Hôpitaux Universitaires Genève

University of Geneva Hospitals and Faculty of Medicine, Geneva, Switzerland

WHO Collaborating Centre on Infection Prevention and Control and Antimicrobial Resistance

UNIVERSITÉ DE GENÈVE

Les nouveautés concernant les recommandations internationales pour la prévention des infections liées à un cathéter

FOCUS on CVC

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CONTENT

- Introduction
- SHEA/IDSA compendium 2022
- Selected recently published studies about the prevention of intravascular catheter infections
- Conclusions

INTRODUCTION

Utilization of intravascular catheters (ICU & CVC):

Table 3. ICU-acquired central line-associated bloodstream infection (CLABSI) rates by country, EU/EEA, 2017

Country/Network	Number of ICUs	Number of patients	Average length of ICU stay (days)	CVC use (days per 100 patient days)	CLABSI rate (episodes per 1 000 catheter-days)			
					Country mean	25th percentile	Median	75th percentile
Belgium	3	614	8.6	71.2	2.7	1.9	3.2	3.8
Estonia	4	309	12.1	86.7	3.6	1.1	3.6	6.0
France	198	68 568	11.1	64.7	2.2	0.9	1.8	2.8
Hungary	8	797	9.6	21.7	4.3	0.0	0.0	7.9
Italy/GiViTI	63	13 950	9.8	82.8	3.0	1.3	2.3	4.1
Italy/SPIN-UTI	27	1 483	11.4	88.7	4.8	0.9	4.1	6.6
Lithuania	22	2 279	8.5	66.5	1.9	0.0	0.8	2.8
Luxembourg	8	2 843	9.8	66.4	1.7	0.0	1.7	2.8
Portugal	43	7 361	11.5	80.4	1.7	0.0	1.0	1.9
Slovakia	8	387	9.3	79.3	4.7	2.5	3.6	6.5
Spain	183	34 119	7.8	75.2	2.6	0.0	1.8	3.8
United Kingdom – Scotland	22	8 729	7.3	62.2	1.7	0.7	1.3	3.0

Source: ECDC, HAI-Net patient-based data 2017

CVC utilisation rate:
- average 70.1 CVC-days per 100 patient-days

https://www.ecdc.europa.eu/sites/default/files/documents/AER_for_2017-HAI.pdf published 2019

INTRODUCTION

Utilization of intravascular catheters (CVC):

Patient characteristics – national point prevalence survey on healthcare-associated infections in acute care hospitals, Switzerland, 2017 (n = 12,931)

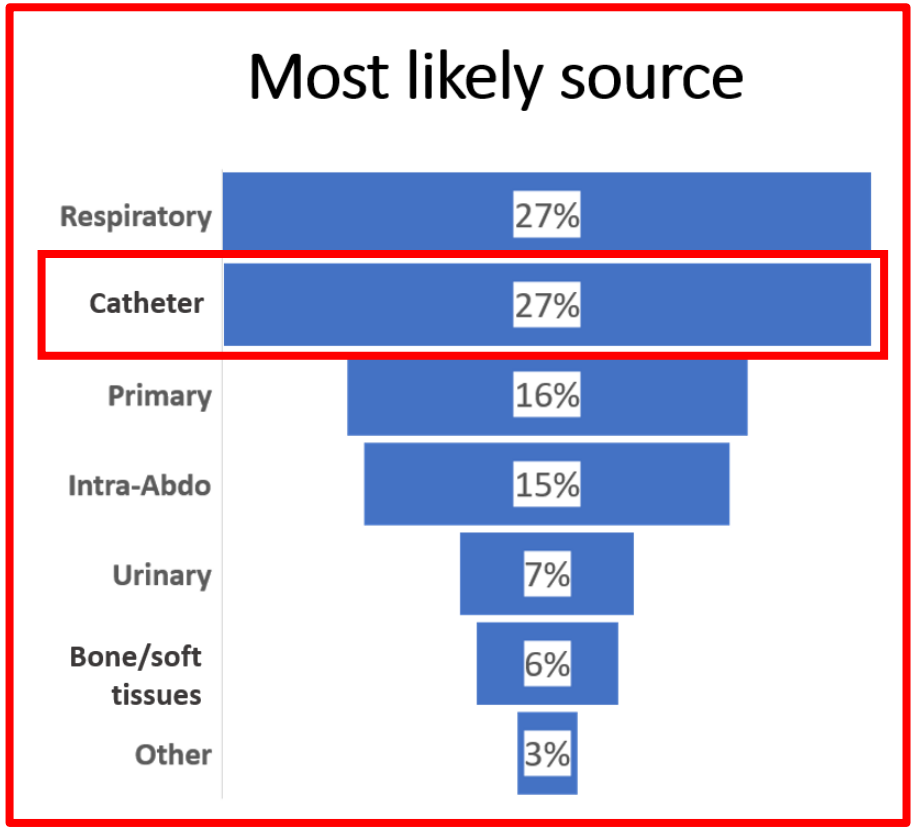
	All hospitals n=12,931			Hospital size <200 beds n=3,516			200–650 beds n=4,380			>650 beds n=5,035			p value
	n	%	95% CI	n	%	95% CI	n	%	95% CI	n	%	95% CI	
Male sex	6,185	47.8	47.0–48.7	n=3,516	46.2	44.5–47.8	n=4,380	47.3	45.8–48.8	n=5,035	49.4	48.1–50.8	0.002
Age group													
0 years	509	3.9	3.6–4.3	147	4.2	3.5–4.8	161	3.7	3.1–4.2	201	4.0	3.5–4.5	0.501
1–17 years	481	3.7	3.4–4.0	214	6.1	5.3–6.9	82	1.9	1.5–2.3	185	3.7	3.2–4.2	<0.001
18–40 years	1,647	12.7	12.2–13.3	475	13.5	12.4–14.6	512	11.7	10.7–12.6	660	13.1	12.2–14.0	0.033
41–60 years	2,284	17.7	17.0–18.3	568	16.2	14.9–17.4	737	16.8	15.7–17.9	979	19.4	18.4–20.5	<0.001
61–80 years	4,942	38.2	37.4–39.1	1,250	35.6	34.0–37.1	1,795	41.0	39.5–42.4	1,897	37.7	36.2–39.0	<0.001
>80 years	3,068	23.7	23.0–24.5	862	24.5	23.1–25.9	1,093	25.0	23.7–26.2	1,113	22.1	21.0–23.5	0.002
McCabe score													
Not fatal	10,119	78.3	77.5–79.0	2,892	82.3	81.0–83.5	3,306	75.5	74.2–76.8	3,921	77.9	76.7–79.0	<0.001
Ultimately fatal	1,730	13.4	12.8–14.0	456	13.0	11.9–14.1	611	13.9	12.9–15.0	663	13.2	12.2–14.1	0.903
Rapidly fatal	669	5.2	4.8–5.6	119	3.4	2.8–4.0	154	3.5	3.0–4.1	396	7.9	7.1–8.6	<0.001
Unknown	413	3.2	2.9–3.5	49	1.4	1.0–1.8	309	7.1	6.3–7.8	55	1.1	0.8–1.4	0.008
Surgery and medical device use													
Surgery[a]	3,210	24.8	24.1–25.6	847	24.1	22.7–25.5	1,117	25.5	24.1–26.8	1,246	24.8	23.6–25.9	0.579
PVC	6,281	48.6	47.7–49.5	1,806	51.4	49.8–53.1	2,209	50.5	49.0–52.0	2,266	45.0	43.6–46.4	<0.001
CVC	1,355	10.5	10.0–11.0	231	6.6	5.6–7.4	397	9.1	8.2–9.9	727	14.4	13.5–15.4	<0.001
Urinary catheter	2,122	16.4	15.8–17.1	558	15.9	14.7–17.1	730	16.7	15.6–17.8	834	16.6	15.5–17.6	0.443

Point-prevalence study 2017, Switzerland

Zingg W et al. Euro Surveill. 2019 Aug;24(32):1800603

INTRODUCTION

ICU-acquired bloodstream infections: the Eurobact2 study



A multicontinental study (2019 - 2021):

- 333 ICUs, 52 countries
- 2600 nosocomial ICU-treated BSIs
- 59% Gram-negative

Tabah A, Buetti N *et al.* the Eurobact2 study, in revision. [and oral presentation ESICM 2021]

INTRODUCTION

CLABSI costs:

Characteristic	Adjusted[a] total costs (2010 USD)			Adjusted[a] variable costs (2010 USD)		
	Coefficient	Excess cost	p	Coefficient	Excess cost	p
CLABSI	0.198	49 618	0.04	0.211	32 412	0.03
Other HAI	0.561	122 217	<0.0001	0.595	78 832	<0.0001
Multiple catheters	0.362	96 000	<0.01	0.386	63 096	<0.01
ICU stay, per day	0.011	2921	<0.0001	0.011	1726	<0.0001
Step-down stay, per day	0.008	2111	<0.0001	0.008	1280	<0.0001

CLABSI, central-line-associated bloodstream infection; HAI, healthcare-associated infection.
[a]All costs were modelled by generalized linear regression with log link and gamma distribution. In addition to the variables listed in the table, estimates were also adjusted for gender, age, race, major surgical procedure, Acute Physiologic and Chronic Health Evaluation (APACHE) II score, Charlson Comorbidity Index, diagnosis-related group (DRG) weight, and DRG system (AP-DRG, CMS-DRG, or APR-DRG).

TABLE 4. Estimated adjusted excess total and variable inpatient hospital costs (2010 US dollars (USD)) for patients with any intensive-care unit (ICU) stay (n = 150)

A bit old data BUT results:
In both ICU and non-ICU patients → adjusted variable costs for patients with CLABSI were c. $32 000 (2010 US dollars) higher on average than for patients without CLABSI.

Stevens V et al. CMI 2014. DOI: 10.1111/1469-0691.12407

INTRODUCTION

CLABSI mortality:

Study or Subgroup	CLABSI Events	CLABSI Total	Control Events	Control Total	Weight	Odds Ratio M-H, Random, 95% CI
Blott 2005	49	176	82	315	8.1%	1.10 [0.72, 1.66]
Cheewinmethasiri 2014	9	44	29	129	6.3%	0.89 [0.38, 2.06]
Dimick 2001	5	9	53	251	4.3%	4.67 [1.21, 18.00]
Hajjej 2014	7	32	10	120	5.4%	3.08 [1.07, 8.88]
Higuera 2007	23	55	12	55	6.3%	2.58 [1.12, 5.93]
Hsu 2013	7	16	12	64	4.9%	3.37 [1.05, 10.86]
Kumar 2014	2	28	0	72	1.4%	13.68 [0.64, 294.32]
Leistner 2013	7	40	3	40	4.1%	2.62 [0.63, 10.95]
Olaechea 2013	262	1011	772	4044	8.7%	1.48 [1.26, 1.74]
Pawar 2004	8	35	3	1279	4.2%	126.02 [31.69, 501.22]
Rello 2000	11	49	17	49	6.1%	0.54 [0.22, 1.33]
Renaud 2001	10	26	7	26	4.9%	1.70 [0.53, 5.48]
Rosenthal 2003	77	142	42	142	7.8%	2.82 [1.73, 4.60]
Smith 2011	4	35	12	1050	4.9%	11.16 [3.41, 36.56]
Soufir 1999	20	38	20	75	6.4%	3.06 [1.35, 6.92]
Stevens 2013	56	197	18	201	7.4%	4.04 [2.27, 7.17]
Warren 2006	21	41	301	1091	7.2%	2.76 [1.47, 5.16]
Wittekamp 2013	1	2	59	219	1.6%	2.71 [0.17, 44.06]
Total (95% CI)		**1976**		**9222**	**100.0%**	**2.75 [1.86, 4.07]**
Total events	579		1452			

Heterogeneity: Tau² = 0.45; Chi² = 87.14, df = 17 (P < 0.00001); I² = 80%

Test for overall effect: Z = 5.06 (P < 0.00001)

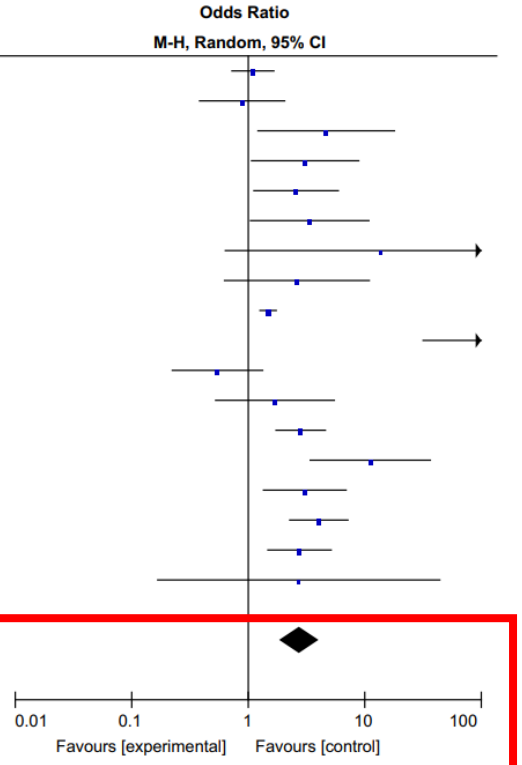


Fig. 2 Mortality of CLABSI compared to No CLABSI, forest Plot. *CLABSI* central line associated blood stream infection

