit Care Med 2006

Expected cost saving per catheter inserted according to strategies



Univariate sensitivity analyses

Parameter	Condition for positive cost/benefit ratio	
	3 days	7 days
Hazard Ratio CHGIS vs standart	HR < 0.90	HR < 0.79
CRI rate	> 0.141 %	> 0.212 %
Global cost of one CRI*	> 2940 \$	> 4400 \$

() less than 2 days of ICU stay*



Conclusion

- The use of CHGIS (Biopatch TM)
 - is cost-beneficial in ICU
 - Even if
 - The extra length of stay due to the CRI is not greater than 2 days
 - The rate of CRI is as low as 0.21% (0.3 pour 1000 catheter-days)
 - The true decrease in CRI is not greater than 21% (HR < 0.79)

Although we did not unmask any increase in antimicrobial or antiseptic resistance using Biopatch a strict surveillance of ecological impact of CHG impregnated sponges is needed if extensively used.

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

Ye et al – AJIC 2011;39:647-54

Table 1. Base case input parameters used in the model

Input parameter	Value	Source
Clinical inputs		
No. of implantable CVCs per year	3,078	Assumes 400-bed hospital (60 ICU, 340 non-ICU with 72% occupancy)
Impregnated CVCs	50%	Assumption
Non-impregnated CVCs	50%	Assumption
Average duration of implantation	10 days	Ho and Litton, ²¹ 2006
CR-BSIs per 1,000 CVC-days	1.93	Edwards et al, ¹⁷ 2009
Rate of local site infection per CVC	10%	Pembererton et al, ¹⁹ 1996
Percent decrease risk of CR-BSIs with CHG-impregnated sponge dressing		
Nonimpregnated CVCs	69%	Timsit et al, ⁸ 2009
Impregnated CVCs	44%	Ruschulte et al, ⁹ 2009
Percentage decrease risk in local site infection with CHG-impregnated sponge dressing		
Impregnated CVCs	47%	Ho and Litton, ²¹ 2006
Nonimpregnated CVCs	47%	Ho and Litton, ²¹ 2006
Economic inputs		
Additional length of stay because of CR-BSI (days)	8.0	Pittet et al, ⁴ 1994
Maximum CHG-impregnated sponge dressing wear time (days)	7.0	CHG-impregnated sponge dressing package insert recommendation ¹³
Average number of CHG-impregnated sponge dressings per CVC	2	Calculated based on duration of CVC and maximum wear time
Cost per CR-BSI	\$25,000	Crawford et al, ¹⁶ 2004, and O'Grady et al, ²² 2002
Cost of a local site infection	\$399	Saint et al, ²³ 2000
Price of CHG-impregnated sponge dressing per unit	\$6.56	J & J Wound Management Price List, February 2009 ²⁹

CHG, chlorhexidine gluconate; CR-BSI, catheter-related bloodstream infection; CVC, central venous catheter; ICU, intensive care unit.

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

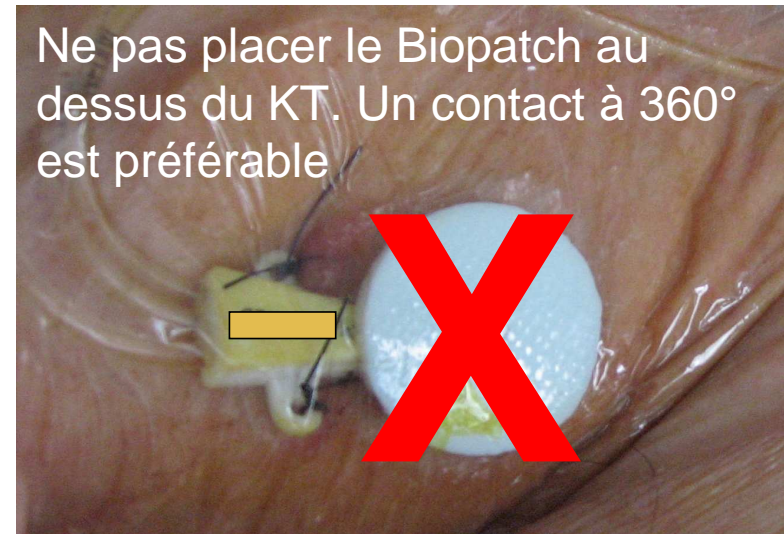
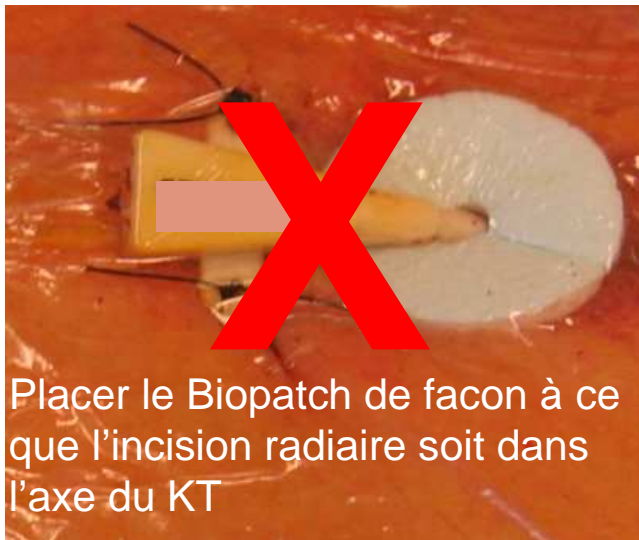
Ye et al – AJIC 2011;39:647-54

