Optimiser la prévention des infections liées aux cathéters

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UMR 1137 DeScID: Decision Science in Infectious Diseases
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Réanimation médicale et infectieuse

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Conflicts of interest

- Symposium, Adboards
  - Merck
  - Pfizer
  - Shionogi
  - Beckton-Dickinson
- Grants to my research unit/ university
  - Pfizer
  - Merck
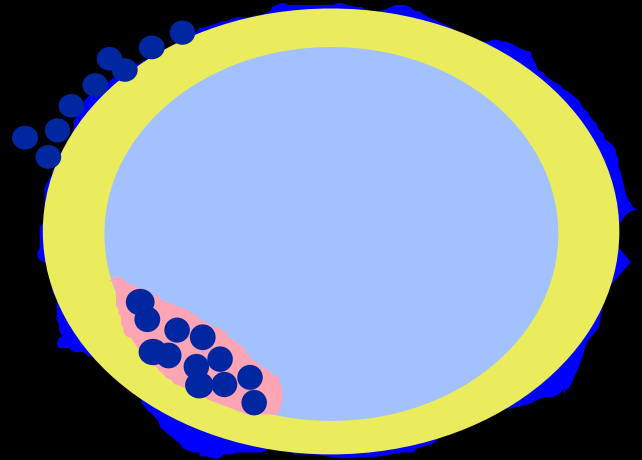 - Thermofischer
  - Biomerieux

Main routes of catheter contamination

Extraluminal: →

Skin infection:

Hematogenous seeding

Endoluminal: →

Hub contamination

Infusate contamination

Let's start from the basics

- Bundles
  - Hand hygiene
  - Strict surgical aseptic conditions
  - Avoid aqueous PVI
  - Subclavian and radial catheters preferentially
  - Remove useless catheters
  - Imediate change of dressings disrupted, soiled or moistened
- Continous quality improvement program
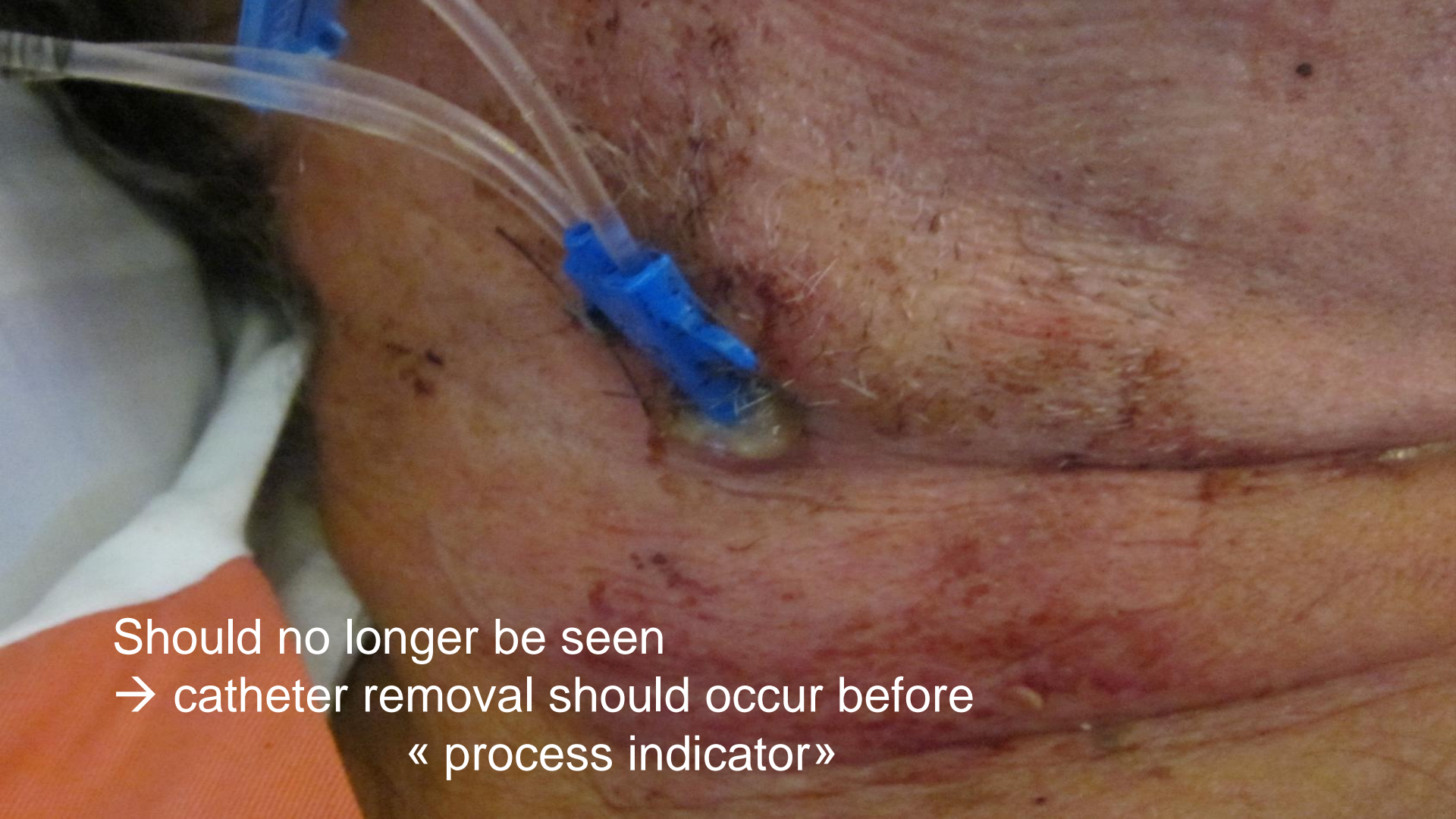- Surveillance, participation to a network

Acceptable levels of CR-BSI (< 1 / 1000 per catheter-days)

Les prescripteurs ne savent pas si les patients ont un cathéter central

Variable	Assessments/Total, n/N (%)		
	Unaware of CVC Presence [*]	Erroneously Believed CVC Was Present	Unaware of CVC Presence or Absence [†]
By provider			
House staff	39/238 (16.4)	42/729 (5.8)	81/967 (8.4)
Interns	22/115 (19.1)	16/339 (4.7)	38/454 (8.4)
Residents	17/123 (13.8)	26/390 (6.7)	43/513 (8.4)
General medicine teaching attending	33/128 (25.8)	25/388 (6.4)	58/516 (11.2)
Hospitalist	18/59 (30.5)	15/339 (4.4)	33/398 (8.3)
By service			
General medicine teaching attending or hospitalist	49/187 (26.2)	45/953 (4.7)	94/1140 (8.2)
Critical care	16/127 (12.6)	24/125 (19.2)	40/252 (15.9)
Other subspecialties	25/111 (22.5)	13/378 (3.4)	38/489 (7.8)
ICU	16/127 (12.6)	24/125 (19.2)	40/252 (15.9)
Non-ICU setting	74/298 (24.8)	58/1331 (4.4)	132/1629 (8.1)
PICC	60/239 (25.1)	—[‡]	—[‡]
Triple lumen catheter	30/192 (15.6)	—[‡]	—[‡]
Total	90/425 (21.2)	82/1456 (5.6)	172/1881 (9.1)

Erreurs par excès et par défaut

PICC> CVC
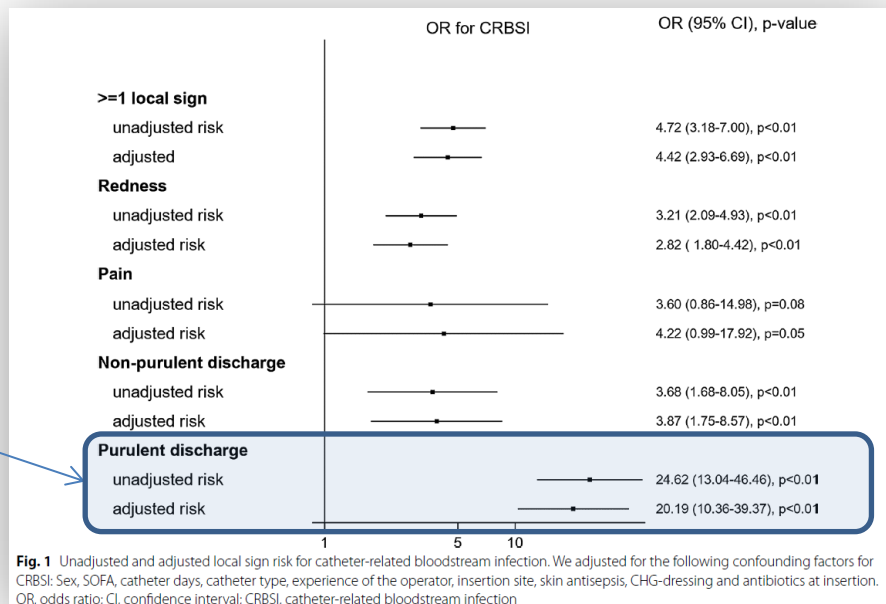Non ICU> ICU

Chopra V et al – Ann Intern Med 2014; 161:562

Should no longer be seen
→ catheter removal should occur before
« process indicator»