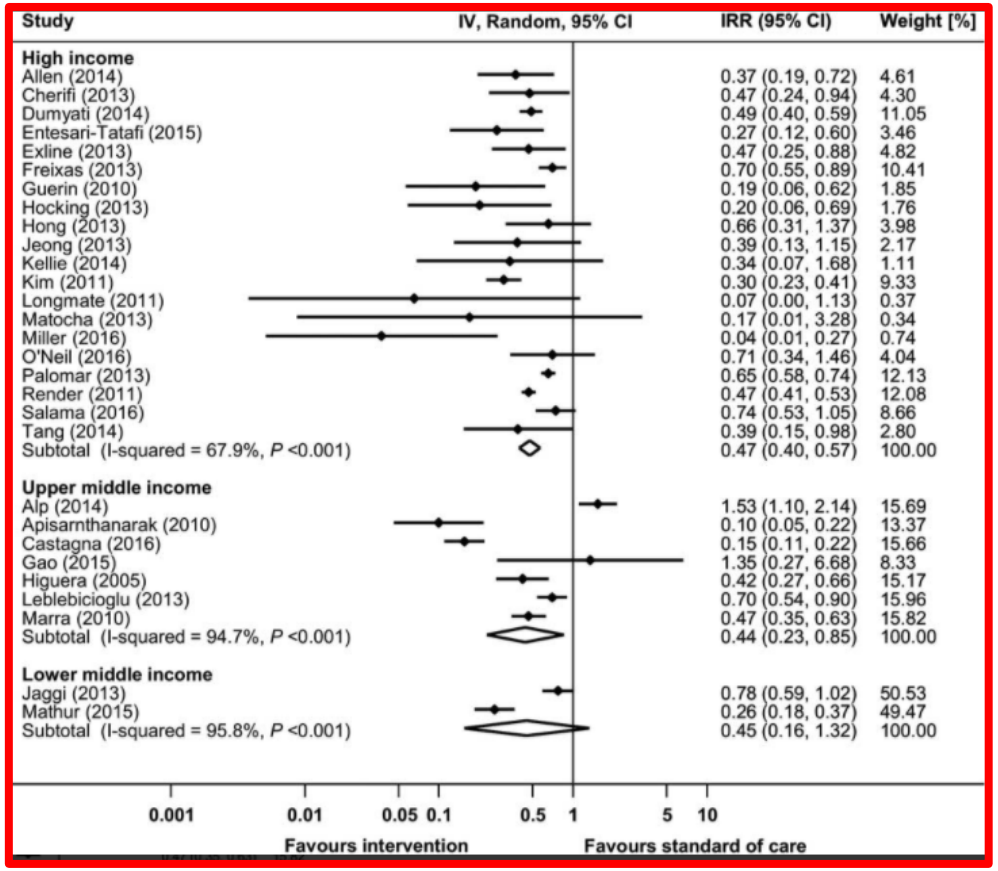
- Meta-analysis of case control and cohort studies (matched and unmatched)
- Mortality of patients with and without CLABSI was performed

CAVE: *S aureus* >> CoNS

Ziegler M et al. Infection 2015. doi: 10.1007/s15010-014-0689-y

INTRODUCTION

Preventable proportion of CLABSI:



Significant reduction of HAI rates in the range of 35%–**55**% associated with multifaceted interventions irrespective of a country's income level

CLABSI: 0.459 (95% CI, 0.381-0.554)

Schreiber PW et al. ICHE. 2018. doi: 10.1017/ice.2018.183.

INTRODUCTION

COVID-19 & intravascular catheter infections:

	2020 Q1	2020 Q2	2020 Q3	2020 Q4
CLABSI	↓ −11.8%	↑ 27.9%	↑ 46.4%	↑ 47.0%
CAUTI	↓ −21.3%	No Change[1]	↑ 12.7%	↑ 18.8%
VAE	↑ 11.3%	↑ 33.7%	↑ 29.0%	↑ 44.8%
SSI: Colon surgery	↓ −9.1%	No Change[1]	↓ −6.9%	↓ −8.3%
SSI: Abdominal hysterectomy	↓ −16.0%	No Change[1]	No Change[1]	↓ −13.1%
Laboratory-identified MRSA bacteremia	↓ −7.2%	↑ 12.2%	↑ 22.5%	↑ 33.8%
Laboratory-identified CDI	↓ −17.5%	↓ −10.3%	↓ −8.8%	↓ −5.5%

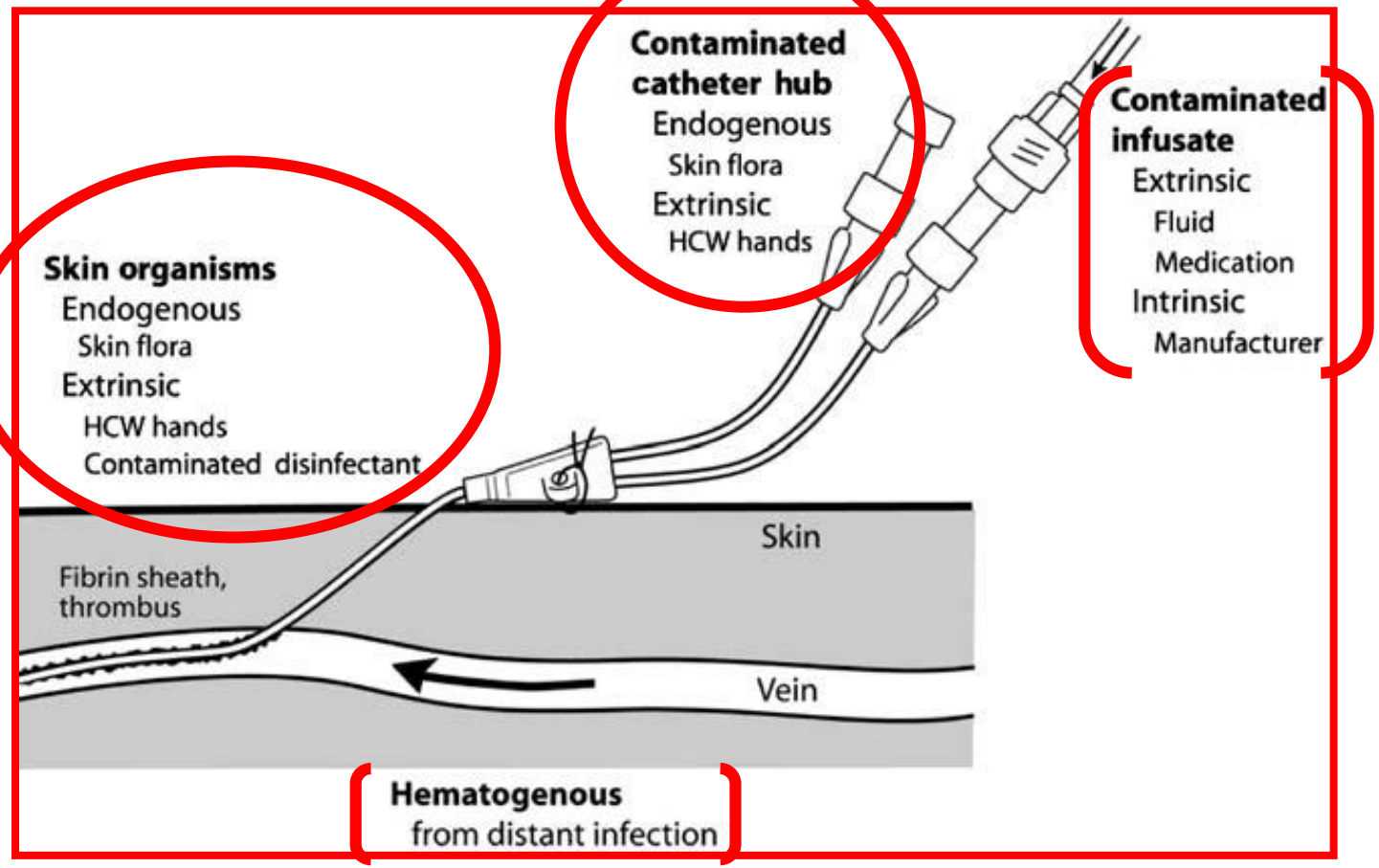
Weiner-Lastinger LM *et al.*, ICHE 2021, doi:10.1017/ice.2021.362

INTRODUCTION

ENDOLUMINAL ROUTE:
- **Catheter care**
- **Long-term catheters**

Pathophysiology & intravascular c

EXTRALUMINAL ROUTE
- **Insertion**
- **Short-term catheters**



Safdar N & Maki D; 2002, Intensive Care Med, 2004 Jan;30(1):62-7

CONTENT

- Introduction
- SHEA/IDSA compendium 2022
- Selected rec … of intravascula…
- Conclusions

With a lot of self-criticism ☺

Infection Control & Hospital Epidemiology (2022), **43**, 553–569
doi:10.1017/ice.2022.87

SHEA

SHEA/IDSA/APIC Practice Recommendation

Strategies to prevent central line-associated bloodstream infections in acute-care hospitals: 2022 Update

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SHEA/IDSA

Essential Practices

Before insertion

1. Provide easy access to an evidence-based list of indications for CVC use to minimize unnecessary CVC placement (Quality of Evidence: LOW)
2. Require education and competency assessment of HCP involved in insertion, care, and maintenance of CVCs about CLABSI prevention (Quality of Evidence: MODERATE)[74–78]
3. Bathe ICU patients aged >2 months with a chlorhexidine preparation on a daily basis (Quality of Evidence: HIGH)[86–90]

At insertion

1. In ICU and non-ICU settings, a facility should have a process in place, such as a checklist, to ensure adherence to infection prevention practices at the time of CVC insertion (Quality of Evidence: MODERATE)[101]
2. Perform hand hygiene prior to catheter insertion or manipulation (Quality of Evidence: MODERATE)[102–107]
3. The subclavian site is preferred to reduce infectious complications when the catheter is placed in the ICU setting (Quality of Evidence: HIGH)[33,37,108–110]
4. Use an all-inclusive catheter cart or kit (Quality of Evidence: MODERATE)[118]
5. Use ultrasound guidance for catheter insertion (Quality of Evidence: HIGH)[119,120]
6. Use maximum sterile barrier precautions during CVC insertion (Quality of Evidence: MODERATE)[123–128]
7. Use an alcoholic chlorhexidine antiseptic for skin preparation (Quality of Evidence: HIGH)[42,129–134]

After insertion

1. Ensure appropriate nurse-to-patient ratio and limit use of float nurses in ICUs (Quality of Evidence: HIGH)[34,35]
2. Use chlorhexidine-containing dressings for CVCs in patients over 2 months of age (Quality of Evidence: HIGH)[45,135–142]
3. For non-tunneled CVCs in adults and children, change transparent dressings and perform site care with a chlorhexidine-based antiseptic at least every 7 days or immediately if the dressing is soiled, loose, or damp. Change gauze dressings every 2 days or earlier if the dressing is soiled, loose, or damp (Quality of Evidence: MODERATE)[145–148]
4. Disinfect catheter hubs, needleless connectors, and injection ports before accessing the catheter (Quality of Evidence: MODERATE)[150–154]
5. Remove nonessential catheters (Quality of Evidence: MODERATE)
6. Routine replacement of administration sets not used for blood, blood products, or lipid formulations can be performed at intervals up to 7 days (Quality of Evidence: HIGH)[164]
7. Perform surveillance for CLABSI in ICU and non-ICU settings (Quality of Evidence: HIGH)[13,165,166]

Buetti N et al. Infection Control & Hospital Epidemiology (2022), 43, 553–569

SHEA/IDSA

Before insertion:

Before insertion

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OK

OK

??