Table 2. Base case clinical and economic consequences

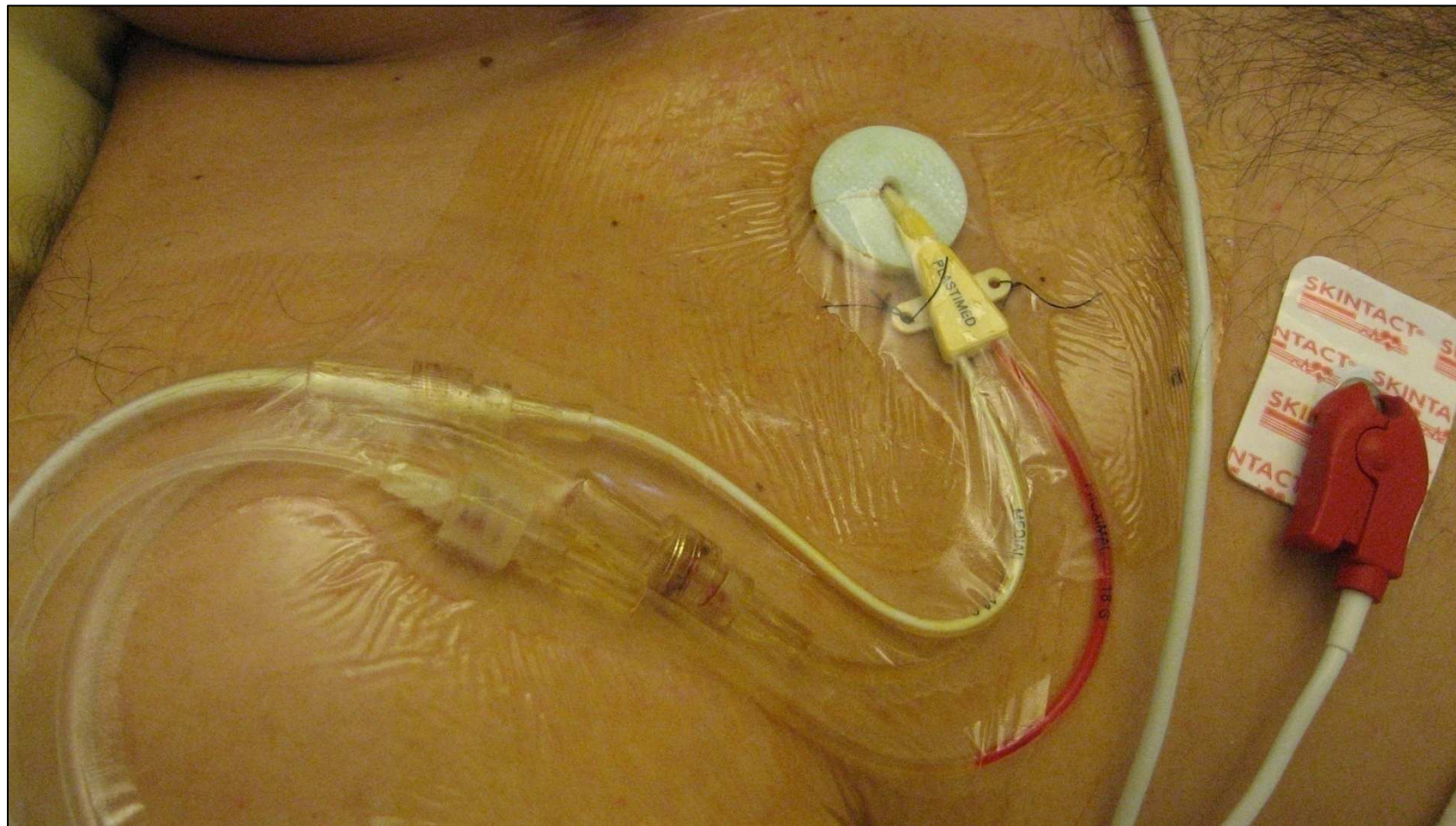
Outcome	Standard CVC management	CVC management with CHG-impregnated sponge dressing	Events avoided/cost savings with CHG-impregnated sponge dressing
Clinical consequences			
Annual number of CR-BSIs	59	24	35
Annual number of local site infections	308	163	145
Number of additional ICU days because of CR-BSI	475	194	281
Annual CR-BSI mortality, n	6	2	4
Economic consequences			
Cost of CHG-impregnated sponge dressing	\$0	\$40,383	-\$40,383
Cost of CR-BSIs	\$1,485,135	\$606,655	\$878,480
Cost of local site infections	\$122,812	\$65,090	\$57,722
Total costs/savings	\$1,607,947	\$712,129	\$895,818

CHG, chlorhexidine gluconate; CR-BSI, catheter-related bloodstream infection; CVC, central venous catheter; ICU, intensive care unit.

Éponges CHG en routine....



Bien positionner le Biopatch





Prevention of central venous catheter related infections with chlorhexidine gluconate impregnated wound dressings: a randomized controlled trial

Heiner Ruschulte • Matthias Franke • Petra Gastmeier •
 Sebastian Zenz • Karl H. Mahr • Stefanie Buchholz •
 Bernd Hertenstein • Hartmut Hecker •
 Siegfried Piepenbrock

Ann Hematol Jul 2008

	Control	Study	Total
Characteristics			
Patients (n)	301	300	601
Median age (years)	47 (range: 18–73)	47 (18–71)	
Gender (male/female)	178/123	155/145	333/268
Neutropenia (days total/average)	2,100/6.9	2,266/7.5	4,366/7.2
Catheterization (days total/average)	4,745/15.76	4,986/16.62	9,731
Insertion sites			
Internal jugular vein	251	239	490
Subclavian vein	50	61	111
CVC-related infections			
Infection at IJV insertion (% of all IJV, n=490)	34 (6.12%)	19*	53
Infection at SCV insertion (% of all SCV, n=111)	4 (3.60%)	14*** (2.86%)	44
Pathogens found causing CRBSI			
<i>Staphylococcus epidermidis</i>	22	11	33
<i>Staphylococcus aureus</i>	1	1	2
<i>Staphylococcus hominis</i>	1	2	3
<i>Staphylococcus haemolyticus</i>	2	1	3
<i>Enterococcus faecalis</i>	1	2	3
<i>Pseudomonas aeruginosa</i>	2	0	2
<i>Escherichia coli</i>	2	1	3
<i>Lactobacillus spp.</i>	1	0	1
<i>Candida albicans</i>	2	0	2
<i>Candida tropicalis</i>	0	1	1

P=0.045
 P=0.028

Meta-analyse incluant les nouvelles études (JFT-

Inserm U823)

Study	Intervention	Controls	CVC days)
Chambers	2/58	12/54	62.5 dys
Garland	12/335	11/370	17.7 dys
Levy	3/74	4/71	5.75 dys
Maki	8/665	24/736	« ICU »
Roberts	1/17	0/16	7 dys
Timsit	6/1847	17/1685	6 dys
Ruschulte	19/300	34/301	16.62 dys

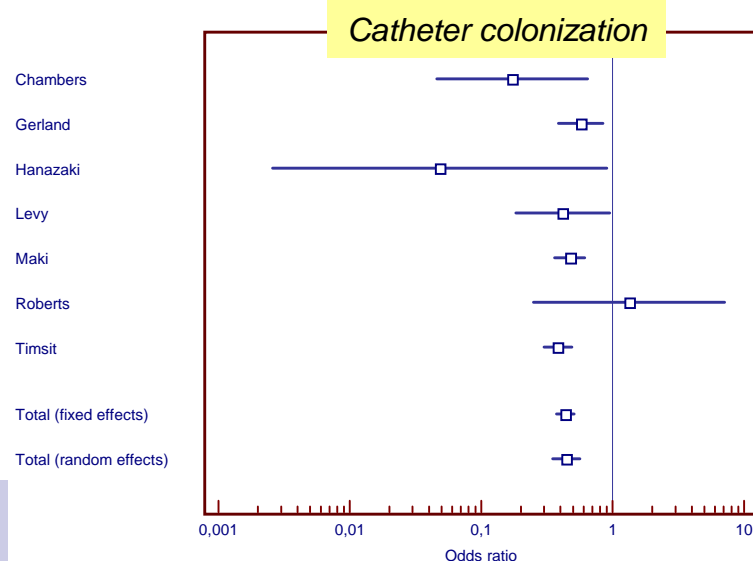
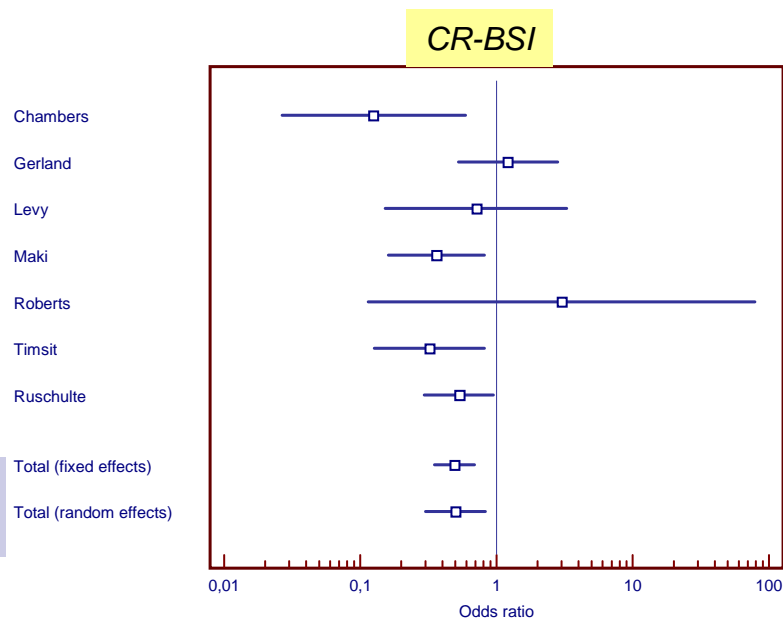
Test for heterogeneity $Q = 10,3494$, $DF = 6$, $P = 0,1107$