Local signs at insertion site and catheter-related bloodstream infections: an observational post hoc analysis using individual data of four RCTs
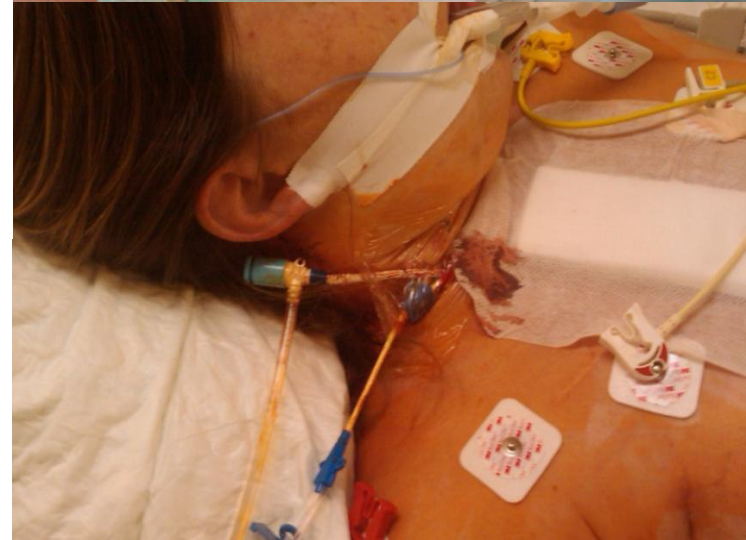
Niccolò Buetti[1,10*], Stéphane Ruckly[1], Jean-Christophe Lucet[1,2], Lila Bouadma[1,3], Maité Garrouste-Orgeas[1,4], Carole Schwebel[5,11], Olivier Mimoz[6,7,8], Bertrand Souweine[9] and Jean-François Timsit[1,3]

5RCTs/ 25 ICUs
6976 patients/14,590 catheters
(101,182 catheter-days)
114 CRBSI

Fig. 1 Unadjusted and adjusted local sign risk for catheter-related bloodstream infection. We adjusted for the following confounding factors for CRBSI: Sex, SOFA, catheter days, catheter type, experience of the operator, insertion site, skin antisepsis, CHG-dressing and antibiotics at insertion. OR, odds ratio; CI, confidence interval; CRBSI, catheter-related bloodstream infection

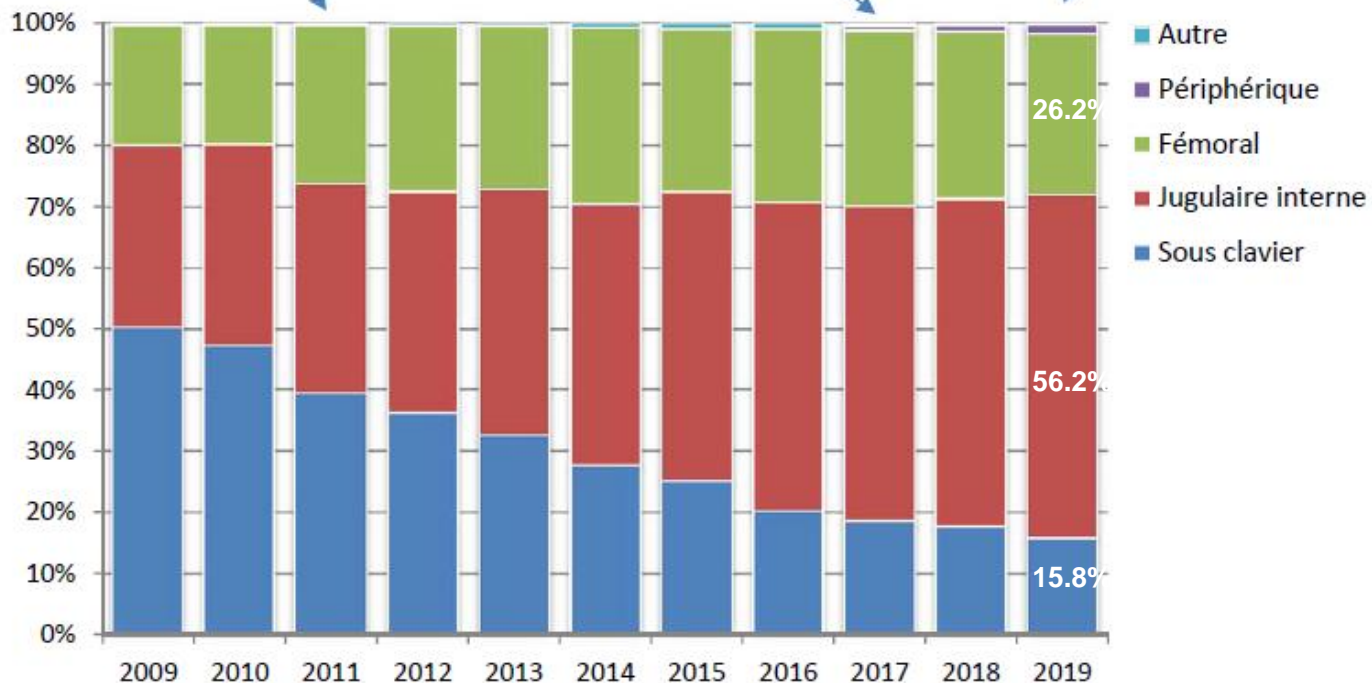|	OR for CRBSI	OR (95% CI), p-value
>=1 local sign		
unadjusted risk		4.72 (3.18-7.00), p<0.01
adjusted		4.42 (2.93-6.69), p<0.01
Redness		
unadjusted risk		3.21 (2.09-4.93), p<0.01
adjusted risk		2.82 (1.80-4.42), p<0.01
Pain		
unadjusted risk		3.60 (0.86-14.98), p=0.08
adjusted risk		4.22 (0.99-17.92), p=0.05
Non-purulent discharge		
unadjusted risk		3.68 (1.68-8.05), p<0.01
adjusted risk		3.87 (1.75-8.57), p<0.01
Purulent discharge		
unadjusted risk		24.62 (13.04-46.46), p<0.01
adjusted risk		20.19 (10.36-39.37), p<0.01

La voie jugulaire est sale par essence …

Recueil des cathéter d'hémodialyse

Recueil des sites d'insertion périphérique (PICC) parmi les CVC
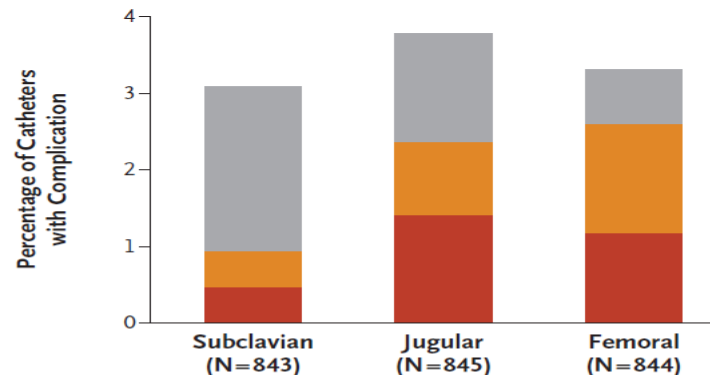
Recueil et analyse des PICC à part

Année 2011 : recueil des CHD / 2017 : recueil des sites d'insertion périphérique (=PICC) parmi les CVC / 2019: recueil et analyse individualisées des PICC.

Intravascular Complications of Central Venous Catheterization by Insertion Site

Jean-Jacques Parienti, M.D., Ph.D., Nicolas Mongardon, M.D.,
Bruno Mégarbane, M.D., Ph.D., Jean-Paul Mira, M.D., Ph.D.,
Pierre Kalfon, M.D., Ph.D., Antoine Gros, M.D., Sophie Marqué, M.D.,
Marie Thuong, M.D., Véronique Pottier, M.D., Michel Ramakers, M.D.,
Benoît Savary, M.D., Amélie Seguin, M.D., Xavier Valette, M.D.,
Nicolas Terzi, M.D., Ph.D., Bertrand Sauneuf, M.D.,
Vincent Cattoir, Pharm.D., Ph.D., Leonard A. Mermel, D.O.,
and Damien du Cheyron, M.D., Ph.D., for the 3SITES Study Group*

Subclavian

→ Less BSI
→ less DVT
→ more insertion failure
→ more pneumothorax

	Subclavian (N=843)	Jugular (N=845)	Femoral (N=844)
Mechanical (grade ≥3)	18 (2.1%)	12 (1.4%)	6 (0.7%)
Symptomatic deep-vein thrombosis	4 (0.5%)	8 (0.9%)	12 (1.4%)
Bloodstream infection	4 (0.5%)	12 (1.4%)	10 (1.2%)

Figure 2. Complications in the Three-Choice Comparison, According to Insertion-Site Group.