- **Several RCTs showed a reduction of CLABSI…**

Buetti N et al. Infection Control & Hospital Epidemiology (2022), 43, 553–569

SHEA/IDSA

Before insertion:

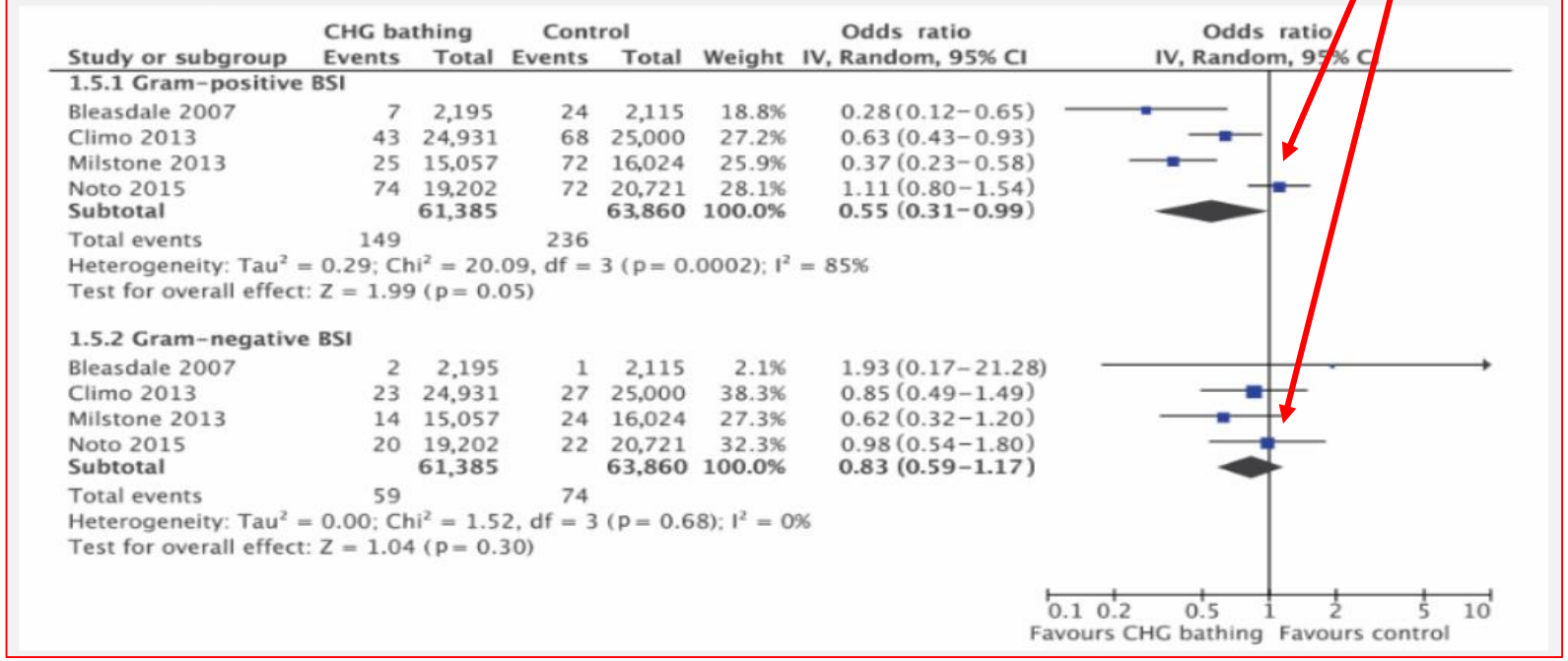
- **Chlorhexidine bathing:**

Last RCT (2012-2013): negative results

Reduction -> possibly due to the reduction of commensal Gram-positive skin microorganisms?

(intervention effect → partially explained by a reduction in blood culture contamination?).

Figure 5. Subgroup analysis of rates of hospital-acquired Gram-positive and Gram-negative bloodstream infections per patient days (n = 4 studies)

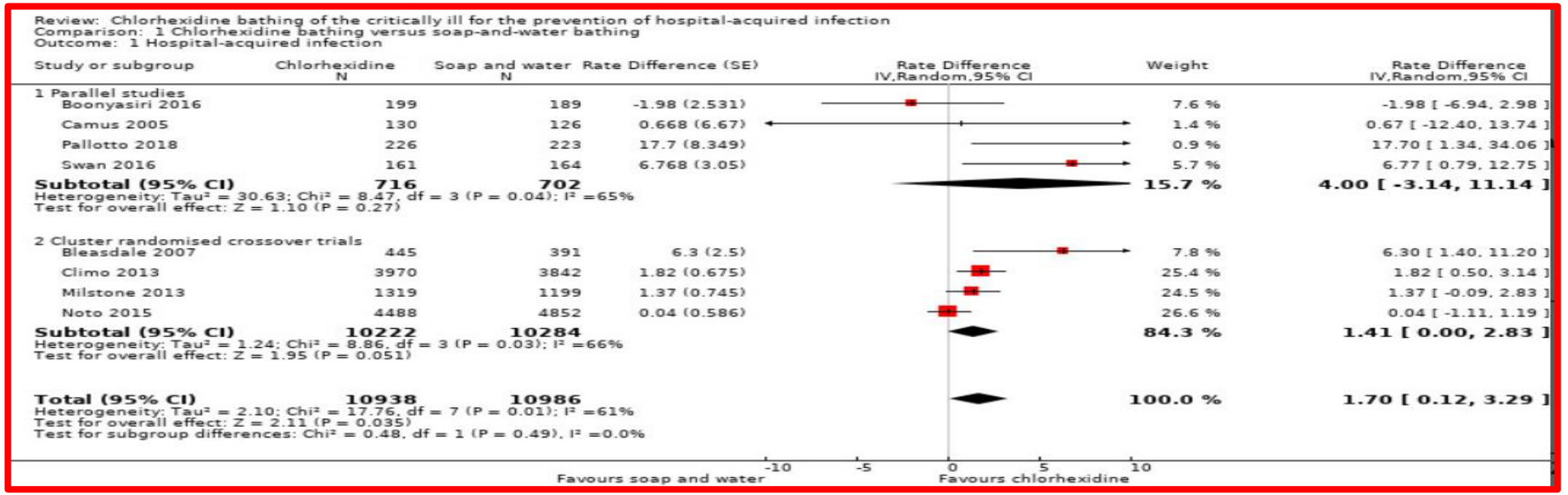


Afonso E et al. Eurosurveillance 2016. DOI: 10.2807/1560-7917.ES.2016.21.46.30400

SHEA/IDSA

Before insertion:

- **Chlorhexidine bathing:**
  - **Large meta-analysis with other outcomes…**
    - *”it is not clear whether bathing with chlorhexidine reduces hospital-acquired infections, mortality, or length of stay in the ICU”*



Lewis SR et al. Cochrane Database Syst Rev. 2019. doi: 10.1002/14651858.CD012248.pub2.

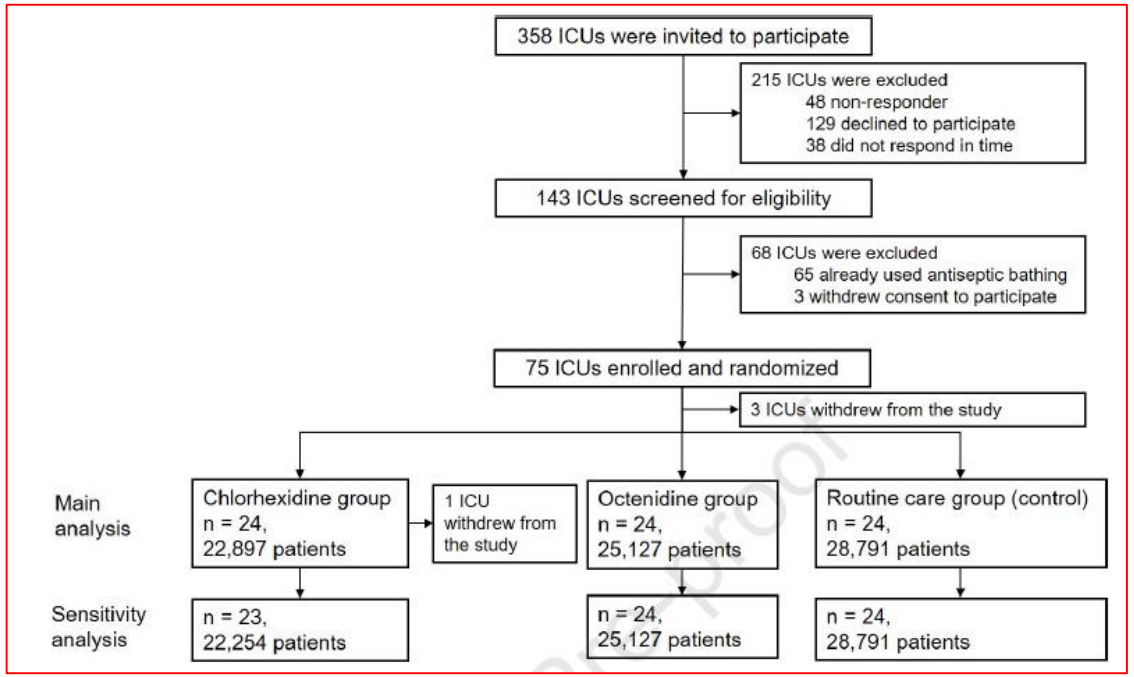
SHEA/IDSA

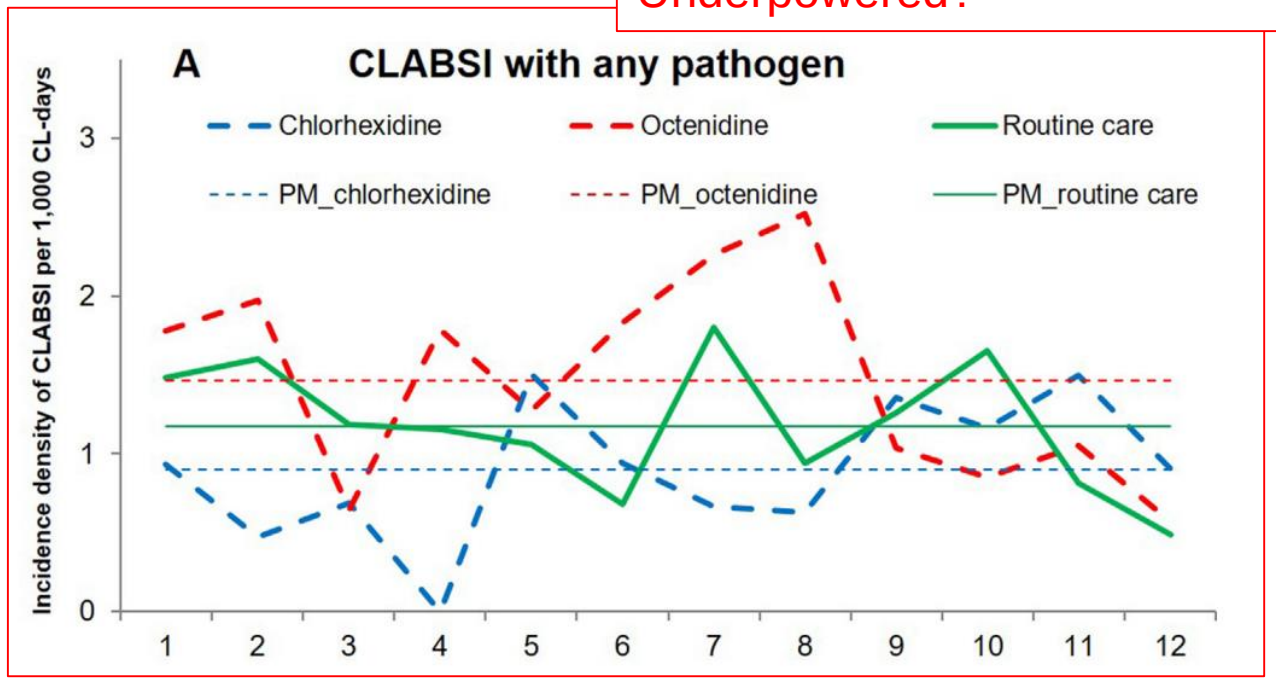
Before insertion:

- **Chlorhexidine bathing:**
  - **New large c-RCT from Germany:**

Adjusted IRR of CLABSI:
- 0.69 (0.37-1.22), **p=0.28** for CHX
- 1.22 (0.54-2.75), **p=0.65** octenidine

Underpowered?





Denkel LA *et al.* Clinical Microbiology and Infection, 2022, https://doi.org/10.1016/j.cmi.2021.12.023..

SHEA/IDSA

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Before insertion

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3. Bathe ICU patients aged >2 months with a chlorhexidine preparation on a daily basis (Quality of Evidence: HIGH)[86-90]

OK

OK

??