Total (fixed)	51/3296	102/3233	OR=0,493 [0,35-0,70]
Total (random)	51/3296	102/3233	OR=0,499 [0,30-0,84]

Study	Intervention	Controls
Chambers	3/58	13/54
Gerland	47/335	82/370
Hanazaki	0/25	7/25
Levy	11/74	21/71
Maki	109/665	216/736
Roberts	4/17	3/16
Timsit	97/1847	213/1685

Test for heterogeneity $Q = 9,0345$, $DF = 6$, $P = 0,1716$

Total (fixed)	271/3021	555/2957	OR=0,435 [0,372-0,510]
Total (random)	271/3021	555/2957	OR=0,443 [0,348-0,564]



KT de courte durée/ réanimation

Quel site? Quel type?

	Central-vein cath.	Arterial cath.
	HR, 95%CI	HR, 95%CI
CR BSI	0.31, 0.099- 0.970	0.15, 0.019-1.130
Colonization	0.42, 0.317- 0.552	0.33,0.225- 0.483
M CRI	0.42, 0.159-1.125	0.39, 0.101-1.470

	Jugular	Subclavian	Femoral	Radial
	HR, 95%CI	HR, 95%CI	HR, 95%CI	HR, 95%CI
CR BSI	0.48, 0.116-1.980	0.18, 0.023-1.360	0.36, 0.063-2.043	infinite
Colonization	0.52, 0.331-0.802	0.54, 0.304-0.951	0.33, 0.219-0.505	0.29, 0.169-0.491
M CRI	0.49, 0.137-1.775	0.18, 0.023-1.360	1.61, 0.336-7.694	infinite



Résistance à la CHG

- CMI Gram +(CNS++) < Gram neg
- Diminution de la bactéricidie pour: *Proteus* sp. *Providencia*, *P. aeruginosa*
- Résistance chromosomique inductible par passage répétés: *P. aeruginosa*, *Providencia* sp., *P. cepacia*
- Résistance induite des SARM (qac A gene)

Noguchi et al – JMM 2005

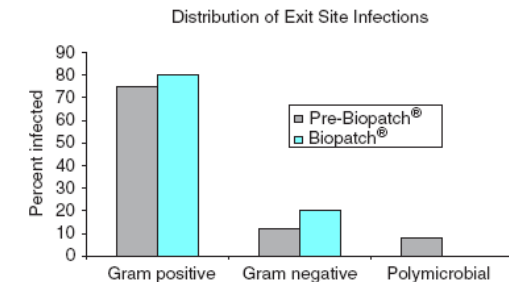
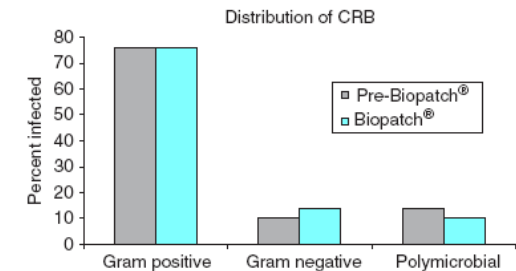
Batra et al –K1774- 49th ICAAC 2009

Long-term hemodialysis catheters in children

Onder et al - Hemodialysis International 2009; 13:11–18

- Before after study, 5 years, 70 children
- Tunneled cuffed catheters

- No decrease in BSI
- No difference in overall catheter survival
- No resistance to Abx, no cutaneous reaction
- But decrease in ESI
- Potential interest in allowing GWX



	Pre-Biopatch® Era January 1999–June 2001 N= 38	Biopatch® Era July 2001–December 2003 N= 40	P value
Exit site infections	9 patients infected with 20 infections	3 patients infected with 5 infections	< 0.05
ESI/1,000 catheter days	1.1	0.2	< 0.05
CRB	32 patients infected 81 CRB	32 patients infected 107 CRB	NS
CRB/1,000 catheter days	4.2	5.5	NS
Overall catheter survival days ± SD	233 ± 178	254 ± 135	NS
Catheters lost to malfunction/break	18/77 (23%)	25/98 (26%)	NS

CRB=catheter-related bacteremia; N=Number; NS; Non-significant; SD=Standard deviation; SI=exit site infections.



A crossover intervention trial evaluating the efficacy of a CHGIS in reducing catheter-related bloodstream infections among patients undergoing hemodialysis.

Camins BC et al - Infect Control Hosp Epidemiol. 2010 Nov;31(11):1118-23.

- Prospective, nonblinded, crossover
- Two outpatient dialysis centers.
- A total of 121 patients who underwent dialysis through tunneled CVC
 - incidence of 6.3 CRBSIs per 1,000 dialysis sessions
 - 30 CRBSIs control group/ 7 CHGIS group
- risk ratio, 1.22 [95% CI, 0.75-1.97]; P = .46)
- Only 2 patients (<2%) experiencing dermatitis

Comparison of Oligon catheters and chlorhexidine-impregnated sponges with standard multilumen central venous catheters for prevention of associated colonization and infections in intensive care unit patients: A multicenter, randomized, controlled study

Kostoula Arvaniti, MD; Dimitrios Lathyris, MD; Phyllis Clouva-Molyvdas, MD; Anna-Bettina Haidich, PhD; Eleni Mouloudi, MD; Eleni Synnefaki, MD; Vasiliki Koulourida, MD; Dimitrios Georgopoulos, MD; Nikoleta Gerogianni, MD; Georgios Nakos, MD; Dimitrios Matamis, MD; for the Catheter-Related Infections in ICU (CRI-ICU) Group

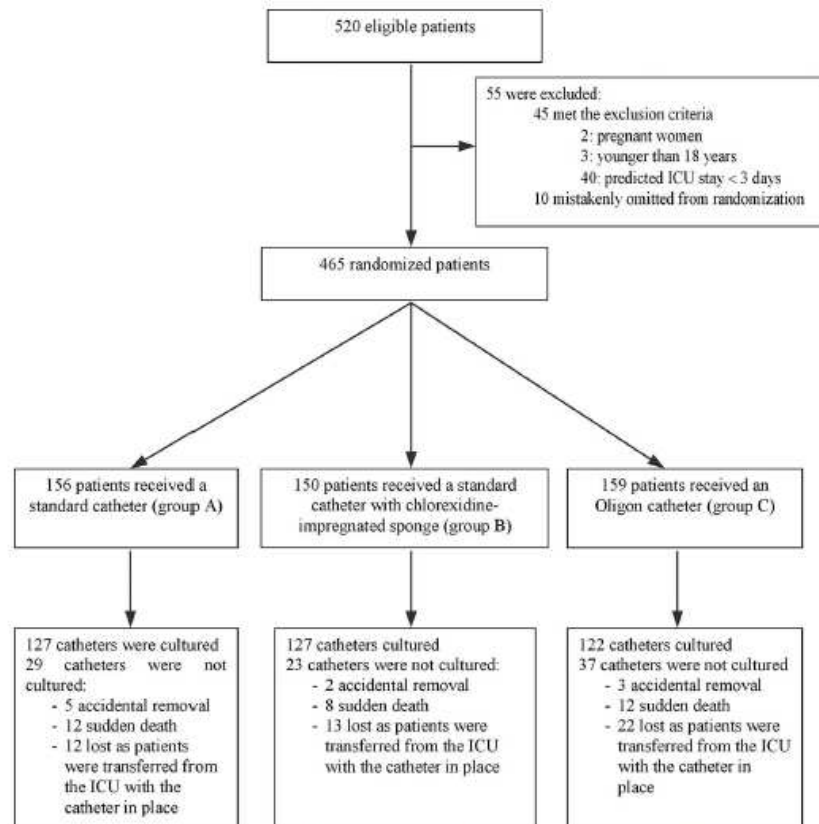


Figure 1. Flow chart of patients/catheters enrolled in the study. ICU, Intensive care unit.