The primary end point (the composite of symptomatic deep-vein thrombosis and bloodstream infection) differed significantly among the insertion-site groups (P=0.02 by the log-rank test), as did the principal safety secondary end point (mechanical complications) (P=0.047 by the chi-square test).

Parienti JJ et al – NEJM 2015; 373: 1320-29

Fémorale vs Jugulaire interne?

Jugulaire

  plutôt chez la femme
  durée d'insertion > 4 jours
  obèses

Fémorale

  plutôt chez l'homme
  maigre
  durée d'insertion < 5 jours

Parienti JJ et al – Jama 2013; Timsit et al – Am J Respir Crit Care Med 2013; 188: 1232-9

R1.1 - Pour diminuer le risque d'infection lié aux voies veineuses centrales, il faut utiliser la voie sous-clavière plutôt que la voie fémorale ou jugulaire, en l'absence de contre-indication* . Cette recommandation ne s'applique pas aux cathéters veineux utilisés pour l'épuration extra-rénale.

GRADE 1+

R1.2 - Il ne faut probablement pas préférer l'abord jugulaire interne à l'abord fémoral lors de la pose d'un cathéter veineux central pour diminuer le taux d'infection.

GRADE 2-

(*) les contre indications usuellement reconnues sont : troubles de l'hémostase primaire ou secondaire sévère : thrombopénies < 50 G/L ou TP<30% (INR>2) et un rapport pa02/fIO2<200 mmHg et toute situation pour lesquels les risques de barotraumatismes sont importants.

- **R1.13 La littérature ne permet pas d'émettre de recommandation concernant le changement de cathéter sur guide en présence d'une dysfonction de cathéter ou devant une suspicion d'infection. AVIS D'EXPERTS**

PICCs

Thrombosis (→ 29.5%):
Gauge of the CVC
Nb lumens
Power PICCs *(protective)*
Heparin-statin use *(protective)*
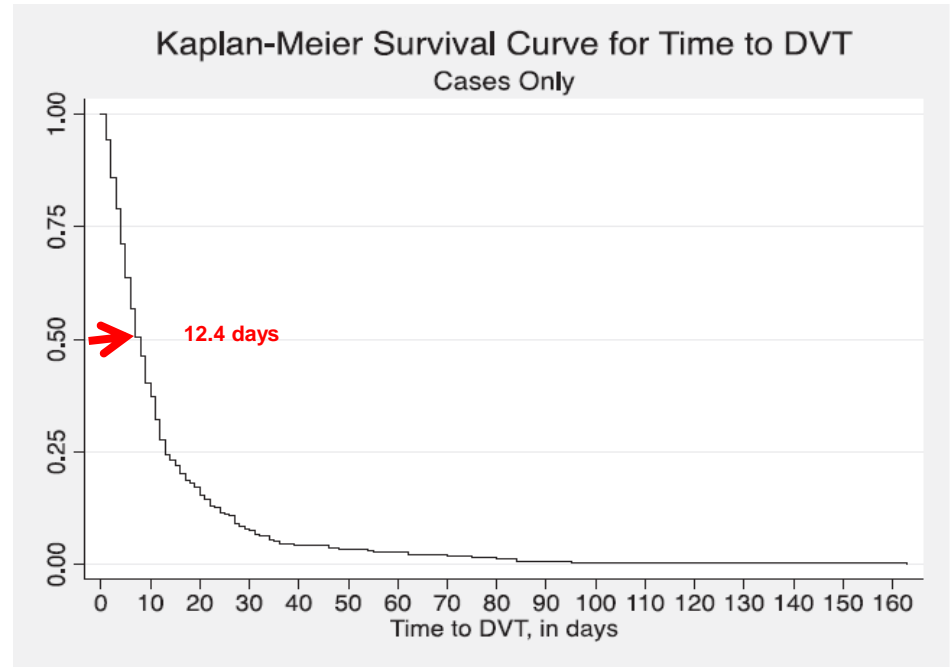Interventional radiology
Surgical patients
ICU

CLA-BSI (6%~ CVC)
Gauge
Nb lumens (power PICCS)
ICU setting
Long term ABx use *(protective)*

Kaplan-Meier Survival Curve for Time to DVT
Cases Only

12.4 days

Time to DVT, in days

Adapted from: Chopra V et al - Lancet 2013; 382: 311; Chopra V et al Amer J Med ; 127;79; Sharp R et al – Intern J Nurse studies 2015; 52:677; Chopra V et al – Thombosis research 2015; 135:829

Accidents liés aux cathéters: un meilleur indicateur que l'ILC?

- Grading des complications grace à une méthode Delphi

- Suivi prospectif: 628 patients/ 2214 catheters
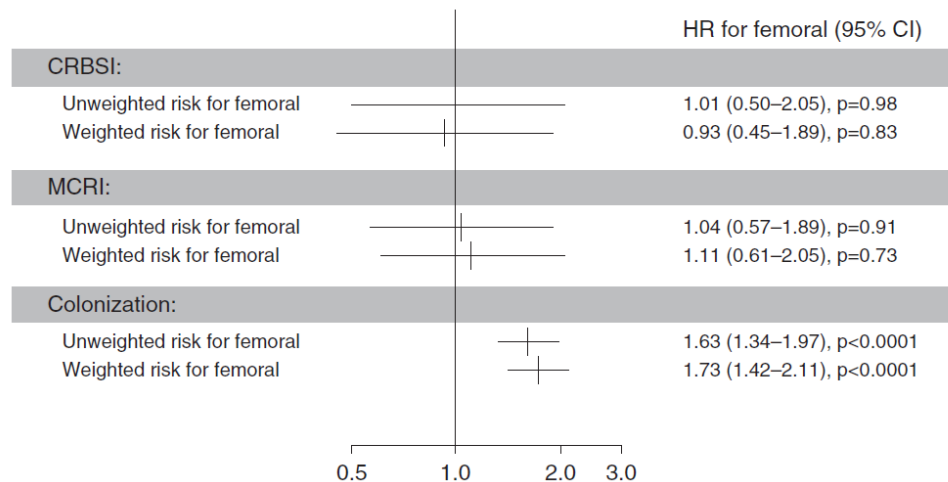KTC 29%, KTA 23% KTD 9% Kt periph 39%

Les complications sévères, très sévères ou fatales ne sont pas celles que l'on croit…

Thromboses nécessitant un traitement spécifique:	n=22 (1 fatale)
Dysfonctionnement graves (KTD et KTA):	n=47
Extravasation avec séquelles cutanées graves:	n= 2
Ablation accidentelles avec consequences sévères:	n=0
Infections systémiques (3) dont 2 bactériémiques:	n=3

Femoral or radial artery?

	Radial (n = 2,867 Pa n = 4,117 Cathet	Femoral (n = 1,449 Patients; n = 2,256 Catheters)
Patients (n = 4,316*)		
Sex, F	919 (32.1)	559 (38.6)
Age, yr, median (IQR)	62 (51–73)	66 (54–76)
Diabetes mellitus	183 (6.4)	96 (6.6)
Chronic respiratory failure	173 (6)	79 (5.5)
Immunosuppression	248 (8.7)	161 (11.1)
Reason for ICU admission		
Shock	922 (32.2)	699 (48.2)
SAPS II, median (IQR)	48 (36–62)	59 (46–74)
Catheters (n = 6,373)		
Experience of the operator (<50 procedures)	2,494 (60.6)	1,295 (57.4)
Mechanical ventilation at insertion	3,063 (74.4)	1,791 (79.4)
Vasopressor at insertion	1,784 (43.3)	1,434 (63.6)
Antibiotic at insertion	2,452 (59.6)	1,367 (60.6)
CRBSI	21 (0.5)	10 (0.4)
MCRI	31 (0.8)	15 (0.7)
Catheter colonization	265 (6.4)	194 (8.6)

HR for femoral (95% CI)

CRBSI:
Unweighted risk for femoral — 1.01 (0.50–2.05), p=0.98
Weighted risk for femoral — 0.93 (0.45–1.89), p=0.83

MCRI:
Unweighted risk for femoral — 1.04 (0.57–1.89), p=0.91
Weighted risk for femoral — 1.11 (0.61–2.05), p=0.73

Colonization:
Unweighted risk for femoral — 1.63 (1.34–1.97), p<0.0001
Weighted risk for femoral — 1.73 (1.42–2.11), p<0.0001

0.5 1.0 2.0 3.0

After IPTW adjustment no difference between both risk of infection. AC colonization higher for femoral arteral catheters.