- **Not sure:**
  - **RCT (2015) negative, large c-RCT (2022) negative**
  - **Effect more on Gram-positive (effect on Gram-negative unclear, probably more CoNS & BC contaminantions…)**
  - **CHX everywhere?**
  - **Conclusions?**

≠

SHEA/IDSA

At insertion:

At insertion

1. In ICU and non-ICU settings, a facility should have a process in place, su… ces at the time of CVC insertion (Quality of Evidence: MODERATE)[101]
2. Perform hand hygiene prior to catheter insertion or manipulation (Quali…
3. The subclavian site is preferred to reduce infectious complications whe… [33]

OK

OK

Discussion

- **3SITES trial:**
  - Large RCT FEM vs JUG vs SUBCL:

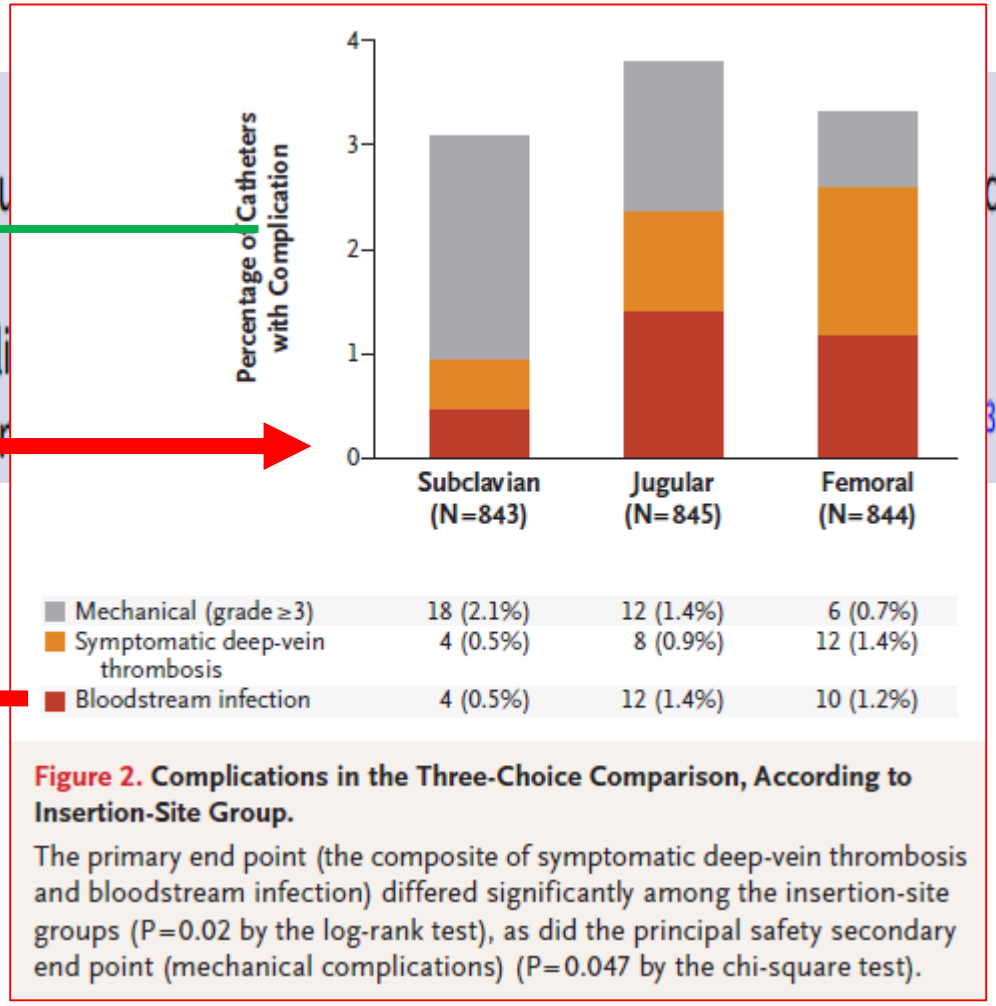


Figure 2. Complications in the Three-Choice Comparison, According to Insertion-Site Group.

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).

Buetti N et al. Infection Control & Hospital Epidemiology (2022), 43, 553–569 // Parienti JJ et al. 3SITES study NEJM 2015. DOI: 10.1056/NEJMoa1500964

SHEA/IDSA

At insertion:

- **Subclavian insertions?**
  - Summary:
    - Subclavian for long catheter maintenance
    - For (predictable?) short catheter maintenance: Jugular and femoral insertions OK
    - Risk difference between FEM and JUG:
      - 3SITES:

> P=0.04), whereas the risk in the femoral group was similar to that in the jugular group (hazard ratio, 1.3; 95% CI, 0.8 to 2.1; P=0.30).

      - Suggestions:
        - internal jugular insertion better with BMI>28.4 kg/m2, OR
        - internal jugular site when the catheter was left in place for more than 5 days

Timsit JF et al. AOIC. 2020. doi: 10.1186/s13613-020-00713-4. // Parienti JJ et al. 3SITES study NEJM 2015. DOI: 10.1056/NEJMoa1500964

SHEA/IDSA

At insertion:

4. Use an all-inclusive catheter cart or kit (Quality of Evidence: MODERATE)[118]
5. Use ultrasound guidance for catheter insertion (Quality of Evidence: HIGH)[119,120]
6. Use maximum sterile barrier precautions during CVC insertion (Quality of Evidence: MODERATE)[123–128]
7. Use an alcoholic chlorhexidine antiseptic for skin preparation (Quality of Evidence: HIGH)[42,129–134]

OK

To be discussed…

OK

Small discussion

- CLEAN study: superiority of alcoholic 2% CHG versus PVI. What about percentage?

Table 1 Multivariate Cox analysis of catheter-related infection (CRI) and catheter-related bloodstream infection (CRBSI) in the 3SITES cohort study ($n = 3471$)

	CRI		CRBSI	
	aHR (95 % CI)	*p* value	aHR (95 % CI)	*p* value
Antiseptic[a]				
5 % PVI-a (4-step)	1 [reference]		1 [reference]	
2 % CHX-a (1-step)	0.51 (0.28–0.96)	0.037	0.83 (0.38–1.79)	0.63
<1 % CHX-a (4-step)	0.73 (0.36–1.48)	0.37	0.93 (0.37–2.37)	0.94
10 % PVI (4-step)	1.50 (0.85–2.64)	0.16	1.17 (0.49–2.81)	0.73
Other or unknown	0.82 (0.21–3.18)	0.82	0.87 (0.12–6.31)	0.89

In comparison with PVI-a, the use of 2 % CHX-a for cutaneous disinfection of the CVC insertion site and maintenance catheter care was associated with a reduced risk of catheter infection, while the benefit of <1 % CHX-a was uncertain.

Pages J et al. ICM 2016. DOI: 10.1007/s00134-016-4406-4

SHEA/IDSA

After insertion:

1. Ensure appropriate nurse-to-patient ratio and limit use of float nurses in ICUs (Quality of Evidence: HIGH)[34,35]

OK

2. Use chlorhexidine-containing dressings for CVCs in patients over 2 months of age (Quality of Evidence: HIGH)[45,

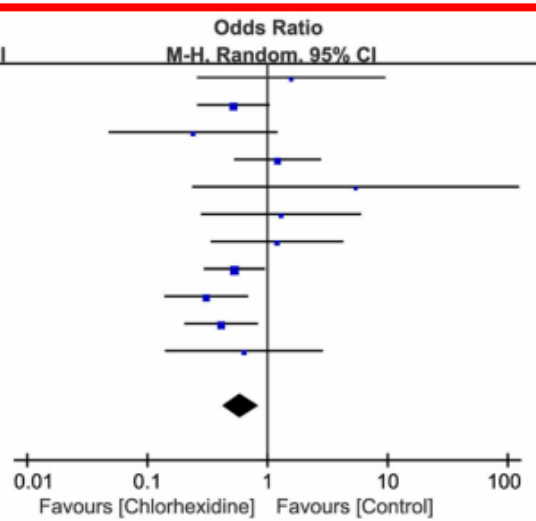
Small discussion

- Recent SR & MA & «real-life» study:

Skin antisepsis with OH 2% CHG

Study or Subgroup	Chlorhexidine Events	Total	Control Events	Total	Weight	Odds Ratio M-H, Random, 95% CI
Arvaniti 2012	3	150	2	156	3.4%	1.57 [0.26, 9.54]
Biehl 2016	13	307	24	306	15.7%	0.52 [0.26, 1.04]
Chambers 2005	2	58	7	54	4.2%	0.24 [0.05, 1.21]
Garland 2001	12	335	11	370	12.3%	1.21 [0.53, 2.79]
Gereker 2017	2	14	0	13	1.2%	5.40 [0.24, 123.81]
Levy 2005	4	74	3	71	4.6%	1.30 [0.28, 6.00]
Pedrolo 2014	6	43	5	42	6.4%	1.20 [0.34, 4.28]
Ruschulte 2008	19	300	34	301	19.1%	0.53 [0.30, 0.95]
Timsit 2009	8	1953	24	1825	13.0%	0.31 [0.14, 0.69]
Timsit 2012	11	2018	27	2055	15.4%	0.41 [0.20, 0.83]
Yu 2015	3	189	4	162	4.7%	0.64 [0.14, 2.89]
Total (95% CI)		**5441**		**5355**	**100.0%**	**0.60 [0.42, 0.85]**
Total events	83		141			

Heterogeneity: Tau² = 0.08; Chi² = 13.08, df = 10 (P = 0.22); I² = 24%
Test for overall effect: Z = 2.87 (P = 0.004)



B Forest plot for the incidence of CRBSI

Fig. 4 The forest plot for different outcomes

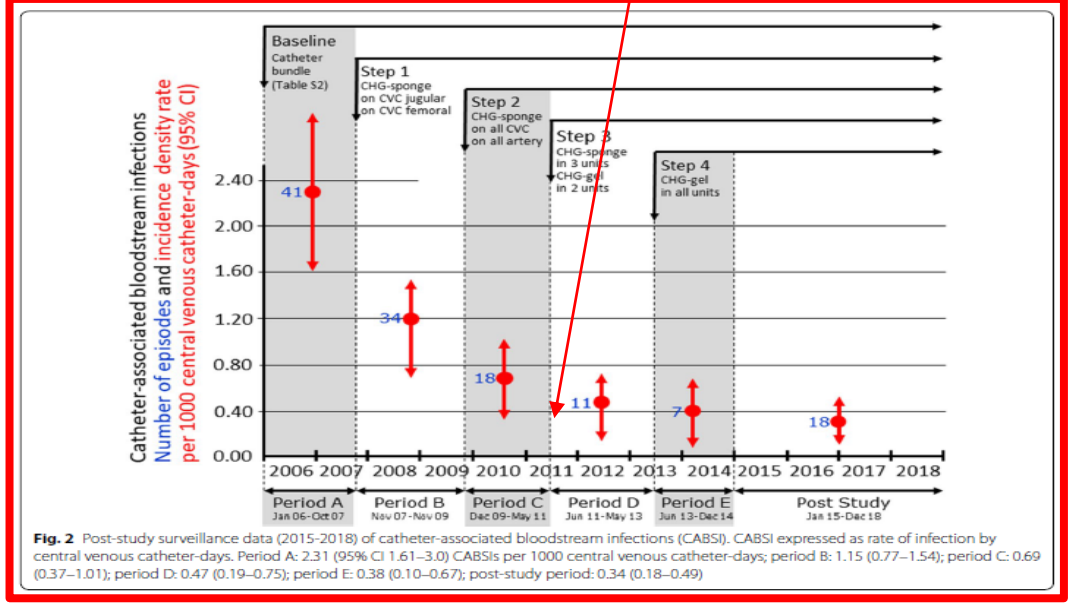


Fig. 2 Post-study surveillance data (2015-2018) of catheter-associated bloodstream infections (CABSI). CABSI expressed as rate of infection by central venous catheter-days. Period A: 2.31 (95% CI 1.61–3.0) CABSIs per 1000 central venous catheter-days; period B: 1.15 (0.77–1.54); period C: 0.69 (0.37–1.01); period D: 0.47 (0.19–0.75); period E: 0.38 (0.10–0.67); post-study period: 0.34 (0.18–0.49)

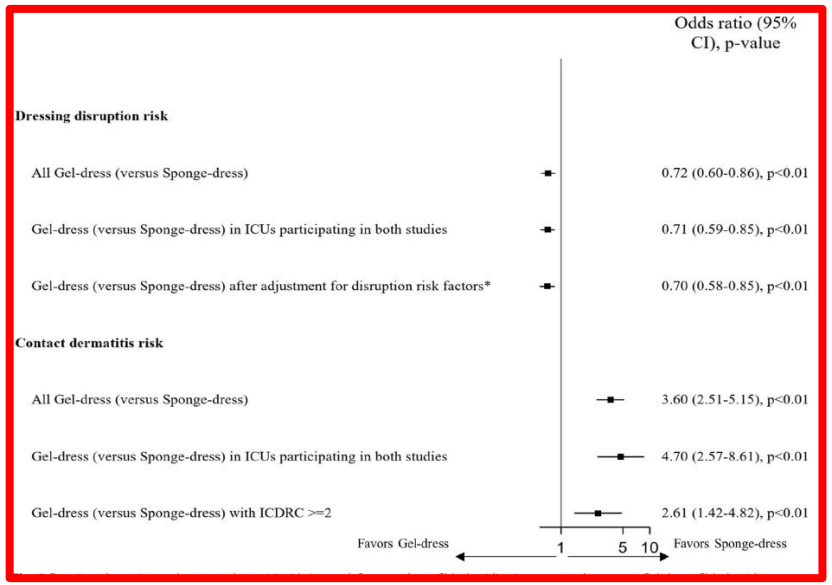
Wei L et al. BMC Infect Dis 2019. 19:429. Eggimann P et al. Intensive Care Medicine 2019. https://doi.org/10.1007/s00134-019-05617-x

SHEA/IDSA

After insertion:

CHG-impregated dressings: Reduction of intravascular catheter infections BUT

- CHG may trigger contact dermatitis
- What about their impact while applying alcoholic 2% CHG skin antisepsis? Or CHG bathing?
- Ecological impact of broadly use of CHG unknown…
- If yes: probably better CHG-gel (*versus* sponge):
  - Similar infection rates but less disruptions
  - Concomitant use with CHG skin antisepsis
    - ↑ dermatitis



Wei L et al. BMC Infect Dis 2019. 19:429. Buetti N et al. Critical Care 2020. doi: 10.1186/s13054-020-03174-0

SHEA/IDSA

Small note on CHG:

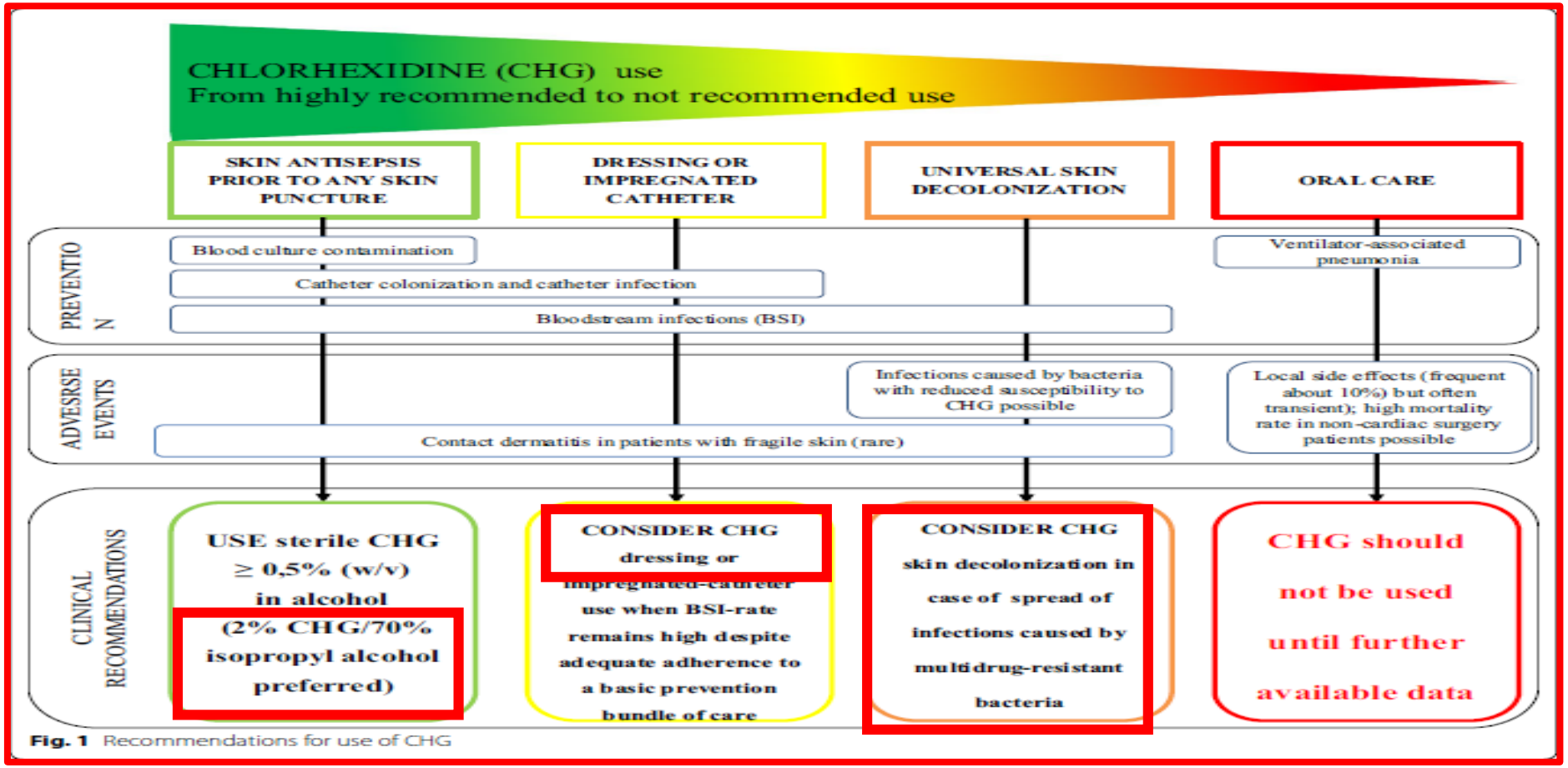


Fig. 1 Recommendations for use of CHG

Bouadma L et al. Intensive Care Medicine. 2018. https://doi.org/10.1007/s00134-018-5137-5.

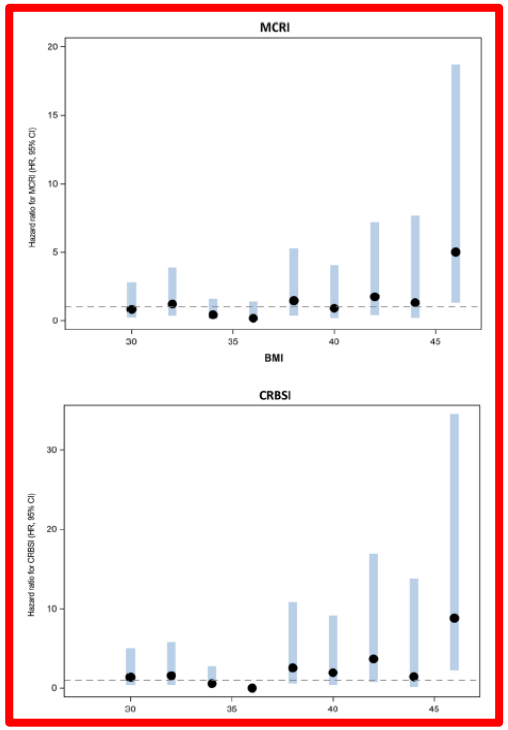
SHEA/IDSA

After insertion:

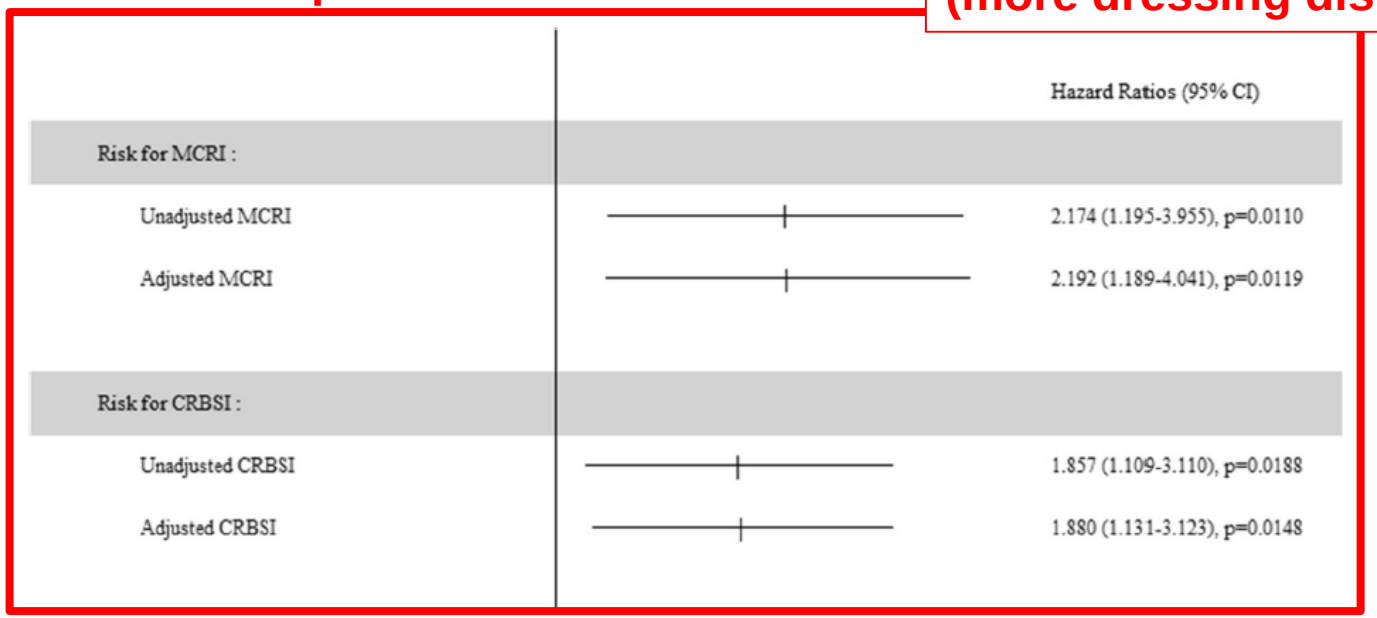
3. For non-tunneled CVCs in adults and children, change transparent dressings and perform site care with a chlorhexidine-based antiseptic at least every 7 days or immediately if the dressing is soiled, loose, or damp. Change gauze dressings every 2 days or earlier if the dressing is soiled, loose, or damp (Quality of Evidence: MODERATE)[145-148]

OK

- Pay attention to dressing disruptions:



Risk for patients with BMI >=40



Patients with BMI ≥ 40: ↑ risk for intravascular infection (more dressing disruptions!)

Buetti N et al. Intensive Care Medicine. 2021. doi: 10.1007/s00134-020-06336-4.

SHEA/IDSA

After insertion:

4. Disinfect catheter hubs, needleless connectors, and injection ports before accessing the catheter (Quality of Evidence: MODERATE)[150-154] — OK
5. Remove nonessential catheters (Quality of Evidence: MODERATE) — OK
6. Routine replacement of administration sets not used for blood, blood products, or lipid formulations can be performed at intervals up to 7 days (Quality of Evidence: HIGH)[164] — Recent study
7. Perform surveillance for CLABSI in ICU and non-ICU settings (Quality of Evidence: HIGH)[13,165,166] — OK

- RSVP trial
  - Multicenter RCT conducted in Australia
  - CVCs and ACs included
  - Adults and children

Effect of infusion set replacement intervals on catheter-related bloodstream infections (RSVP): a randomised, controlled, equivalence (central venous access device)–non-inferiority (peripheral arterial catheter) trial

Claire M Rickard, Nicole M Marsh, Emily N Larsen, Matthew R McGrail, Nicholas Graves, Naomi Runnegar, Joan Webster, Amanda Corley, David McMillan, John R Gowardman, Debbie A Long, John F Fraser, Fenella J Gill, Jeanine Young, Marghie Murgo, Evan Alexandrou, Md Abu Choudhury, Raymond J Chan, Nicole C Gavin, Azlina Daud, Annamaria Palermo, Adrian Regli, E Geoffrey Playford

Rickard C *et al.,* Lancet. 2021 Apr 17;397(10283):1447-1458. doi: 10.1016/S0140-6736(21)00351-2.

SHEA/IDSA

After insertion:

- RSVP trial

Effect of infusion set replacement intervals on catheter-related bloodstream infections (RSVP): a randomised, controlled, equivalence (central venous access device)–non-inferiority (peripheral arterial catheter) trial

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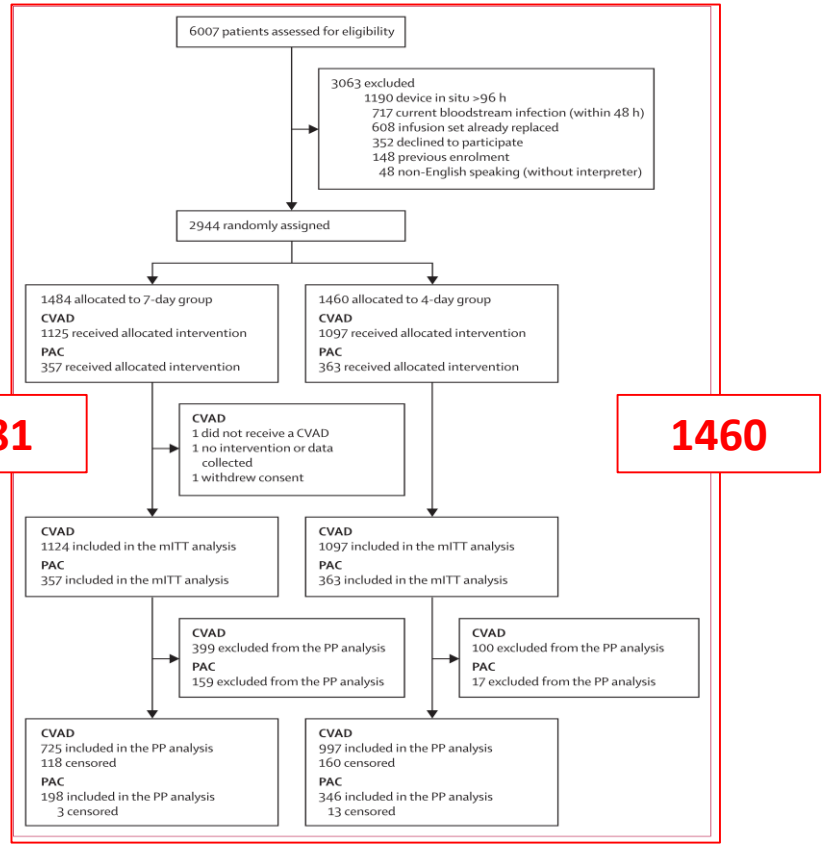


	7-day group (n=1481)	4-day group (n=1460)
Total days studied	17 196	17 438
Adults	1293 (87·3%)	1259 (86·2%)
Age, years	59·0 (47–68)	57·0 (45–67)
Paediatrics	188 (12·7%)	201 (13·8%)
Age, years	3·2 (0·9–10·0)	2·3 (0·8–8·0)
Male	935 (63·1%)	915 (62·7%)
Female	546 (36·9%)	545 (37·3%)
Hospital day at entry	5 (3–9·5)	4 (3–8)
Diagnosis		
Medical—general	452 (30·5%)	483 (33·1%)
Medical—haematology	322 (21·8%)	318 (21·8%)
Emergency surgical	236 (16·0%)	225 (15·4%)
Catheter type		
CVAD	1124 (75·9%)	1097 (75·1%)
Tunnelled cuffed or implanted port	203 (13·7%)	197 (13·5%)
Non-tunnelled	486 (32·8%)	489 (33·5%)
PICC	435 (29·4%)	411 (28·2%)
PAC	357 (24·1%)	363 (24·9%)

Rickard C *et al.,* Lancet. 2021 Apr 17;397(10283):1447-1458. doi: 10.1016/S0140-6736(21)00351-2.