- 5 ICU Grecs
- CHGIS placé après 24heures
- Procédure unique mais PVI aqueuse seulement
- Kt non cultivé si dc
- Bloc de permutation de 10!!!! Avec 3 groupes
- Enveloppes scellées
- Evaluation par le réanimateur revue par 2 autres réanimateurs en aveugle
- KT non cultivés considérés comme non infecté et stérile
- 219 par bras prévu
- Arrêt prématuré car difficulté d'inclusion

Comparison of Oligon catheters and chlorhexidine-impregnated sponges with standard multilumen central venous catheters for prevention of associated colonization and infections in intensive care unit patients: A multicenter, randomized, controlled study

Kostoula Arvaniti, MD; Dimitrios Lathyris, MD; Phyllis Clouva-Molyvdas, MD; Anna-Bettina Haidich, PhD; Eleni Mouloudi, MD; Eleni Synnefaki, MD; Vasiliki Koulourida, MD; Dimitrios Georgopoulos, MD; Nikoleta Gerogianni, MD; Georgios Nakos, MD; Dimitrios Matamis, MD; for the Catheter-Related Infections in ICU (CRI-ICU) Group

Characteristic	All Patients (Intention-to-Treat) (n = 465)	Group A (Standard Central Venous Catheter) (n = 156)	Group B (Chlorhexidine–Gluconate- Impregnated Sponge) (n = 150)	Group C (Oligon Central Venous Catheter) (n = 159)	p
Age, median (IQR), y	59 (39.5–72)	59 (40–72)	57 (32.5–70)	63 (46–73)	.02
Men (no., %)	324 (69.7)	112 (71.8)	109 (72.7)	103 (64.8)	.23
More than one comorbidities (no., %)	291 (63.0)	96 (61.5)	91 (61.0)	104 (65.4)	.65
Comorbidities (no., %)					
Immunodeficiency ^b	37 (7.9)	16 (10.2)	9 (6)	12 (7.5)	.39
Cancer	37 (7.9)	19 (12.2)	4 (2.7)	14 (8.8)	.01
Chronic obstructive pulmonary disease	59 (12.7)	22 (14.1)	15 (10)	22 (13.8)	.48
Diabetes	42 (9)	18 (11.5)	12 (8)	12 (7.5)	.12
McCabe (no., %)					
None or nonfatal underlying disease	438 (94.2)	147 (94.2)	147 (98)	144 (90.6)	.02
Ultimately or rapidly fatal underlying disease	27 (5.8)	9 (5.8)	3 (2)	15 (9.5)	
Acute Physiologic And Chronic Health Evaluation II on ICU admission, median (IQR)	22 (17–24.5)	22 (17–26)	22 (16–24.5)	22 (17–24)	.75
Duration of catheterization, median (IQR), days	7 (5–9)	7 (5–9)	7 (5–9)	7 (5–9)	.72
Catheter-days (no., %)	3353	1152	1054	1147	
Insertion site (no., %)					
Internal jugular	89 (19.1)	30 (19.2)	26 (17.3)	33 (20.7)	.75
Subclavian	163 (35.1)	53 (34)	55 (36.7)	55 (34.6)	.87
Femoral	213 (45.8)	73 (46.8)	69 (46)	71 (44.7)	.93
Antibiotics on CVC removal (no., %)	117 (25.2)	39 (25)	39 (26)	39 (24.5)	.95
Antibiotics (≥1) effective for the isolated bacteria (no., %)	15 (12.8)	3 (7.7)	7 (17.9)	5 (12.8)	.40
Propofol infusion (no., %)	196 (42.2)	73 (46.8)	55 (36.7)	68 (42.8)	.20
Blood infusion (no., %)	94 (20.2)	37 (23.7)	20 (13.3)	37 (23.3)	.04
Total parenteral nutrition (no., %)	105 (22.6)	35 (22.4)	31 (20.7)	39 (24.5)	.71



Comparison of Oligon catheters and chlorhexidine-impregnated sponges with standard multilumen central venous catheters for prevention of associated colonization and infections in intensive care unit patients: A multicenter, randomized, controlled study

Kostoula Arvaniti, MD; Dimitrios Lathyris, MD; Phyllis Clouva-Molyvdas, MD; Anna-Bettina Haidich, PhD; Eleni Mouloudi, MD; Eleni Synnefaki, MD; Vasiliki Koulourida, MD; Dimitrios Georgopoulos, MD; Nikoleta Gerogianni, MD; Georgios Nakos, MD; Dimitrios Matamis, MD; for the Catheter-Related Infections in ICU (CRI-ICU) Group

Table 3. Catheter colonization/infection and catheter-related bloodstream infections^a

	Group A (Standard Central Venous Catheter) (n = 156)	Group B (Chlorhexidine-Gluconate- Impregnated Sponge) (n = 150)	Group C (Oligon Central Venous Catheter) (n = 159)	Chlorhexidine-Gluconate- Impregnated Sponge vs. Standard Central Venous Catheter Unadjusted Hazard Ratio (95% Confidence Interval)	<i>p</i>	Oligon vs. Standard Central Venous Catheter Unadjusted Hazard Ratio (95% Confidence Interval)	<i>p</i>
No. of catheter-days	1148	1054	1147				
Catheter colonization							
No. of catheters (%)	24 (15.38)	21 (14)	25 (15.72)	1.21 (0.56–2.61)	.64	1.0 (0.46–2.21)	.98
Incidence, per 1000 catheter-days	20.9	19.92	21.79				
Catheter-related infection, nonbacteremic							
No. of catheters (%)	9 (5.76)	6 (4)	7 (4.40)	0.65 (0.23–1.85)	.42	0.72 (0.27–1.95)	.52
Incidence, per 1000 catheter-days	7.83	5.69	6.10				
Catheter-related bloodstream infection							
No. of catheters (%)	2 (1.28)	3 (2)	2 (1.25)	1.65 (0.27–10.01)	.59	0.75 (0.11–5.38)	.78
Incidence, per 1000 catheter-days	1.4	2.84	1.74				

^aUnadjusted hazard ratios in the intention-to-treat analysis stratified by center.

Table 4. Cox proportional hazards model for catheter colonization and stratified for center^a

Variables	Adjusted Hazard Ratio	(95% Confidence Interval)	<i>p</i>
Type of CVC			
Chlorhexidine-gluconate-impregnated sponge vs. standard CVC	1.19	(0.63–2.25)	.59
Oligon CVC vs. standard CVC	1.21	(0.67–2.18)	.53
Insertion site			
Internal jugular vein vs. subclavian vein	3.29	(1.26–8.61)	.01
Femoral vein vs. subclavian vein	3.36	(1.17–9.65)	.02
Cancer	2.29	(1.06–4.94)	.03
Age	1.01	(0.99–1.02)	.46
Blood infusion	1.06	(0.49–2.28)	.88
McCabe score (none or non fatal underlying disease)	3.12	(0.88–11.1)	.08

CVC, central venous catheter.