05:43

HD

01:45

HD

Strict surgical asepsis

	Study	Y/N	BSI
Mermel 1991	ICU Observ.	86 (ICU) 211 (BO)	RR : 0.48 (0.19-0.91)
Raad 1994	Oncology RCT	176 167	RR : 0.32 (0.10-0.96) (colonization)
Sherertz 2000	ICU Before/ after	2009 3093	4.51 vs 3.23 per 1000 catheter-days
Ishikawa 2010	Surgery RCT	211/213	1.5 vs 1.6 per 1000 catheter-days

4. CATHETER INSERTION

4.1 MAXIMAL STERILE BARRIERS:

- sterile gloves,

- long-sleeved sterile gown

- procedure mask

- Cap

- large sterile sheath drape

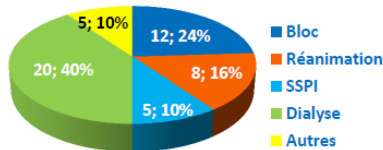→ **should represent the standard**

Improper / Proper

5377 observations de la tenue des professionnels

	KTC	VP	CCI	B1	B2
Nombre des observations	332	2064	733	1798	450
Casaque Stérile	85 % (282)	/	/	/	/
Tenue propre	/	98 % (2030)	98 % (716)	99 % (1777)	99 % (447)
Port du masque	99 % (328)	/	100% (732)	/	94% (424)
Masque Conforme	98 % (323)	/	98 % (718)	/	97 % (413)
Port d'une coiffe	98% (326)	/	56% (411)	/	/
Coiffe conforme	94 % (313)	/	88% (362)	/	/
Conformité globale	79 % (262)	98 % (2030)	48 % (350)	99 % (1777)	91 % (450)

Absence de casaque stérile 15%

Bloc 12; 24%
Réanimation 8; 16%
SSPI 5; 10%
Dialyse 20; 40%
Autres 5; 10%

Enquête observa4 2020
Sylvie Beaune/ Agnes Petiteau.

https://www.spiadi.fr/app/files/observa4.e37f7258edb8b64219df8e8aa9163876.pdf

Maximal barrier sterile precautions

Echo-guidage

- R1.9 - Il faut insérer les cathéters veineux **jugulaires internes** sous contrôle échographique pour réduire le nombre de complications mécaniques.

  GRADE 1+

- R1.10 - Il faut probablement insérer les cathéters **sous-claviers** sous contrôle échographique pour diminuer le nombre de complications mécaniques.

  GRADE 2+

- R1.11 - Les experts suggèrent d'insérer les cathéters **fémoraux** sous contrôle échographique pour diminuer le nombre de complications mécaniques

  AVIS D'EXPERTS

- R1.12 - Les experts suggèrent de canuler **l'artère radiale et fémorale** sous contrôle échographique pour réduire le nombre de complications mécaniques.

  AVIS D'EXPERTS

- Ped R.2 - Pour l'abord veineux central chez le nourrisson et l'enfant, à l'exclusion de la néonatalogie, il faut probablement privilégier **l'abord supra claviculaire échoguidé** de la veine brachiocéphalique pour diminuer le nombre de ponctions et les complications mécaniques immédiates.
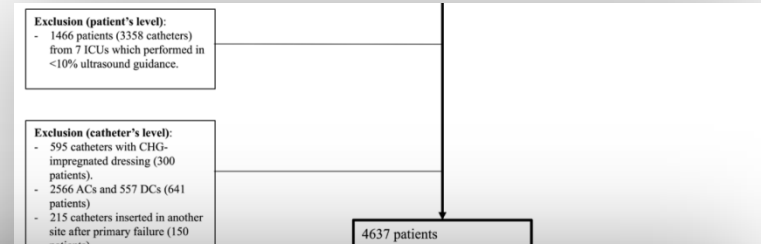
  GRADE 2+

- Ped R.3 - Chez l'enfant, les experts suggèrent le **site radial plus que fémoral** lors de la pose d'un cathéter artériel afin de diminuer le risque de thrombose.

  AVIS D'EXPERTS

Ultrasound Guidance and Risk for Central Venous Catheter–Related Infections in the Intensive Care Unit: A Post Hoc Analysis of Individual Data of 3 Multicenter Randomized Trials

Niccolò Buetti,[1,2] Olivier Mimoz,[3] Leonard Mermel,[4] Stéphane Ruckly,[1] Nicolas Mongardon,[5] Claire Dupuis,[1] Jean-Paul Mira,[6] Jean-Christophe Lucet,[1,7] Bruno Mégarbane,[8] Sébastien Bailly,[9] Jean-Jacques Parienti,[10,11] and Jean-François Timsit[1,12]

Exclusion (patient's level):
- 1466 patients (3358 catheters) from 7 ICUs which performed in <10% ultrasound guidance.

Exclusion (catheter's level):
- 595 catheters with CHG-impregnated dressing (300 patients).
- 2566 ACs and 557 DCs (641 patients).
- 215 catheters inserted in another site after primary failure (150 patients).

4637 patients

Table 3.   Key Points for Optimal Ultrasound-Guided Central Venous Catheter Insertion With Focus on Infection Prevention Measures

1. Preprocedure
Operators should be familiar with the operation of their specific US machine prior to initiation of a vascular access procedure.
Use a high-frequency linear transducer with a long sterile sheath to perform vascular access procedures.
Use single-use sterile transmission gel.
Operators should evaluate the target blood vessel size and depth during preprocedural ultrasound evaluation.
2. Techniques
Operators should use a standardized procedure checklist that includes the use of real-time US guidance.
US guidance should be combined with aseptic technique and maximal sterile barrier precautions.
The needle tip should never be in contact with the sterile sheath of transducer.
3. Training
Novice operators should complete a systematic training program before attempting US-guided CVC insertion independently on patients.
Cognitive training in US guided CVC insertion should include infection prevention strategies.
Trainees should demonstrate minimal competence in infection prevention measures before placing US-guided CVCs independently.
Competency assessments should include formal evaluation of knowledge in infection prevention measures using standardized assessment tools.
Periodic proficiency assessment of all operators should be conducted to ensure maintenance of competency.

Buetti et al - Curr Opin Crit Care 2020, 26:459–465

A non adherent dressing need to be changed immediately

Dressings

Timsit et al - Crit Care Med 2012; 40: 1707

Dressing disruption is a major risk factor for catheter-related infections

Jean-François Timsit; Lila Bouadma; Stéphane Ruckly; Carole Schwebel; Maïté Garrouste-Orgeas; Régis Bronchard; Silvia Calvino-Gunther; Kevin Laupland; Christophe Adrie; Marie Thuong; Marie-Christine Herault; Sebastian Pease; Xavier Arrault; Jean-Christophe Lucet

Post hoc analysis;
3275 catheters with at least one dressing change (24127 catheter-days)

- 7347 dressings (67%) were performed before the planned date because of disruption

- Disruption increased skin colonization at catheter removal

- Number of disruption and disruption of the final dressing increased by 2-15 fold increase in CR-BSI

Dressing disruption is associated with dressing performance time

Outcome variable=disruption $\geq 50\%$

ICU		
Dressing cost	0.58/euros	0.01
Patient		
Male	0.74	0.004
Metastatic cancer	0.58	0.04
Coma	0.69	0.012
Sofa	1.03 per point	0.006
Duration of cath maintenance	1.1 per day	$<10^{-4}$
Catheter		$<10^{-4}$
Subclavian vein	1	
Femoral artery	2.16	
Radial artery	2.06	
Femoral or jugular vein	1.75	

High performance (HP) vs standard dressings

- HP decreased unscheduled dressing change:

  highly adhesive group (64.3%) vs standard group (71.9%) (P<0.001).

- HP increased colonization with no impact on MCRI or CR-BSI
- HP increased contact dermabrasion and cutaneous colonization

ECOG scale (p<0.0001)

A good compromize between adherence and tolerability…

Nouveaux pansements adhésifs non aggressifs

Variable	Advanced	HP/IV3000	Cox marginal HR$_{adj}$ [95 % CI], p value*
All catheters	No. catheter-days = 5389	No. catheter-days = 5078	
Dysfunction	35.63**	33.48	1.04 [0.80–1.35], p = 0.79
Severe catheter dysfunction	5.57	3.35	1.43 [0.69–2.94], p = 0.34
Accidental removal	6.87	6.70	1.07 [0.56–2.04], p = 0.84
At least a minor complication	57.37	57.52	1.03 [0.84–1.27], p = 0.79
Global complication scoring severe and very severe	7.24	6.10	1.17 [0.72–1.90], p = 0.53
CVC, dialysis, pulmonary arterial and arterial catheters	No. catheter-days = 4463	No. catheter-days = 4184	8647
Deep thrombosis	3.36	4.30	0.89 [0.45–1.77], p = 0.74
Colonization/CRI/CRBSI	13.44	15.77	0.89 [0.61–1.32], p = 0.57
Peripheral catheters	No. catheter-days = 926	No. catheter-days = 894	
Extravasation and phlebitis	28.08	21.25	1.40 [0.69–2.82], p = 0.35
	Advanced incidence rate	HP/IV3000 incidence rate	Overall incidence rate
All complications	61.2	60.5	60.9