SHEA/IDSA

After insertion:

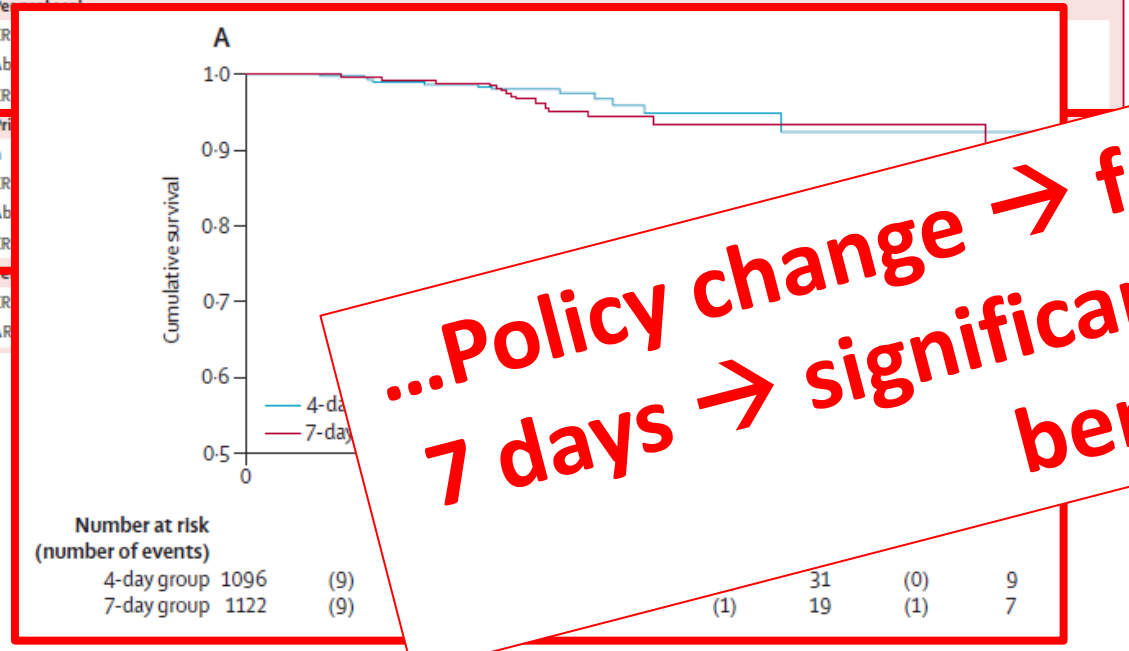
- RSVP trial

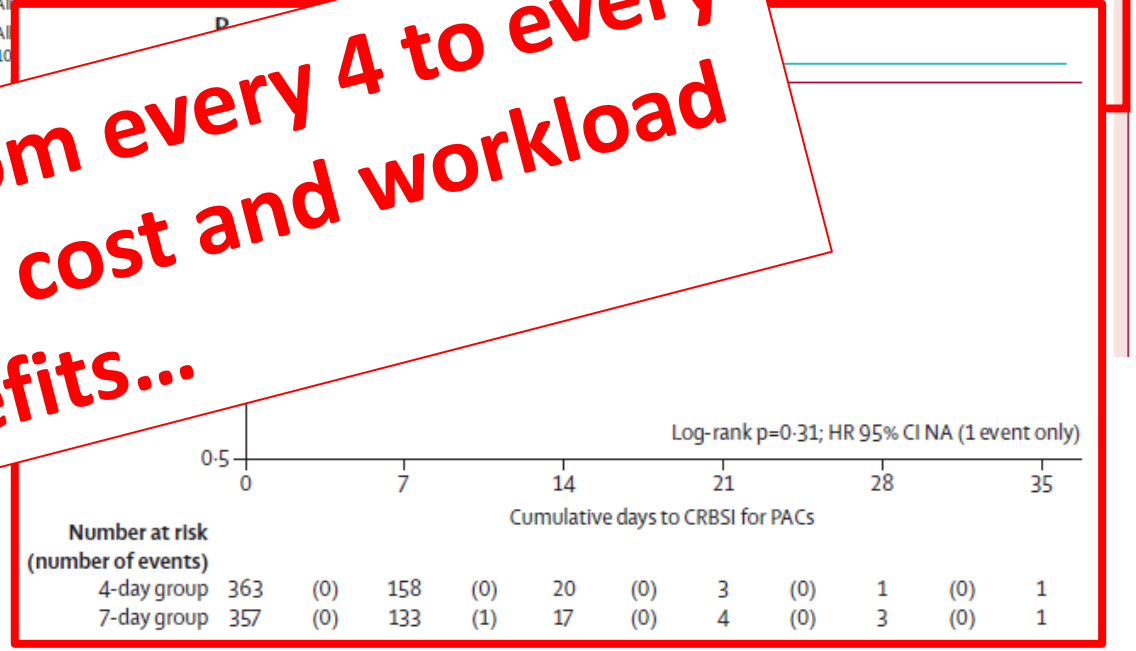
Effect of infusion set replacement intervals on catheter-related bloodstream infections (RSVP): a randomised, controlled, equivalence (central venous access device)–non-inferiority (peripheral arterial catheter) trial

Claire M Rickard, Nicole M Marsh, Emily N Larsen, Matthew R McGrail, Nicholas Graves, Naomi Runnegar, Joan Webster, Amanda Corley, David McMillan, John R Gowardman, Debbie A Long, John F Fraser, Fenella J Gill, Jeanine Young, Marghie Murgo, Evan Alexandrou, Md Abu Choudhury, Raymond J Chan, Nicole C Gavin, Azlina Daud, Annamaria Palermo, Adrian Regli, E Geoffrey Playford

	7-day group	p value	4-day group	Overall
Primary endpoint (mITT—CVADs)				
n	1124 (14 698 days)	..	1097 (14 817 days)	2221 (29 515 days)
CRBSI per patient	20 (1·78%)	..	16 (1·46%)	36/2221 (1·62%)
Absolute risk difference	0·32% (−0·73 to 1·37)	..	..	..
CRBSI per 1000 days	1·36 (0·8 to 2·0)	..	1·08 (0·6 to 1·6)	1·22 (0·8 to 1·6)
CRBSI HR	1·33 (0·69 to 2·57)	0·40	..	..

	7-day group	p value	4-day group	Overall
Primary endpoint (mITT—CVADs)				
n	1124 (14 698 days)	..	1097 (14 817 days)	2221 (29 515 days)
Secondary outcomes (CVADs)				
Infusion set colonised	4/39 (10·3%)	1·00	7/60 (11·7%)	11/99 (11·1%)
Tip colonised‡	26 (2·3%)	..	(2·0%)	48 (2·2%)
Tip colonised per 1000 days	1·8			1·6
HR	1·35 (0·76 t			..





…Policy change → from every 4 to every 7 days → significant cost and workload benefits…

Rickard C *et al.,* Lancet. 2021 Apr 17;397(10283):1447-1458. doi: 10.1016/S0140-6736(21)00351-2.

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UNIVERSITÉ DE GENÈVE

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Additional Approaches

1. Use antiseptic- or antimicrobial-impregnated CVCs (Quality of Evidence: HIGH in adult patients[38,39,169–171] and Quality of Evidence: MODERATE in pediatric patients)[172,173]
2. Use antimicrobial lock therapy for long-term CVCs (Quality of Evidence: HIGH)[177–184]
3. Use reco… …ekly af… …gh a CVC (Quality of Evide…
4. Utilize in… …ality o…
5. Use anti… …Quality…
6. Use an a… …er con…

Study/year/Country	Antimicrobial-coated central venous catheters	Number of patients	Age (year) Mean ± SD	CRBSIs, n/total	Catheter duration, days	CR, n/total
Yücel et al. [17] /2004/Germany	AC versus CSC	223	62 (29–80)/61 (21–80)†	0/118 0/105	6 (2–36)/6 (2–19)†	6/118 38/105
Walz et al. [18] /2010/USA	AC versus Chlo/SS	960	59.1 ± 15.6/60.1 ± 15.2	65/419 71/398	6.7 ± 4.8/6.8 ± 4.7	12/419 21/398
van Vliet et al. [19] /2011/The Netherlands	Chlo/SS versus CSC	94	67 ± 8/68 ± 7	Not reported	9 ± 7/10 ± 7	6/48 10/46
Thornton et al. [20] /1996/UK	AC versus OVS	176	Not reported	Not reported	Not reported	56/91 68/85
Theaker et al. [21] /2002/UK	Chlo/SS versus CSC	232	62.5	12/101 12/131	7.4/7.2	40/101 55/131
Tennenberg et al. [22] /1997/USA	Chlo/SS versus CSC	282	59.2 ± 1.1/57.9 ± 1.1	5/137 9/145	5.1 ± 0.2 5.3 ± 0.2	Not reported
Sheng et al. [23] /2000/China	Chlo/SS versus CSC	235	64 ± 18/61 ± 18	1/113 2/122	9.1 ± 5.5 8.2 ± 4.6	9/113 25/122
Moss et al. [24] /2000/UK	AC versus CSC	204	59/61	Not reported	3.79/4.25	[illegible]
Ostendorf et al. [25] /2005/Germany	Chlo/SS versus CSC	184	51/53*	3/90 7/94	[illegible]	
Osma et al. [26] /2006/Turkey	Chlo/SS versus CSC	133	49.4 ± 19.1/47.8 ±			
Maki et al. [27] /1997/USA	CSC versus Chlo/SS	[illegible]				
Logghe et al. [28] /2006/UK						
León [29] /19… Belgium						
Khare et al. [30] /2004/Spain						
Kalfon et al. [31] /2007/France						
Jaeger et al. [32] /2005/Germany						
Hagaua et al. [33] /2009/Romania						
Corral et al. [34] /2003/Spain						29/80 41/65
Carrasco et al. [35] /2004/USA				…/132	9.5/9*	13/128 29/132
Camargo et al. [36] /2009/Brazil			…(36–82)†	8/51 6/58	14 (7.5–21)/12 (8–19)†	15/51 20/58
Run-Christian et al. [illegible]	[illegible]	[illegible]	59.2 ± 17.8/58 ± 18.0	3/188	10.5 ± 8.9/12 ± 11.7	7/188

Study/year/Country	Antimicrobial-coated central venous catheters	Number of patients	Age (year) Mean ± SD	CRBSIs, n/total	Catheter duration, days	CR, n/total
Bach et al. [38] /1999/Germany	OVS versus CSC	67	Not reported	2/34 2/33	Not reported	18/34 19/33
Bach et al. [39] /1996/Germany	AC versus CSC	20	Not reported	Not reported	Not reported	3/10 4/10
Antonelli et al. [40] /2012/Italy	OVS versus CSC	272	64.8 ± 16.6/62.9 ± 17.3	6/135 7/137	13 ± 24/15 ± 37	44/135 41/137
Moretti et al. [41] /2005/USA	OVS versus CSC	514		1/262 0/252	6.2/5.7*	
Rupp et al. [42] /2005/USA	CSC versus Chlo/SS	777	61 ± 15.5/60 ± 16.4	3/393		
Rickard et al. [43] /2016/Australia	Chlo/SS versus CSC	404	55.06 ± 18.66			
[illegible]	…/SS versus CSC	460	58.3 ± 18.7/56.2 ± 20.3	2/237 6/223	8.4 ± 3.5/7.8 ± 3.2	14/237 30/223
Ranucci et al. [45] /2003/Italy	CSC versus OVS	545	65 ± 15.3/63.5 ± 15.2	12/277 9/268	9 ± 6.9/9.1 ± 7	31 ± 7/21 ± 4
Raad et al. [46] /1997/USA	CSC versus AC	298	56 (17–88)/58 (19–87)†	7/136 5/130	6 (1–21)/6 (1–28)†	36/136 11/130
Fraenkel et al. [47] /2006/Australia	AC versus OVS	646	53.2 ± 20.1/53.4 ± 19.5	4/280 5/294	6.23 ± 3.83/6.25 ± 3.9	25/280 43/294
Collin [48] /1998/USA	Chlo/SS versus CSC	220	46.4/47.2*	1/58 4/61	9.0 ± 6.1/7.3 ± 5.0	2/58 25/61
Dünser et al. [49] /2005/Australia	OVS versus Chlo/SS versus CSC	275	63 ± 16/62 ± 16/60 ± 16	Not reported	9.3 ± 4/9.7 ± 4/10.7 ± 4.2	27/160 12/165 19/160

Studies before best practice procedures where CRBSI levels were unacceptably high compared with today's standards

Chong HY et al. Clin Infect Dis. 2017; 64(Suppl_2):S131–S140. Wang H et al. Ann Intensive Care 2018; 8:71.