^aThe hazard ratios are adjusted for insertion site, cancer, age, blood administration, McCabe score (none or nonfatal underlying disease).

Comparison of Oligon catheters and chlorhexidine-impregnated sponges with standard multilumen central venous catheters for prevention of associated colonization and infections in intensive care unit patients: A multicenter, randomized, controlled study


Kostoula Arvaniti, MD; Dimitrios Lathyris, MD; Phyllis Clouva-Molyvdas, MD; Anna-Bettina Haidich, PhD; Eleni Mouloudi, MD; Eleni Synnefaki, MD; Vasiliki Koulourida, MD; Dimitrios Georgopoulos, MD; Nikoleta Gerogianni, MD; Georgios Nakos, MD; Dimitrios Matamis, MD; for the Catheter-Related Infections in ICU (CRI-ICU) Group

Raisons possibles

Manque de puissance
 Population (trauma)
 PVI aqueuse, Accès fémoral
 Mise en place des CHGIS à J1
 Flore particulière
 Apprentissage de la procédure
 Dermatite=0

Variable	Number (%) All Patients (Intention-to-Treat) (n = 465)	Group A (Standard CVC) (n = 156)	Group B (Chlorhexidine- Gluconate- Impregnated Sponge CVC)	
			Group B (n = 150)	Group C (Oligon CVC) (n = 159)
Catheter colonization (no., %)	70 (15.05)	24 (15.4)	21 (14)	25 (15.7)
<i>Acinetobacter baumannii</i>	26 (37.1)	8 (33.3)	11 (52.34)	7 (28)
<i>Pseudomonas aeruginosa</i>	8 (11.4)	1 (4.2)	4 (19)	3 (12)
<i>Klebsiella</i> spp.	7 (10)	4 (16.7)	0 (0)	3 (12)
<i>Enterobacter</i> spp.	3 (4.3)	2 (8.4)	0 (0)	1 (4)
Other Gram-negative bacteria	3 (4.3)	0 (0)	2 (9.5)	1 (4)
<i>Staphylococcus aureus</i>	2 (2.89)	1 (4.2)	0 (0)	1 (4)
Coagulase-negative staphylococci	19 (27.1)	7 (29.2)	4 (19)	8 (32)
<i>Enterococcus</i> spp.	1 (1.4)	0 (0)	0 (0)	1 (4)
Other bacteria	1 (1.4)	1 (4.2)	0 (0)	0 (0)
Catheter-related infection, non bacteremic (no., %)	22 (4.7)	9 (5.8)	6 (4)	7 (4.4)
<i>A. baumannii</i>	8 (36.4)	2 (22.2)	1 (16.7)	5 (71.4)
<i>P. aeruginosa</i>	3 (13.6)	2 (22.22)	1 (16.7)	0
<i>Klebsiella</i> spp.	4 (18.2)	4 (44.4)	0 (0)	0 (0)
<i>Enterobacter</i> spp.	1 (4.5)	0 (0)	0 (0)	1 (14.3)
Other Gram-negative bacteria	4 (18.2)	1 (11.11)	2 (33.3)	1 (14.3)
<i>S. aureus</i>	2 (9.1)	0 (0)	2 (33.33)	0
Coagulase-negative staphylococci	0 (0)	0 (0)	0 (0)	0 (0)
<i>Enterococcus</i> spp.	0 (0)	0 (0)	0 (0)	0 (0)
Other bacteria	0 (0)	0 (0)	0 (0)	0 (0)
Catheter-related bloodstream infection (no., %)	7 (1.5)	2 (1.3)	3 (2)	2 (1.25)
<i>A. baumannii</i>	4 (57.1)	1 (50)	1 (33.3)	2 (100)
<i>P. aeruginosa</i>	1 (14.3)	1 (50)	0 (0)	0 (0)
<i>Klebsiella</i> spp.	1 (14.3)	0 (0)	1 (33.3)	0 (0)

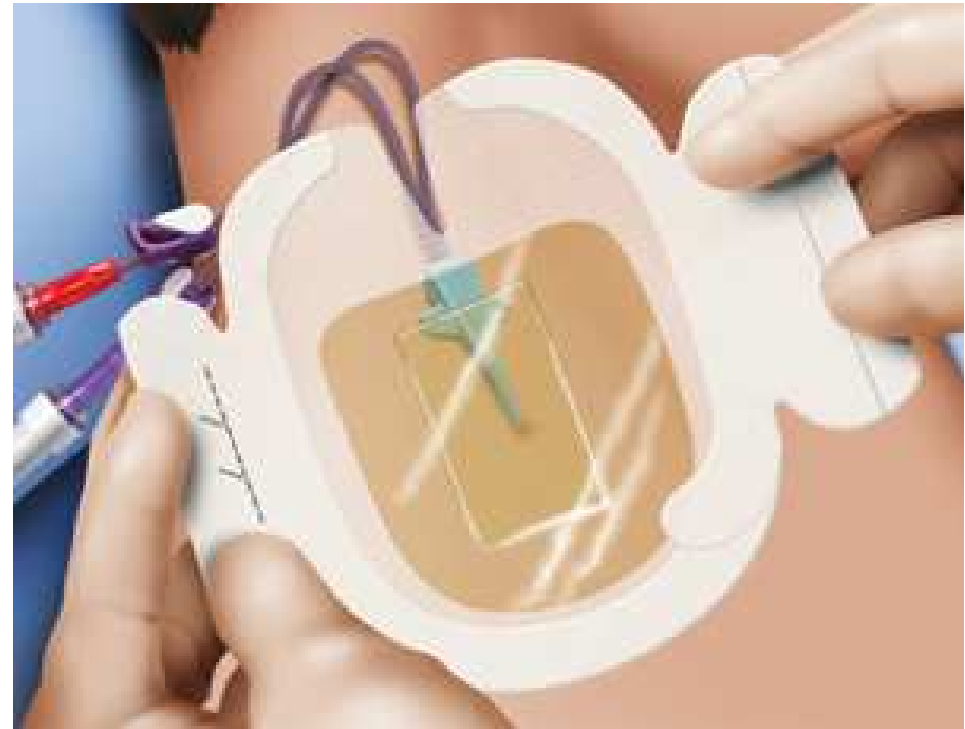
CVC: central venous catheter.



Qui bénéficie probablement des éponges imprégnées de CHG?

- KT de courte durée (<30 jours)
- Cathéters artériels et veineux centraux
- Pas de données (et rationnel physiopathologique faible) pour les KT de durée intermédiaire ou longue (> 30 jours)
- Pas de données (et rationnel physiopathologique faible) pour les KT d'hémodialyse et les CAP
- SEULEMENT si les procédures (appropriation locale) sont appliquées (indicateurs de process++)
- Avec une surveillance des taux d'ILC et de la flore colonisante et infectante...
- Doute si haute proportion de BGN très résistants (SARM, PA, Acinetobacter, KPC)
- Courbe d'apprentissage

CHG sponge or CHG gel?



CHG sponge or CHG gel?