* Generalized estimating equation (GEE) with independent correlation structure, adjusted for patient origin, parenteral nutrition, patient SAPS, and stratified according to the study period

** Incidence rate per 1000 catheter-days

Gunther S et al – Intensive Care Med 2016; Nov;42(11):1753-1765
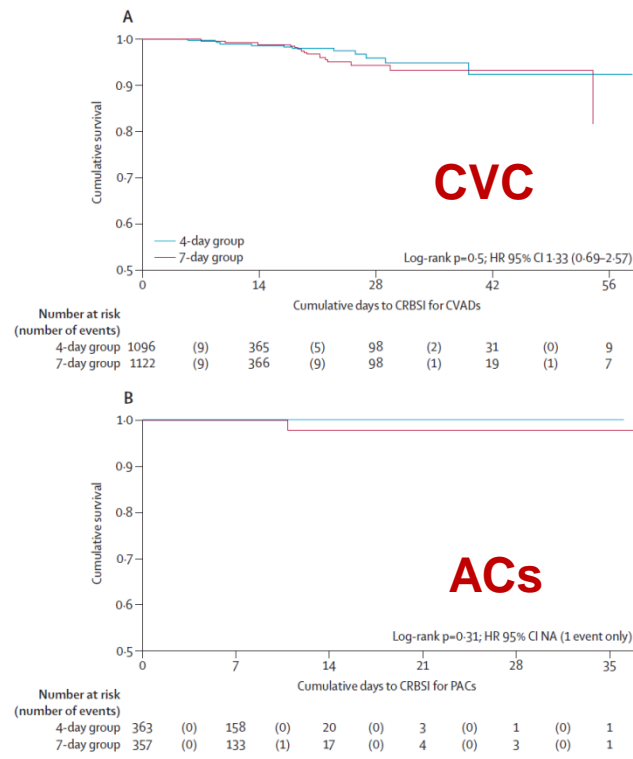
Rythme de réfection des pansements

- **R1.8 - Il ne faut probablement pas refaire le pansement avant le 7ᵉ jour sauf si celui-ci est décollé, souillé ou imbibé de sang.**

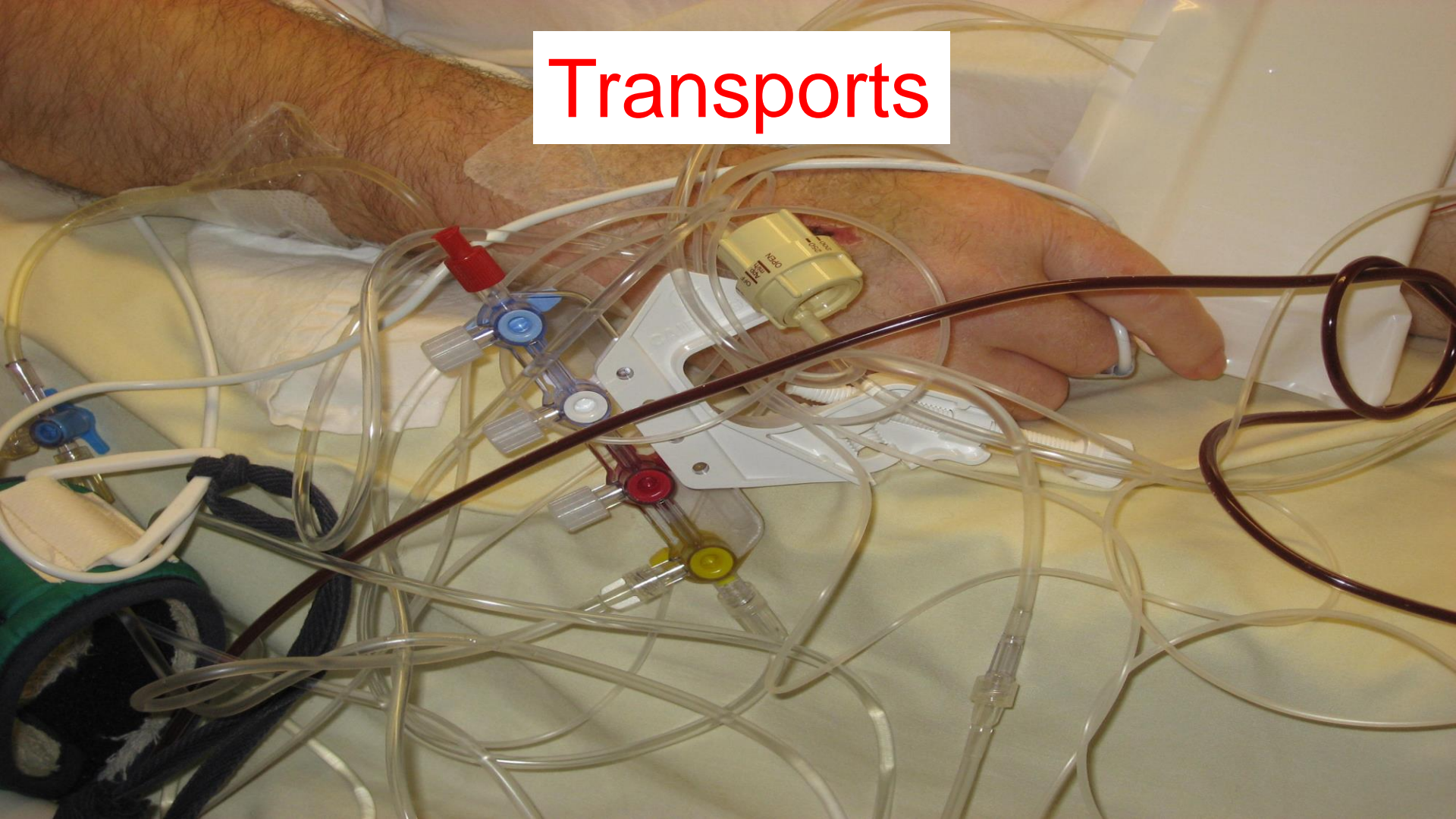 **GRADE 2-**

4-day vs 7-day use of infusion sets

- In this large RCT, pragmatic in 10 hospitals, adult and paediatric patients with central venous access devices or peripheral arterial catheters were randomised to infusion set replacement every 7 days, or 4 days (controls).

  - The study showed that 7-day compared with 4-day infusion set replacement for the prevention of CRBSI was equivalent for central venous access devices and non-inferior for peripheral arterial catheters.

  - Costs were lower in the 7-day infusion set replacement group.

Rickard C et al - Lancet 2021; 397: 1447–58

Transports

Antiseptic solutions (in vivo)

- Avoid aqueous 10% PVI[1]
- Synergy between alcohol and PVI[3]
- Synergy between alcohol and CHG
- Possible synergy between PVI and alc-CHG[4]
- Unresolved issues:
  - 2% alc-CHG vs alc-PVI?
  - 2% alc-CHG vs 0.5% alc-CHG ?[8]
  - 2% alc-CHG vs 2%CHG?[8,9]
  - Other antiseptic: Octenidine (0.1%) [7]
  - Scrubbing before + desinfection

1- Chaiyakunapruk N - Ann Intern Med 2002; 136:792; 2- Valles J - ICHE 2008; 29:847– 853   3- Parienti JJ – Crit Care Med 2004 32: 708-713 4- Langgartner ICM 2004; 30: 1081 5- Mimoz - Arch intern Med 2008 6- Girard R - Journal of Infection and Public Health 2012; 35—42 7- Dettenkofer M - Clin Microbiol Infect 2010; 16:600 8- Adams D - JHI 2005:61: 287 9- Karpanen TJ - AAC 2009 53:1717

CLEAN study
Essai randomisé
« double »

69% ethanol-5% PVI vs 2% CHG-70% isopropyl alcohol

Détersion (4 temps) vs pas (1 temps)