SHEA/IDSA

Approaches that Should Not Be Considered a Routine Part of CLABSI Prevention
1. Do not use antimicrobial prophylaxis for short-term or tunneled catheter insertion or while catheters are *in situ* (Quality of Evidence: HIGH)[209–213]
2. Do not routinely replace CVCs or arterial catheters (Quality of Evidence: HIGH)[214]
Unresolved Issues
1. Routine use of needleless connectors as a CLABSI prevention strategy before an assessment of risks, benefits, and education regarding proper use[215–219]
2. Surveillance of other types of catheters (eg, peripheral arterial or peripheral venous catheters)[11,21,22]
3. Standard, nonantimicrobial transparent dressings and CLABSI risk.
4. The impact of using chlorhexidine-based products on bacterial resistance to chlorhexidine
5. Sutureless securement
6. Impact of silver zeolite-impregnated umbilical catheters in preterm infants (applicable in countries where it is approved for use in children)[227]
7. Necessity of mechanical disinfection of a catheter hub, needleless connector, and injection port before accessing the catheter when antiseptic-containing caps are being used

- Maybe the future…:
  - Standard catheter securement: CVC → skin with sutures
    - possible nidus for bacterial colonization?
  - Suture-free systems:
    - “Safe”: similar percentage of catheter migration or unplanned removals, prevent catheter failure?
    - Maybe promising systems for preventing infections? Some data from hemodialysis catheters…

Buetti N et al. Infection Control & Hospital Epidemiology (2022), 43, 553–569 // Am J Infect Control 44(1):54–60. https:// doi. org/ 10. 1016/j. ajic. 2015. 08. 022 // Karpanen TJ et al. Ann Intensive Care 9(1):49. https:// doi. org/ 10. 1186/s13613-019-0519-6 // Mitchell Ml et al. Aust Crit Care 33(5):441–451. https:// doi. org/ 10. 1016/j. aucc. 2019. 10. 002 // Fujimoto K et al. (2021) Sci Rep 11(1):21771. https:// doi. org/ 10. 1038/s41598-021-01372-6

CONTENT

- Introduction
- SHEA/IDSA compendium 2022
- Selected recently published studies about the prevention of intravascular catheter infections
- Conclusions

SELECTED PUBLICATIONS

1. Prone position and intravascular catheter infections

- 202 patients matched: age, sex, year of hospitalisation, centre, SAPS II at admission and length of ICU stay

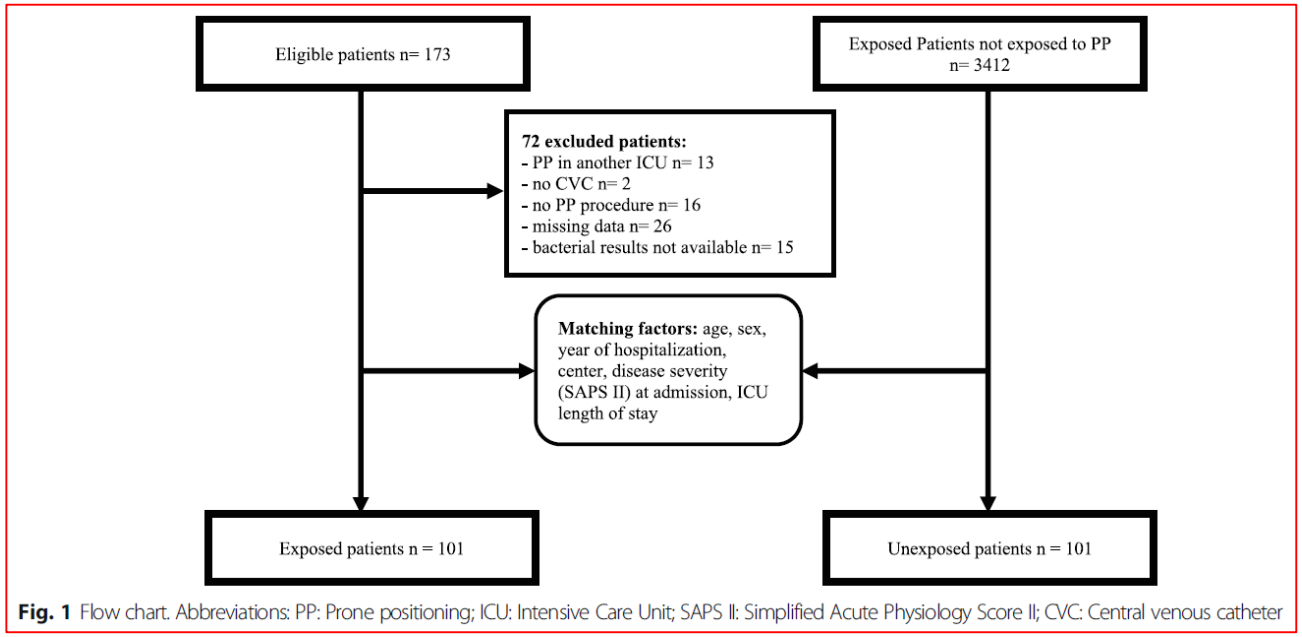


Fig. 1 Flow chart. Abbreviations: PP: Prone positioning; ICU: Intensive Care Unit; SAPS II: Simplified Acute Physiology Score II; CVC: Central venous catheter

Characteristics	Total cohort (*N* = 202)	Exposed (prone) group (*N* = 101)	Unexposed (supine) group (*N* = 101)
Centre 1 (VS 2)	90 (45)	45 (45)	45 (45)
Gender (M)	147 (73)	74 (73)	74 (73)
Age (y)	61 (48–68)	61 (46–68)	61 (52–70)
BMI (kg/m^2)	28 (25–34)	30 (26–35)	27 (24–31)
SAPS II score	54 (43–66)	54 (43–66)	53 (44–66)
SOFA score	9 (8–12)	10 (8–12)	9 (8–11)
Immunosuppression[a]	98 (49)	51 (51)	47 (47)
Surgical admission (vs. medical)	36 (18)	14 (14)	22 (22)
Nosocomial patient origin (vs. community)	98 (49)	49 (49)	49 (49)
Catheterization duration (days)	17 (8–26)	19 (9–27)	14 (8–25)
Number of catheter per patient	2 (1–3)	2 (1–2)	2 (1–3)
Catheter insertion site			
Jugular	148 (73)	76 (75)	72 (71)
Subclavian	18 (9)	8 (8)	10 (10)
Femoral	36 (18)	17 (17)	19 (19)

Louis *et al.* BMC Infectious Diseases (2021) 21:534. https://doi.org/10.1186/s12879-021-06197-2

SELECTED PUBLICATIONS

1. Prone position and intravascular catheter infections

- 202 patients matched: age, sex, year of hospitalisation, centre, SAPS II at admission and length of ICU stay

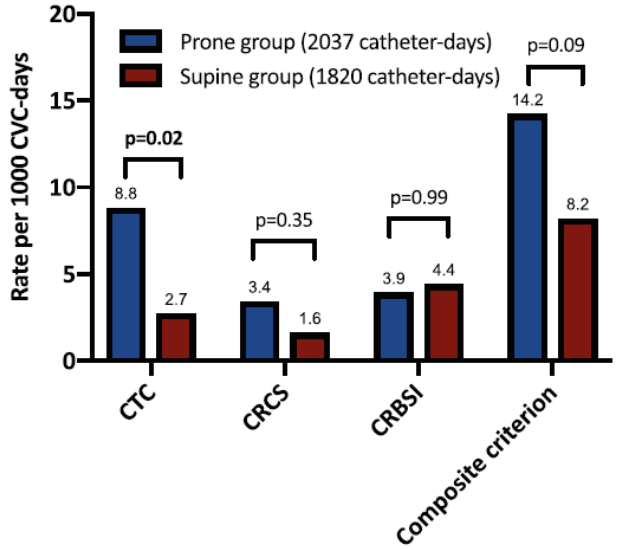


Fig. 2 Incidences in the exposed and unexposed groups of central venous catheter (CVC) tip colonization (CTC), catheter-related clinical sepsis (CRCS), catheter-related bloodstream infection (CRBSI), and a composite outcome composed of CTC and/or CRCS and/or CRBSI

Multivariate analysis
identified PP as a factor related to catheter colonization or infection (p=0.04)

Louis *et al.* BMC Infectious Diseases (2021) 21:534. https://doi.org/10.1186/s12879-021-06197-2

SELECTED PUBLICATIONS

2. Catheter type and risk of infection in oncological patients

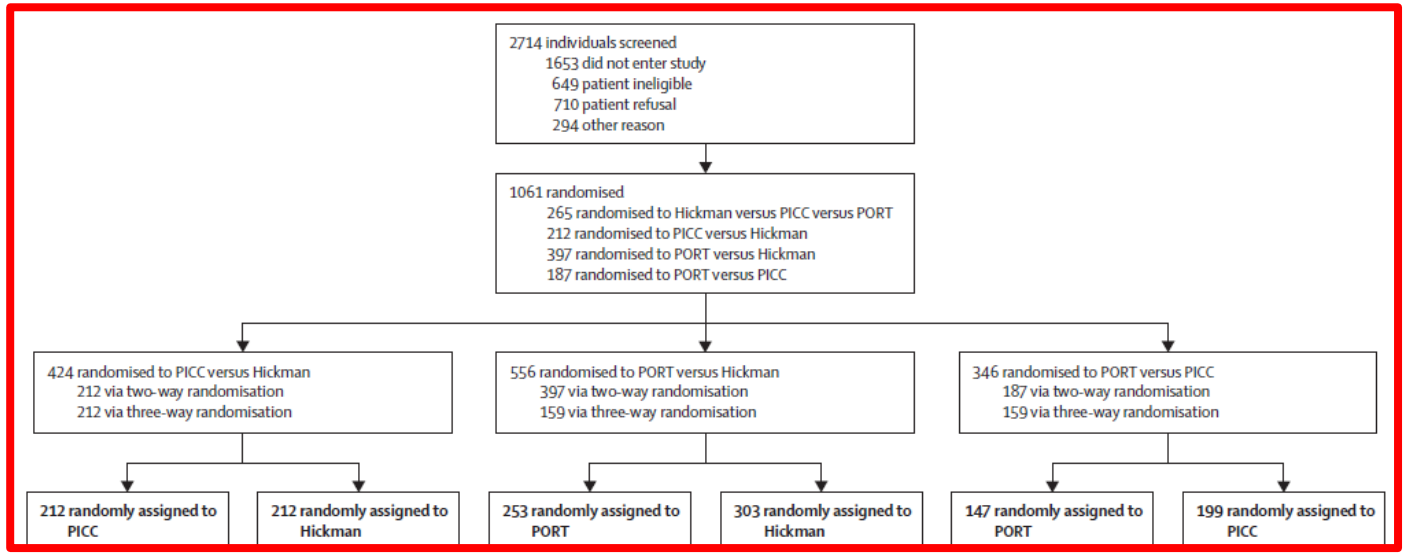
- Hickman-type tunnelled catheters (Hickman) *versus* PICCs *versus* totally implanted ports (PORTs)
- Systemic anticancer treatment (3 months) via a central vein
- Open-label, multicentre, randomised controlled trial
- Haematological malignancy from 18 oncology units in the UK
- **Primary outcome: complication rate** (composite)
  - infection, venous thrombosis, pulmonary embolus, inability to aspirate blood, mechanical failure, and other)
- FUP: until device removal, withdrawal from study, or 1-year follow-up

Moss J et al. Lancet 2021; 398: 403–15

SELECTED PUBLICATIONS

2. Catheter type and risk of infection in oncological patients

- 1061 were enrolled



Moss J et al. Lancet 2021; 398: 403–15

SELECTED PUBLICATIONS

2. Catheter type and risk of infection in oncological patients

	PICCs vs Hickman		PORTs vs Hickman		PORTs vs PICCs	
	PICCs (n=212)	Hickman (n=212)	PORTs (n=253)	Hickman (n=303)	PORTs (n=147)	PICCs (n=199)
Number of complications						
0	102 (48%)	109 (51%)	180 (71%)	172 (57%)	100 (68%)	106 (53%)
≥1	110 (52%)	103 (49%)	73 (29%)	131 (43%)	47 (32%)	93 (47%)
Laboratory confirmed bloodstream infection						
Patients	10 (5%)	41 (19%)	14 (6%)	49 (16%)	8 (5%)	7 (4%)
Complications	11 (6%)	43 (25%)	16 (12%)	54 (27%)	9 (11%)	7 (5%)
Suspected catheter-related bloodstream infection						
Patients	10 (5%)	18 (9%)	19 (8%)	15 (5%)	8 (5%)	5 (3%)
Complications	12 (7%)	23 (14%)	21 (16%)	16 (8%)	11 (13%)	
Venous thrombosis						
Patients						

PORTs are more effective and safer than both Hickman and PICCs…
Our findings suggest that most patients receiving SACT for solid tumours should receive a PORT within the UK National Health Service…

P… …number of complications in that group

Moss J et al. Lancet 2021; 398: 403–15

SELECTED PUBLICATIONS

3. PICC *versus* midlines

- Multihospital registry (48 hospitals)
- Patients admitted to a participating site from Dec 2017 to Jan 2020
  - PICC or midline placement for the indications of difficult venous access or intravenous antibiotic therapy prescribed for 30 or fewer days
- **Composite outcome:** symptomatic catheter-associated deep vein thrombosis (DVT), catheter-related bloodstream infection and catheter occlusion.