Biopatch™

- 92mg of CHG per disk
- Reduce bacterial count over time and suppress regrowth during **at least 7 days**
- **Continuous inspection of the insertion site not possible**
- **Absorption** of 8-fold sponge-weight of exudates
- Better release of CHG due to better skin contact if properly placed ?
- **Learning curve for application, Perfect application difficult (jugular ++)**
- **Clinical studies available**

Tegaderm CHG

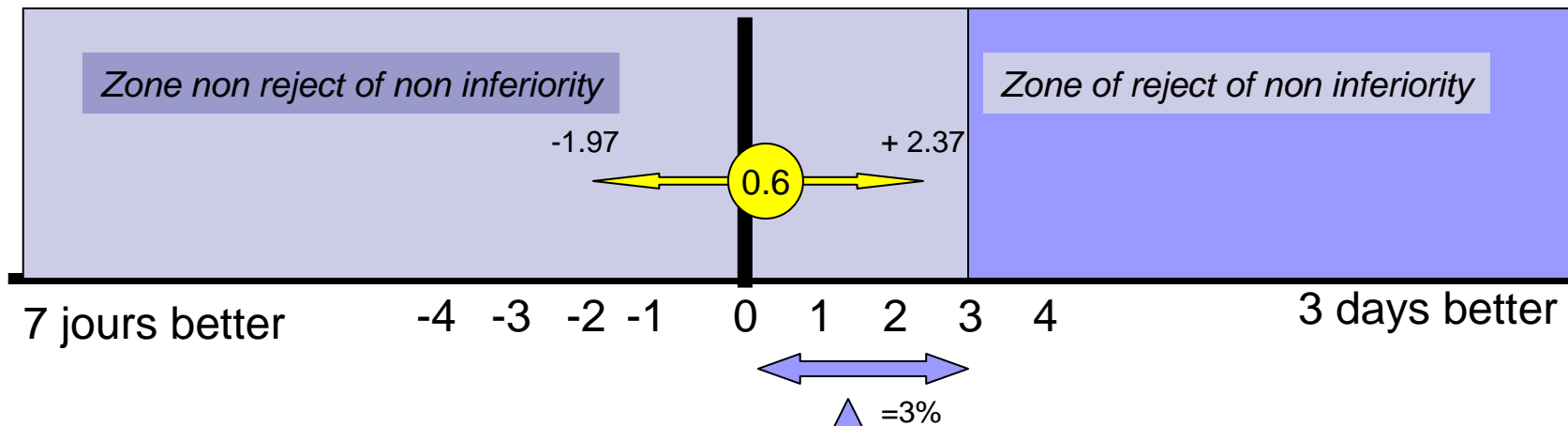
- 45 mg of CHG (3 X 4 cm)
- Identical *in vivo* time-kill of flora on unprepped skin (**> 7 days**) and prepped skin
- **Continuous inspection possible** although inferior to transparent dressings
- **Absorption possible but slower than the sponge**
- Skin under the catheter not in contact with CHG (discordant results)
- **Application and removal easy**
- **No clinical studies supporting efficacy**



Un pansement tous les 7 jours n'est pas inférieur à un pansement tous les 3 jours

	All assessable catheters N=3532	3-day changes* n=1657	7-day changes* n=1828
Significant catheter colonization	310 (8.8)	142 (8.6)	168 (9.2)
<i>S. aureus</i>	16	7	9
Coag.-negative staphylococci	153	73	80
Other gram positive cocci	34	17	17
<i>Pseudomonas spp.</i>	53	30	23
<i>Enterobacter spp.</i>	82	33	49
<i>Escherichia coli</i>	15	5	10
<i>Acinetobacter baumannii</i>	15	5	10
Fungi	13	5	8
		Hazard ratio: 0.992 [0.771 to 1.276], P=0.949	

11.1/1000 catheter-days vs 11.7 /1000 catheter-days





3-jours vs 7 jours

Nombre moyen de changements de pansements:

3-jours 0.52 (0.30)/catheter-jours)

7-jours (0.47 (0.31)/catheter-jours); $P < 0.0001$)

Nombre de réfection prématurée des pansements

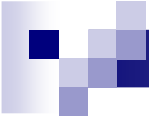
3-jours (40.6% (2562/6312)

7-jours (50.6% (3062/6047) $P < 10^{-4}$)



Impact of dressing disruption on CRI risk

- Ancillary study.
- All the catheter with at least one dressing after insertion
- Scheduled vs unscheduled (dressing disruption)
- Center, patients and catheter Risk factors of dressing disruptions
- Relationship between dressing disruption and CRI



7 ICUs/1419 patients with at least one dressing change/3275 catheters/24127 catheter-days

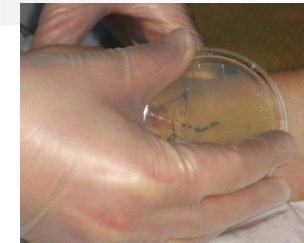
- 7347 dressings (67%) were performed before the planned date because of disruption
- Direct measures of the dressing costs: (Micro-costing)

Rate of dressing disruption >50%

Result of the hierarchical mixed model

Fixed effects	Odds Ratio	95% CI	DF	Pr > t
Intercept			7,46	0,1297
Global_cost	0,58	0,41 – 0,80	7,01	0,0132
Male	0,74	0,60 – 0,91	1148	0,0043
Metastatic cancer	0,58	0,34 – 0,98	1121	0,0405
ICU admission : coma	0,69	0,51 – 0,92	1175	0,012
SOFA admission	1,03	1,01 – 1,06	1272	0,0059
Antibiotic at cath insertion	1,26	1,04 – 1,54	3263	0,0198
Site : femoral artery	2,16	1,62 – 2,89	3263	<,0001
Site : radial artery	2,06	1,61 – 2,65	3263	<,0001
Site : not subclavian vein	1,75	1,37 – 2,25	3263	<,0001
Site : subclavian vein	1	,	,	,
Time in place : less than 4 days	1	,	,	,
Time in place : 4 to 6 days	2,1	1,66 – 2,65	3263	<,0001
Time in place : 7 to 10 days	3,4	2,62 – 4,43	3263	<,0001
Time in place : more than 10 days	4,9	3,72 – 6,46	3263	<,0001
Remaining with extra renal epuration	1,29	0,95 – 1,74	2513	0,1025
Random effects	Estimate	Standard Error		Pr Wald
Centre	0,414	0,2336		0,0764
Patient	0,8021	0,1206		<,0001

Relationship between number of disruptions and skin colonization at catheter removal