2mn 07 s

37 s

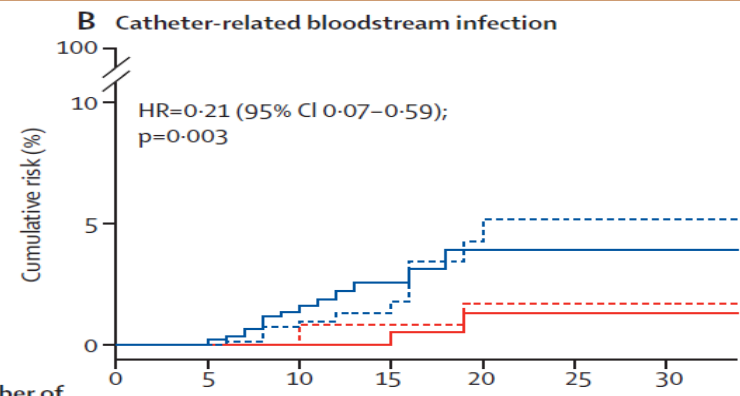4 temps

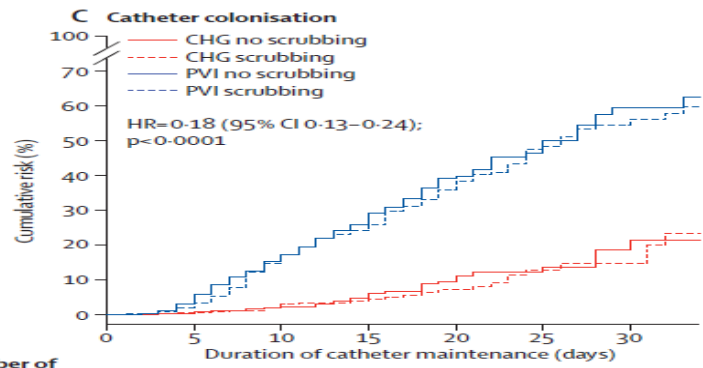1 temps

A Catheter–related infection

HR=0.15 (95% CI 0.05–0.41); p=0.0002

Number of catheters at risk							
CHG—no scrubbing	1277	816	388	195	108	57	27
CHG—scrubbing	1270	792	362	180	104	56	35
PVI—no scrubbing	1326	888	418	199	100	43	20
PVI—scrubbing	1286	788	391	207	106	60	32

B Catheter-related bloodstream infection

HR=0.21 (95% CI 0.07–0.59); p=0.003

Number of catheters at risk							
CHG—no scrubbing	1277	816	388	195	108	57	27
CHG—scrubbing	1270	792	362	180	104	56	35
PVI—no scrubbing	1326	888	418	199	100	43	20
PVI—scrubbing	1286	788	391	207	106	60	32

C Catheter colonisation

- CHG no scrubbing
- CHG scrubbing
- PVI no scrubbing
- PVI scrubbing

HR=0.18 (95% CI 0.13–0.24); p<0.0001

Duration of catheter maintenance (days)

Number of catheters at risk							
CHG—no scrubbing	1277	816	388	195	108	57	27
CHG—scrubbing	1270	792	362	180	104	56	35
PVI—no scrubbing	1326	888	418	199	100	43	20
PVI—scrubbing	1286	788	391	207	106	60	32

Mimoz et al - Lancet 2016

Conclusion

- CHG2% alc >> PVI-alc for catheter infection
- Scrubbing is useless in ICU patients

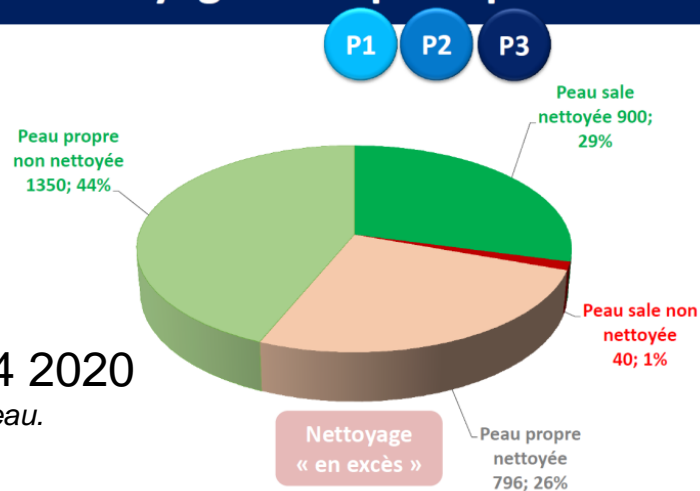- No shift in cutaneous flora of preferential effect on Gram pos.

Questions:
- Applicator effect?
- Better impact for arterial and HD catheters (no significant heterogeneity)
- Significantly more skin reactions (p=0.03)
- 0.5% CHG??

- **R1.4 - Avant l'insertion d'un cathéter intravasculaire, il faut effectuer une désinfection en un seul temps pour diminuer le taux d'infection. GRADE 1+**

Le nettoyage de la peau pour les 3086 poses

P1 P2 P3

ADULTE

Peau propre non nettoyée 1350; 44%

Peau sale nettoyée 900; 29%

Peau sale non nettoyée 40; 1%

Nettoyage « en excès »

Peau propre nettoyée 796; 26%

SF2H (2019) Nettoyage si peau sale, souillée ou sueur

Enquête observa4 2020
Sylvie Beaune/ Agnes Petitieau.

Asepsie chirurgicale à la pose

R1.3 – Pour la désinfection cutanée avant l'insertion d'un cathéter intravasculaire, il faut utiliser une solution alcoolique de Chlorhexidine à 2% plutôt qu'une solution alcoolique de povidone iodée pour diminuer le taux d'infections.
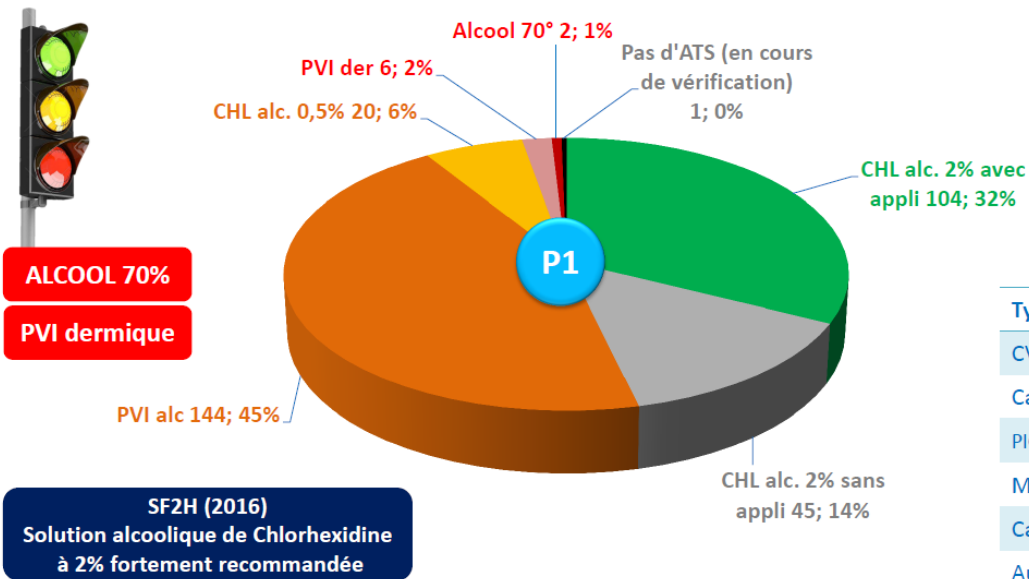
GRADE 1+

- Ped R.1 - En réanimation pédiatrique, pour la désinfection cutanée avant insertion d'un cathéter veineux central chez les **nourrissons de plus d'1 mois** et les enfants, les experts suggèrent d'utiliser, par analogie avec les adultes, une solution alcoolique de chlorhexidine à 2%

AVIS D'EXPERTS

L'antiseptique pour les 322 poses de cathéters centraux
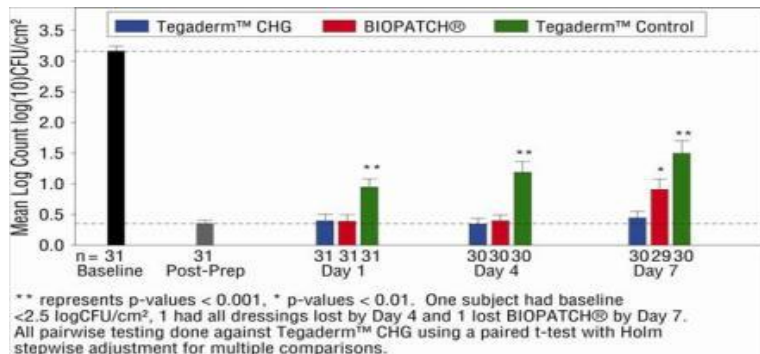
ADULTE

Alcool 70° 2; 1%

Pas d'ATS (en cours de vérification) 1; 0%

PVI der 6; 2%

CHL alc. 0,5% 20; 6%

CHL alc. 2% avec appli 104; 32%

P1

ALCOOL 70%

PVI dermique

PVI alc 144; 45%

CHL alc. 2% sans appli 45; 14%

SF2H (2016)
Solution alcoolique de Chlorhexidine à 2% fortement recommandée

Type de Cathéter	Nb (%)
CVC	110 (33)
Cath. artériel	44 (13)
PICCline	62 (19)
MIDline	28 (8)
Cath. Dialyse	36 (11)
Autre cath. central	52 (16)

Enquête observa4 2020

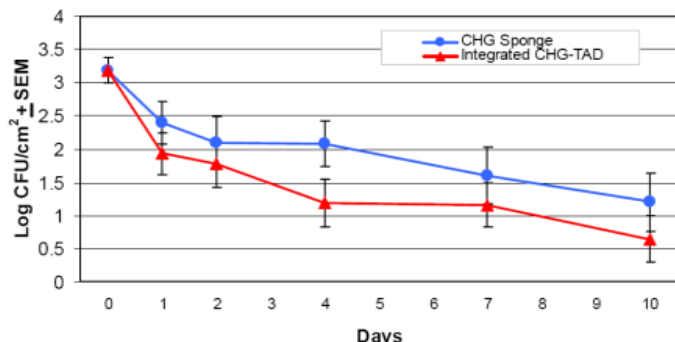*Sylvie Beaune/ Agnes Petiteau.*

https://www.spiadi.fr/app/files/observa4.e37f7258edb8b64219df8e8aa9163876.pdf

CHG dressings: Bacterial growth on healthy volunteers

** represents p-values < 0.001, * p-values < 0.01. One subject had baseline <2.5 logCFU/cm², 1 had all dressings lost by Day 4 and 1 lost BIOPATCH® by Day 7. All pairwise testing done against Tegaderm™ CHG using a paired t-test with Holm stepwise adjustment for multiple comparisons.