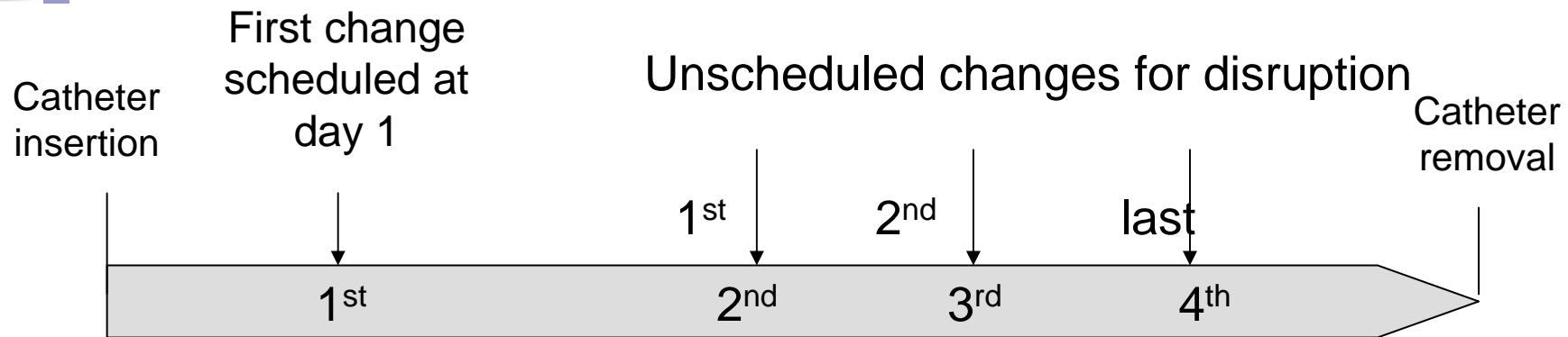


Nutritive trypticase-soy agar plate

Culture	No. (%)				
	No. of disruption by catheter				
	0 (n = 735)	1 (n = 561)	2 (n = 409)	3 (n = 304)	> 3 (n = 577)
Sterile	535 (72.79)	351 (62.57)	253 (61.86)	183 (60.20)	325 (56.33)
1-9 CFUs/plate	80 (10.88)	65 (11.59)	41 (10.02)	35 (11.51)	77 (13.34)
10-99 CFUs/plate	69 (9.39)	103 (18.36)	84 (20.54)	57 (18.75)	104 (18.02)
>=100 CFUs/plate	51 (6.94)	42 (7.49)	31 (7.58)	29 (9.54)	71 (12.31)
mean catheter days (std)	4.82 (4.07)	5.71 (4.49)	7.00 (4.92)	8.49 (5.36)	11.74 (7.13)

Skin culture at catheter removal was not performed in 689/3275 (21.04%) cases.

The relationship between cutaneous culture and number of dressing disruption was highly significant ($p < 10^{-4}$, Spearman rank correlation coefficient)



Unadjusted						
	Catheter colonization ≥ 10 ³ CFUs/ml		Catheter-related bloodstream infection		Major catheter-related infection	
	HR (95% CI)	P Value	HR (95% CI)	P Value	HR (95% CI)	P Value
First	1.64 (1.13-2.39)	0.01	3.15 (0.67-14.79)	0.15	2.66 (0.50-14.26)	0.25
Second disruption	1.52 (1.14-2.04)	0.005	5.18 (1.85-14.48)	0.002	4.31 (1.39-13.41)	0.012
Final disruption	13.54 (10.17-18.04)	<.0001	14.90 (6.40-34.64)	<.0001	13.41 (5.17-34.75)	<.0001
Adjusted*						
	HR (95% CI)	P Value	HR (95% CI)	P Value	HR (95% CI)	P Value
First disruption	1.30 (0.90-1.88)	0.16	2.64 (0.67-10.42)	0.17	1.92 (0.50-7.31)	0.34
Second disruption	1.15 (0.86-1.54)	0.34	4.50 (1.70-11.90)	0.002	3.24 (1.16-9.04)	0.025
Final disruption**	11.85 (8.85-15.88)	<.0001	13.56 (6.22-30.87)	<.0001	11.80 (4.87-28.56)	<.0001

HR: Hazard ratio.

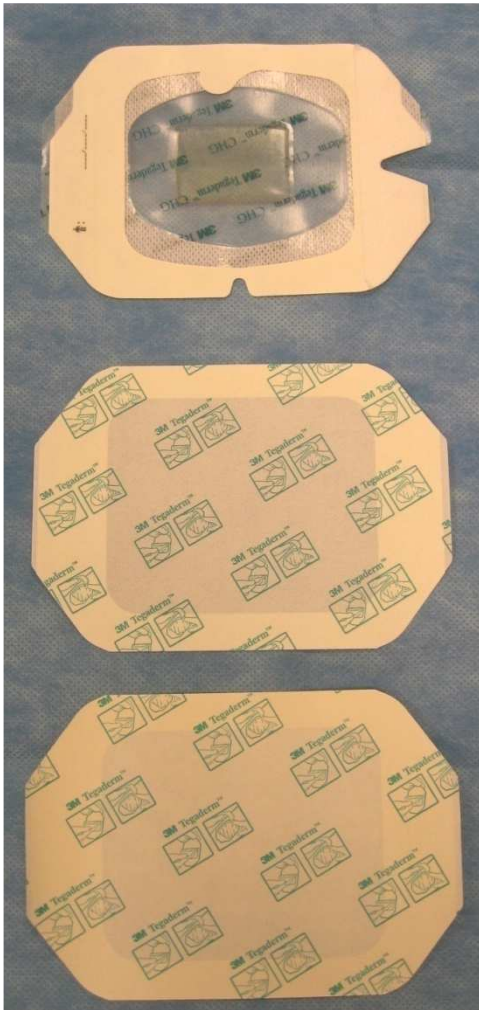
(*) Analysis adjusted on significant risk factors of events:

For catheter colonization: at least one blood pack during catheter maintenance; antibiotic within 48 hours of CVC removal; catheter insertion site; CHGIS group; trauma.

For catheter-related bloodstream infection: hematological malignancy; CHGIS group.

For major catheter-related infection: CHGIS group; hematological malignancy; age; urinary bladder at catheter removal.

(**) Final disruption referred to the disruption of the last dressing performed before catheter removal.



DRESSING 2

High performance transparent dressing containing a chlorhexidine gel for the prevention of catheter-related infections in ICUs.

OUTCOME RÉA

Purposes



- Main objective: To demonstrate that Tegaderm CHG (group 1), lowers the rate of CRI compared to classical dressings Tegaderm and Tegaderm HP.

- Secondary objectives:
 - To demonstrate that dressings having a strong adhesiveness decrease the rate of detachment.
 - To demonstrate that the rate of adherent is an element encouraging the infection of central venous catheters and of arterial catheters in intensive care units, and to quantify its importance.
 - Other: safety, colonization rate, CR-BSI rates



Judgment criteria

(Independent monitoring committee)

1. Major catheter related infection

- CR-BSI: DTP and or positive cath. tip culture+ positive BC
- Systemic Infection without BSI: purulence or positive catheter tip culture and regression of sepsis at catheter removal

2. Colonization rates

3. Rate of unstuck dressings and relationship with MCRI

4. Safety: ECOG scale

5. Cost-effectiveness analysis



Hypothesis

- Major CRI in non CHG dressing 3%
- 2 catheters per patient in mean
- Log HR (CHG use)= -0.94 ± 0.4 (*HR ratio 0.38*)
- Inter-catheter correlation = 0.02
- Randomization 2:1:1

944 patients TegadermCHG (1888 cath.)

472 patients Tegaderm (944 cath.)

472 patients Tegaderm HP (944 cath.)

- Analyses will use a Cox's models for clustered data

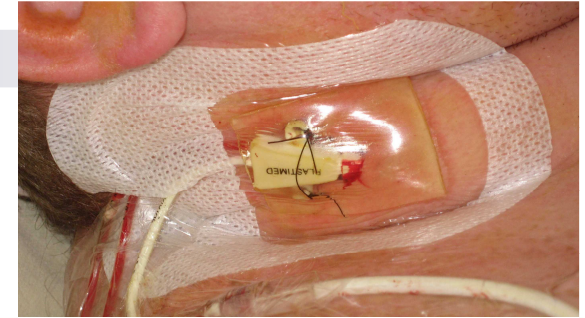


Inclusion/exclusion criteria

- CVC and/or arterial catheter > 48 hours

- Exclusion:
 - Known allergy to CHG or adhesive transparent dressing
 - PAC, PICCs, Antibiotic or antiseptic catheters.
 - Emergent insertion
 - Informed consent refusal

Unique procedure



■ Catheters

- Maximal barrier precaution
- Subclavian and radial accesses as often as possible
- Skin deterision (PVI scrub or CHX scrub) + alcoholic (70%) PVI (5%) or alcoholic CHX
- Immediate removal if no longer needed or suspicion of CRI

■ Transparent dressings (Tegaderm 3M Saint Paul MN)

- Same skin disinfection
- Immediate dressing if leakage or soiling
 - Arm 1 : Tegaderm CHG at insertion and Tegaderm HP on the first connection
 - Arm 2:Tegaderm HP
 - Arm 3:Tegaderm standart

■ Continuous monitoring

- Teaching, Audit
- Data monitoring in an electronic datafile



Cath. removal

■ Catheters


- Systematic catheter culture
- Even if non suspected of CRI
- Before ICU discharge if possible
- 2 BC + DTP if the cath. must remain in place
- And Check for further Cath. culture and sepsis after ICU discharge



Dressing 2 in practice..

Alain LEPAPE / Julien BOHE	Lyon Sud (rea médicale et chirurgicale)
Rémy GAUZIT	CHU Hôtel Dieu Paris
Maité GARROUSTE-ORGEAS	Hôpital St Joseph Paris
Elie AZOULAY	Hôpital St Louis Paris
Gaétan PLANTEFEVE	Hôpital d'Argenteuil
Gilles TROCHE	Hôpital de Versailles
Olivier MIMOZ	CHU Poitiers
Philippe MONTRAVERS / Lila BOUADMA	CHU Bichat (rea médicale et chirurgicale)
Bertrand SOUWEINE	CHU Clermont Ferrand
Djillali ANNANE	CHU Raymond Poincaré Garches
Maité GARROUSTE-ORGEAS	Hôpital St Joseph, Paris
Serge ALFANDARI	CH Tourcoing

11 hospitals / 13 ICUs



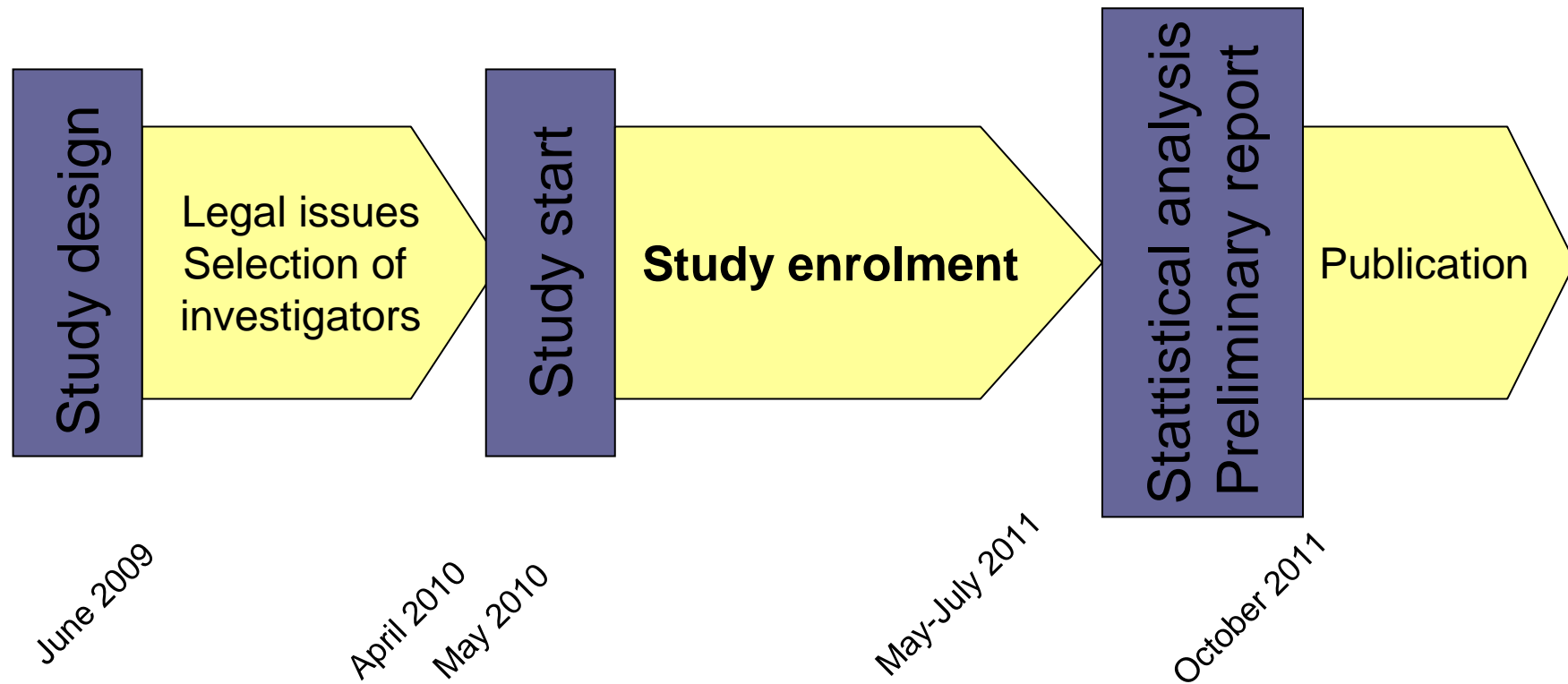
Data checking and statistical analyses

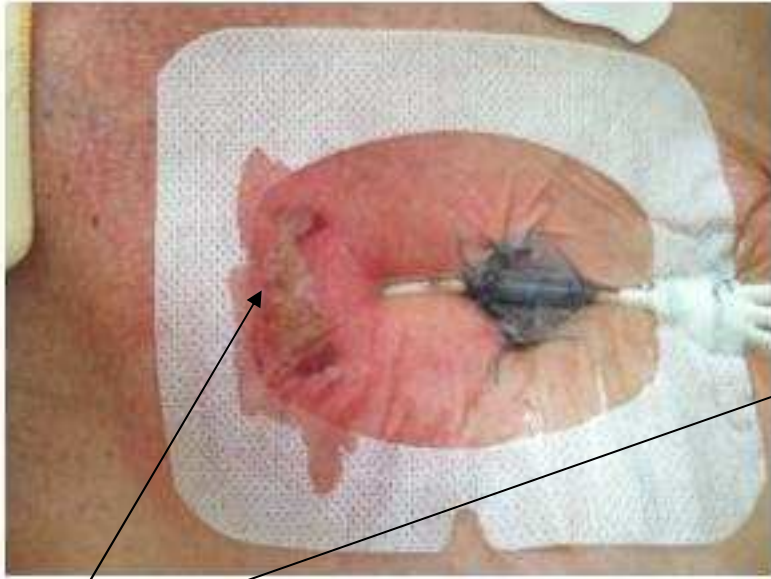
- Jean-François Timsit
- Aurélien Vésin
- Caroline Tournegros

Data monitoring committee

- Jean-Christophe Lucet
- Jean-Ralph Zahar
- Christophe Adrie
- Jacques Croize
- Safety board: Xavier Arrault

Dressing 2 in Practice





D0



D7



Prévention de l'ILC

- Surveillance appropriée++
- Optimiser les mesures simples
 - Le plus souvent réconfortant
 - Politique générale d'hygiène
 - Politique spécifique simple
 - Suivi d'indicateur de process++

- Si vous voulez tendre vers encore moins..
 - Pansements avec éponges à la CHG
 - Gels ? → résultats d'ici 1 mois...