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

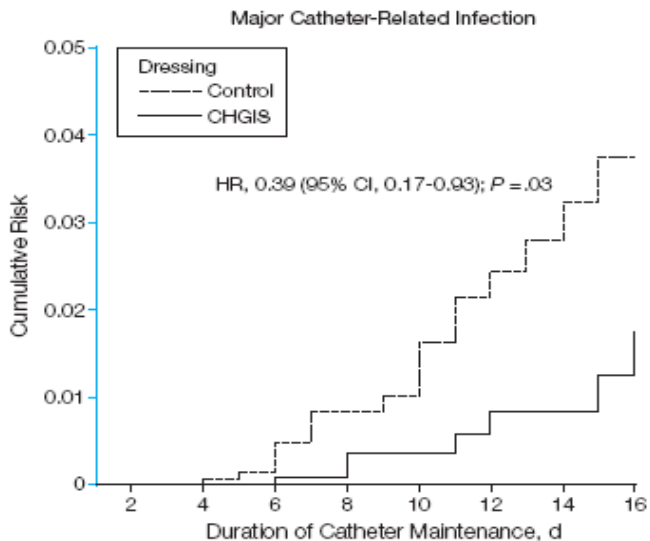The bacterial regrowth is limited by both CHG-sponge and CHG-gel-dressings

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

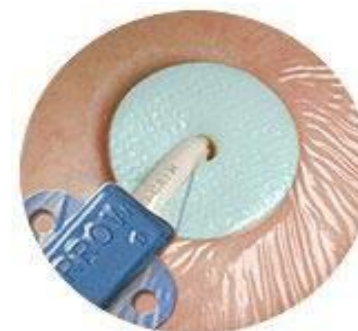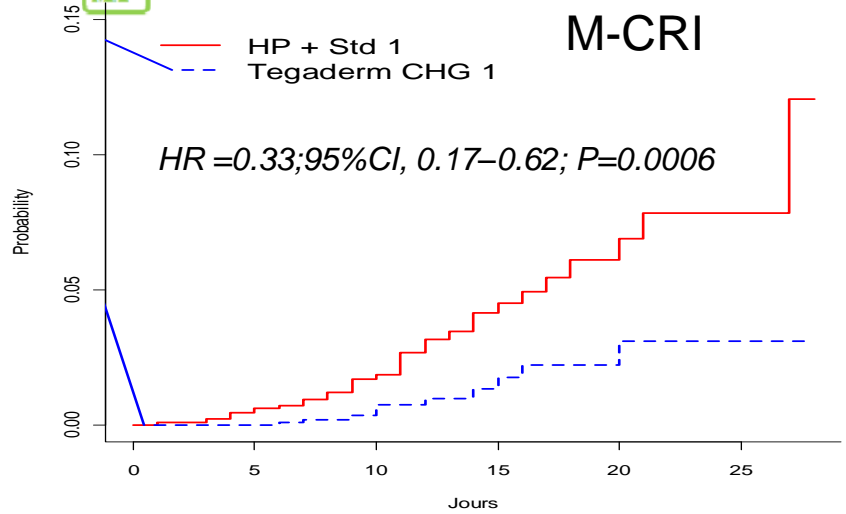CHG-dressings decrease normal unprepped skin flora for up to 7 days

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

Timsit JF et al, JAMA 2009

M-CRI

HP + Std 1
Tegaderm CHG 1

HR =0.33;95%CI, 0.17–0.62; P=0.0006

Probability

Jours

Nombre de cathéters exposés au risque

	J0	J3	J6	J9	J12	J15	J18	J21	J24	J28
HP + Standart	2053	1569	1006	632	400	250	152	98	61	37
CHG	2108	1645	1039	626	383	241	145	95	57	39

CR-BSI

HP + Std 1
Tegaderm CHG 1

Probability

Jours

Nombre de cathéters exposés au risque

	J0	J3	J6	J9	J12	J15	J18	J21	J24	J28
HP + Standart	2053	1569	1006	632	400	250	152	98	61	37
CHG	2108	1645	1039	626	383	241	145	95	57	39

CHG dressings prevented one major-CRI for every 71 catheters
(95%CI, 57-125 catheters) left for a mean of 10 days.

Timsit et al - Am J Respir Crit Care Med 186:1272–1278, 2012

CHG sponge   or   CHG gel?

Similar efficacy
Similar CHG concentrations
Continuous inspection (better) for CHG gels
Absorbtion of exsudates and blood (better) for CHG sponge
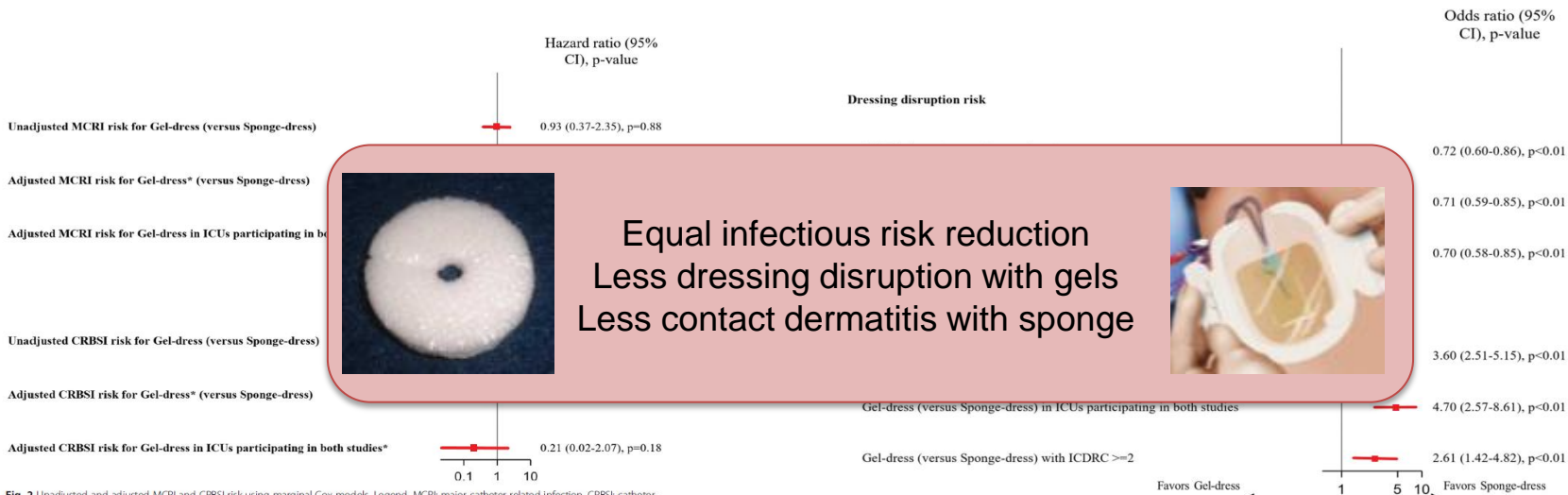Learning curve for CHG sponges
Similar cost-benefit

1-Ho et al -Journal of Antimicrobial Chemotherapy (2006) 58, 281–287; 2-Timsit et al - Jama 2009; 12 (301) 1231-1241; 3-Timsit et al Am J Respir Crit Care Med Vol 186, 2012 4- Schwebel et al – Crit Care Med 2012 40:11–17 5- Maunoury F et al - Plos one PLoS One. 2015 Jun 18;10(6):e0130439.

Critical Care

Chlorhexidine-impregnated sponge versus chlorhexidine gel dressing for short-term intravascular catheters: which one is better?

Niccolò Buetti[1*] , Stéphane Ruckly[1], Carole Schwebel[2,3], Olivier Mimoz[4,5,6], Bertrand Souweine[7], Jean-Christophe Lucet[1,8] and Jean-François Timsit[1,9]

Hazard ratio (95% CI), p-value

Odds ratio (95% CI), p-value

Dressing disruption risk

Unadjusted MCRI risk for Gel-dress (versus Sponge-dress)   0.93 (0.37-2.35), p=0.88

0.72 (0.60-0.86), p<0.01

Adjusted MCRI risk for Gel-dress* (versus Sponge-dress)

0.71 (0.59-0.85), p<0.01

Adjusted MCRI risk for Gel-dress in ICUs participating in b...

0.70 (0.58-0.85), p<0.01

Equal infectious risk reduction
Less dressing disruption with gels
Less contact dermatitis with sponge

Unadjusted CRBSI risk for Gel-dress (versus Sponge-dress)

3.60 (2.51-5.15), p<0.01

Adjusted CRBSI risk for Gel-dress* (versus Sponge-dress)

Gel-dress (versus Sponge-dress) in ICUs participating in both studies   4.70 (2.57-8.61), p<0.01

Adjusted CRBSI risk for Gel-dress in ICUs participating in both studies*   0.21 (0.02-2.07), p=0.18

Gel-dress (versus Sponge-dress) with ICDRC >=2   2.61 (1.42-4.82), p<0.01

0.1   1   10

Favors Gel-dress   1   5   10   Favors Sponge-dress

Fig. 2 Unadjusted and adjusted MCRI and CRBSI risk using marginal Cox models. Legend. MCRI: major catheter-related infection. CRBSI: catheter-related bloodstream infection. Sponge-dress: chlorhexidine-impregnated sponges. Gel-dress: chlorhexidine-impregnated dressing. *Adjustment variables were sex, mechanical ventilation at admission, experience of the operator, and insertion site. For the adjusted analyses for gel-dress in ICUs participating in both studies, we performed an additional analysis stratifying for ICU and we observed similar results for MCRI (HR 0.30, 95% CI 0.06–1.48, $p = 0.14$) and CRBSI (HR 0.16, 95% CI 0.02–1.70, $p = 0.13$)

Fig. 3 Dressing disruption and contact dermatitis risk. Legend. Sponge-dress: Chlorhexidine-impregnated sponges. Gel-dress: Chlorhexidine-impregnated dressing. CI: Confidence interval. ICU: Intensive care unit. ICDRC: International Contact Dermatitis Research Group system. *Adjustment variables were sex, chronic renal failure, coma at admission, SOFA score, and subclavian site

Side effects

Contact dermatitis 0.5 to 1% of the catheters

A- Allergy to transparent dressing, with a protection induced by the GHX sponge
B- Contact dermatitis with CHX sponges, skin heals within one week after sponge removal
C-Cotact dermatitis with CHG gel dressings, skin heals within one week afetr removing the active dressings

Pansements imprégnés

- R1.7 - Il **faut probablement** utiliser des **pansements imprégnés de Chlorhexidine** pour diminuer le taux d'infections liées au cathéter veineux central ou artériel.
  GRADE 2+

- Ped R.8a - **Chez l'enfant**, les pansements imprégnés à la **Chlorhexidine peuvent être utilisés aux points d'entrée** des cathéters **veineux centraux** si les mesures standards de prévention ne suffisent pas à diminuer le taux d'incidence des infections liées aux cathéters. Ces pansements ne sont pas recommandés chez les nouveau-nés prématurés. AVIS D'EXPERTS

- Ped R.8b **Aucune recommandation** pédiatrique ne peut être émise concernant l'utilisation des pansements imprégnés à la chlorhexidine aux points d'entrée des cathéters **artériels.** AVIS D'EXPERTS

CATHETER CARE

Do not left in place unnecessary catheters.

Daily visual inspection of the catheter site.

Document the date of dressing change.

Consider CHG-impregnated dressings.

Replace tubing no more frequently than at 4 days intervals, but at least every 7 days.

Do not left in place dressing if unstuck, soiled or moistened.

Do not use catheter locks for prevention

Buetti et al - Curr Opin Crit Care 2020, 26:459–465

Other issues?

- CHG impregnated catheters
    - No sufficient evidence IF other thing are made properly
    - If your CRI level is acceptable
- Ethanol lock
    - Not feasible for CVC
    - Not effective for hemodialysis catheters
- CHG body washes
    - Discordant result
    - Possible effect mainly on Gram positive
    - Increase in MIC to CHG with use
    - Only in specific circumstances

Prevention: impregnated catheters

Meta-analysis: First generation externally coated
Silver-sulfadiazine-chlorhexidine

11 studies   2602 CVCs   (2-10 days)

0.03   0.1   0.3   1,0   RR (95% CI)

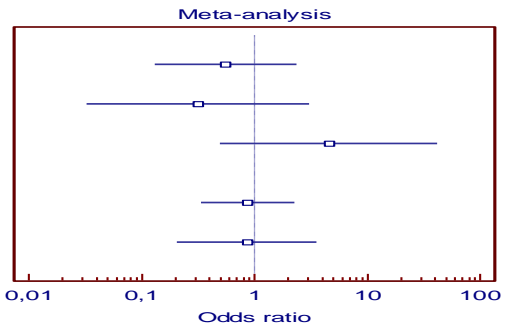|		
colonization:	0.44 (0.36-0.54)	25.3% vs. 43.5%
bacteremia:	0.56 (0.37-0.84)	3.2% vs. 5.2%

Cost-effectiveness analysis :
Absolute reduction of bacteremias: 1.2% to 3.4%
Cost savings: 68 $ to 391 $ per catheter used

Veenstra JAMA 1999

Applicability if appropriate bundle applied? CR-BSI: CHG-SS Plus vs Placebo   Hockenhull – CCM 2009

Study or sub-category	Treatment n/N	Control n/N	CR-BSI level Control group	Peto OR 95% CI	Weight %	Peto OR 95% CI
01 CHSS Blue Plus - Antimicrobial Impregnated						
Brun-Buisson, 2004	3/188	5/175	2.8%		3.57	0.56 [0.14, 2.26]
Jaeger, 2005	1/51	8/55	14%		3.78	0.20 [0.05, 0.78]
Ostendorf, 2005	3/90	7/94	7.4%		4.33	0.45 [0.13, 1.61]
Rupp, 2005	1/345	3/362	1,1%		1.81	0.38 [0.05, 2.74]
Osma, 2006	4/64	1/69	1,4%		2.20	3.73 [0.63, 22.16]
Subtotal (95% CI)	738	755			15.69	0.51 [0.26, 1.00]

Total events: 12 (Treatment), 24 (Control)
Test for heterogeneity: Chi² = 6.72, df = 4 (P = 0.15), I² = 40.5%
Test for overall effect: Z = 1.95 (P = 0.05)

3.2%

Meta-analysis

Brun-Buisson 2004
Rupp 2005
Osma, 2006
Total (fixed effects)
Total (random effects)

0,01   0,1   1   10   100
Odds ratio

Study	Intervention	Controls
Brun-Buisson 2004	3/188	5/175
Rupp 2005	1/362	3/345
Osma, 2006	4/64	1/69
Total	8/614	9/589

Test for heterogeneity
Q = 3,2742, DF = 2, P = 0,1945

Control group= 1.5%, OR (random)=0.852 (0.204-3.56), no heterogeneity

KT imprégnés

- R1.5 - Il **ne faut probablement pas** utiliser les cathéters veineux **centraux imprégnés par des antimicrobiens** (antiseptiques ou antibiotiques) dans le but de diminuer l'incidence des bactériémies (exprimée pour 1 000 jours de cathéters).

GRADE 2-

- R1.6 - Les données de la littérature chez l'adulte sont **insuffisantes** pour formuler une recommandation concernant l'utilisation d'un **cathéter imprégné d'héparine** pour diminuer le taux de thrombose

AVIS D'EXPERTS

- Ped R. 6 - Chez l'enfant, Il ne faut probablement **pas utiliser** les CVC imprégnés d'**héparine** pour réduire le risque d'occlusion ou de thrombose.

GRADE 2-

Other issues?

- CHG impregnated catheters
  - No sufficient evidence IF other thing are made properly
  - If your CRI level is acceptable
- Ethanol lock
  - Not feasible for CVC
  - Not effective for hemodialysis catheters
- CHG body washes
  - Discordant result
  - Possible effect mainly on Gram positive
  - Increase in MIC to CHG with use
  - Only in specific circumstances

Messages

1. Connaissez vos chiffres le risque zéro n'est pas réaliste
2. Adaptez les recommandations a votre situation locale
3. La base c'est
   1. Asepsie chirurgicale (attention abord US)
   2. Ablation systématique si inutile
   3. Réfection rapide des pansements décollés
   4. Sous Clavière/ radiale
   5. Pose sous échographie raisonnée après programme d'enseignement etroit
   6. CHG-alc 2% sauf allergies
4. Les pansements imprégnés de CHG sont efficaces
5. Décolonisation universelle par toilette CHG → « the jury is still out »
6. CHG pour tout??
   1. Attention à la diversité biologique!!
      1. Synergie PVI/CHG?
      2. Autres AS?: octenidine?
      3. Dans tous les cas surveillance (culture des cathéters suspects)

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