Swaminathan et al. JAMA Intern Med 2021. doi:10.1001/jamainternmed.2021.6844

SELECTED PUBLICATIONS

3. PICC *versus* midlines

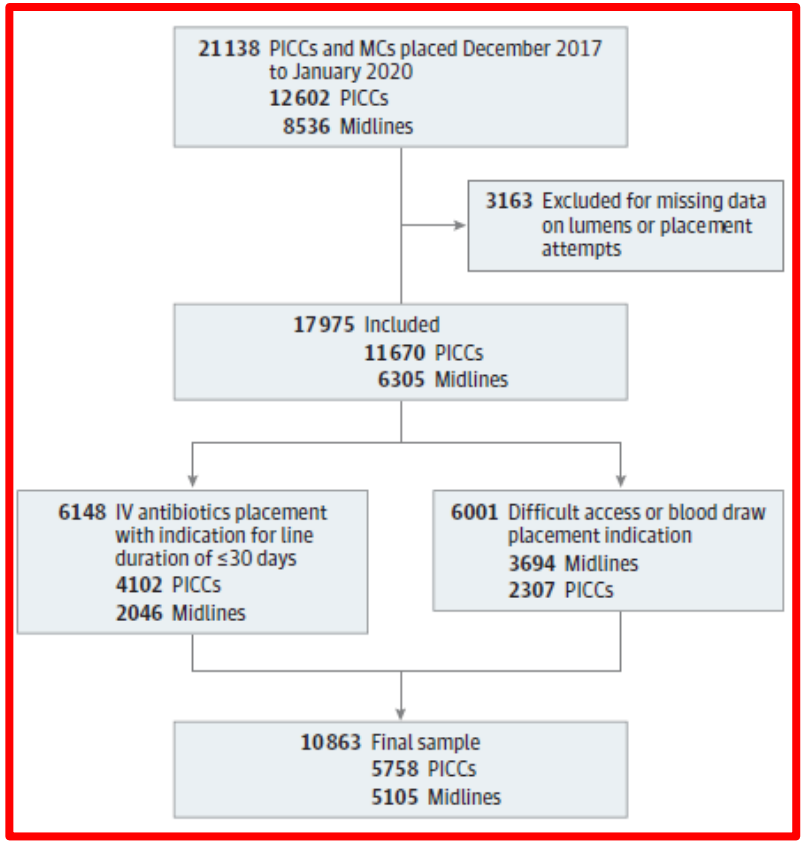


Table 1. Patient, Device, and Hospital Characteristics (n = 10 863)

Characteristic	No. (%) Midline (n = 5105)	No. (%) PICC (n = 5758)	Standardized mean difference	Total, No. (%)
Patient characteristics				
Sex				
Female	2969 (58.2)	2772 (48.1)	0.202	5741 (52.8)
Male	2136 (41.8)	2986 (51.9)	−0.202	5122 (47.2)
Race and ethnicity[a]				
Asian	32 (0.6)	27 (0.5)	0.022	59 (0.5)
Black	2001 (39.2)	1065 (18.5)	0.469	3066 (28.2)
White	2877 (56.4)	4373 (75.9)	−0.423	7250 (66.7)
Age group, ≥65 y	2524 (49.4)	2852 (49.5)	−0.002	5376 (49.5)
Age, median (IQR)	64.8 (52.8-75.5)	64.9 (53.8-75.4)	−0.019	64.8 (53.4-75.4)
Charlson, median (IQR)	3 (2-5)	3 (2-5)	0.041	3 (2-5)
BMI, median (IQR)	28.8 (23.9-35.8)	29.2 (24.2-35.7)	−0.007	29.0 (24.1-35.8)
Admitted from home	4499 (88.1)	4978 (86.5)	0.050	9477 (87.2)
Level of care				
ICU	1145 (22.5)	1557 (27.1)	−0.106	2702 (24.9)
Inpatient medical floor	3874 (76.1)	4165 (72.4)	0.085	8039 (74.1)
Outpatient/emergency department	74 (1.4)	33 (0.6)	0.08809	107 (0.1)

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3. PICC *versus* midlines

Table 1. Patient, Device, and Hospital Characteristics (n = 10 863) (continued)

Characteristic	No. (%)		Standardized mean difference	Total, No. (%)
	Midline (n = 5105)	PICC (n = 5758)		
Device characteristics				
Placement indication				
Short-term antibiotics	2046 (40.1)	4102 (71.2)	−0.661	6148 (56.6)
Chemotherapy	5 (0.1)	76 (1.3)	−0.146	81 (0.7)
Difficult access/blood draws	3694 (72.4)	2307 (40.1)	0.688	6001 (55.2)
Multiple fluids	62 (1.2)	239 (4.2)	−0.183	301 (2.8)
TPN	2 (<0.1)	218 (3.8)	−0.276	220 (2.0)
No. of device lumens				
Single	4334 (84.9)	3637 (63.2)	0.512	7971 (73.4)
Double	762 (14.9)	1750 (30.4)	−0.376	2512 (23.1)
Triple/quadruple	9 (0.2)	371 (6.4)	−0.355	380 (3.5)
Gauge				
4F	4464 (87.4)	3425 (59.5)	0.668	7889 (72.6)
5F	638 (12.5)	2202 (38.2)	−0.619	2840 (26.1)
≥6F	3 (0.1)	131 (2.3)	−0.208	134 (1.2)
Device length, median (IQR), cm	14 (10-16)	42 (39-46)	−6.601	35 (14-43)
Device duration, median (IQR), d	6 (3-12)	14 (7-27)	−0.776	10 (5-20)
Device removal (for any complication)	371 (7.3)	300 (5.2)	0.085	671 (6.2)

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3. PICC *versus* midlines

Table 4. Multivariate Analysis Showing Odds of Major Complications Stratified by Device Type[a]

Outcome	No. (%) Total (n = 10 863)	Midline (n = 5105)	PICC (n = 5758)	OR (95% CI)	*P* value	HR (95% CI)	*P* value
Any major complication	769 (7.1)	200 (3.9)	569 (9.9)	1.99 (1.61-2.47)	<.001	1.21 (1.02-1.44)	.03
Primary BSI	112 (1.0)	19 (0.4)	93 (1.6)	4.44 (2.52-7.82)	<.001	1.76 (1.06-2.92)	.03
Catheter occlusion	510 (4.7)	105 (2.1)	405 (7.0)	2.24 (1.70-2.96)	<.001	1.58 (1.26-1.97)	<.001
DVT	160 (1.5)	74 (1.4)	86 (1.5)	0.93 (0.63-1.37)	.70	0.53 (0.38-0.74)	<.001
PE	22 (0.2)	8 (0.2)	14 (0.2)	1.29 (0.46-3.61)	.62	0.92 (0.36-2.32)	.85

Abbreviations: BSI, bloodstream infection; CLABSI, central line–associated blood stream infection; CVC, central venous catheter; DVT, deep vein thrombosis; HR, hazard ratio; OR, odds ratio; PE, pulmonary embolism; PICC, peripherally inserted central catheter.

[a] For logistic mixed-effect models, results

Randomized clinical trials comparing these devices are needed ☺

(Canada study ongoing NCT03502980)

PICCs appeared

selection betwee

with midlines. Thoughtful

of venous thrombosis, appears necessary in clinical care.

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SELECTED PUBLICATIONS

4. New bundle among haemodialysis patients in Australia

- Stepped wedge, cluster randomised trial in 37 renal services across Australia (adults)
- Multifaceted intervention bundle that included elements of catheter care was implemented at one of three randomly assigned time points
- Outcome: CRBSI

Kotwal S et al. BMJ 2022;377:e069634 http://dx.doi.org/10.1136/bmj-2021-069634

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4. New bundle among haemodialysis patients in Australia

- At time of catheter insertion
- Surgical aseptic technique (hand hygiene, sterile gloves, surgical mask, eye protection, and gown), and a sterile environment (sterile surgical field on the patient) or a sterile room as per unit availability must be applied.
- An antiseptic solution using a minimum of 2% chlorhexidine with 70% alcohol must be used
- Site of insertion:
  - The right internal jugular vein is the best site for catheter insertion
  - Avoid catheters in the subclavian vein owing to incidence of central vein stenosis
  - Avoid femoral catheters when possible
- We do not recommend any specific catheter type
- Ultrasound guided catheter placement is recommended if the resources are available
- Semi-permeable transparent dressing must be applied to the line. If a patient is allergic to these dressings, then an alternative appropriate dressing may be used
- All patients must receive education on the following topics:
  - Vascular access care
  - Hand hygiene
  - Risks related to catheter use
  - Recognising signs of infection
  - Instructions for access management when away from the dialysis unit
  - To ensure that their catheter and exit site are kept dry
  - To seek assistance from dialysis should a dressing become wet, soiled, or leak, or if the catheter itself begins to slip out
  - To not shower in the first 72 hours after catheter insertion. After 72 hours, in order to have a shower, the catheter site must be covered with waterproof material
- All patients should receive a copy of the REDUCCTION catheter care sheet

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SELECTED PUBLICATIONS

4. New bundle among haemodialysis patients in Australia

Catheter maintenance

- Hand hygiene, sterile gloves, a plastic apron, and aseptic technique (hand hygiene, gloves) must be applied at all occasions of catheter access:
  - An antiseptic solution using a minimum of 2% chlorhexidine with 70% alcohol must be used
  - For those unable to tolerate chlorhexidine, povidone-iodine or 70% alcohol may be used
- Dressing must be changed at least every seven days and each time the dressing appears visibly soiled or loose
- We do not recommend the routine use of mupirocin ointment or medicated honey at the catheter exit site
- All units must use at least one of the following specific interventions aimed at prophylaxis against catheter related bacteraemia*:
  - Impregnated dressings (such as chlorhexidine impregnated patch or sponge) at the catheter exit site and/or
  - Antimicrobial (eg, citrate or taurolidine based) or antibacterial (eg gentamicin) catheter locking solutions†
- All patients must be advised to ensure that their catheter and exit site are kept dry. Patients must be advised to seek assistance from dialysis should a dressing become wet, soiled, or leak, or if the catheter itself begins to slip out
- All patients should receive a copy of the REDUCCTION catheter care sheet
- All patients must receive education on the following topics:
  - Vascular access care
  - Hand hygiene
  - Risks related to catheter use
  - Recognising signs of infection
  - Instructions for access management when away from the dialysis unit
- All patients must be advised not to shower in the first 72 hours after catheter insertion. After 72 hours, in order to have a shower, the catheter site must be covered with waterproof material

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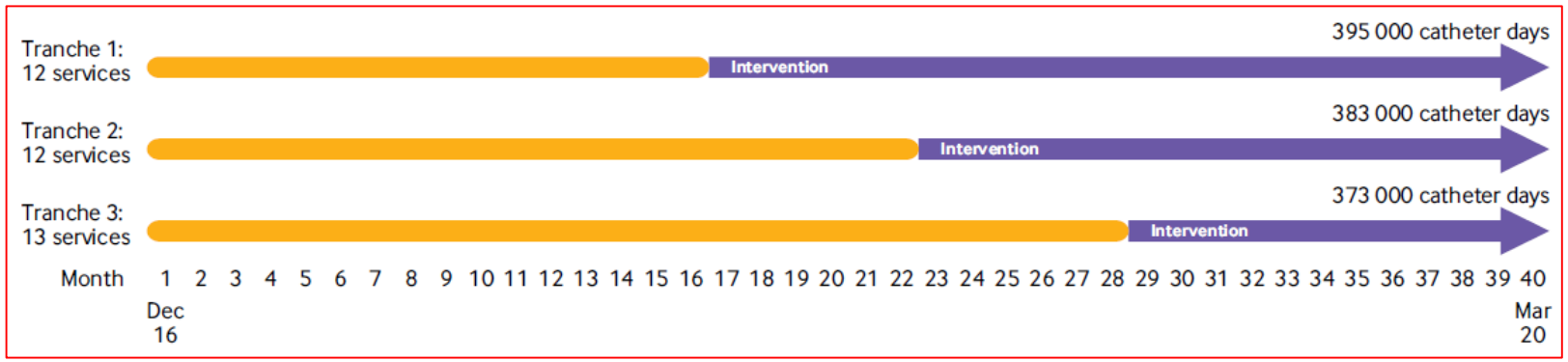
4. New bundle among haemodialysis patients in Australia

Table 1 | Patient characteristics during baseline and intervention phases of trial

Characteristics	Baseline phase (n=3519)	Intervention phase (n=2845)
Women	1398 (39.7)	1110 (39.0)
Mean (SD) age	60.7 (15.8)	60.9 (15.9)
Ethnicity:		
Asian*	293 (8.3)	240 (8.4)
White	2250 (63.9)	1822 (64.0)
First Nations†	378 (10.7)	342 (12.0)
Pacific Islander‡	89 (2.5)	63 (2.2)
Other or not recorded	509 (14.5)	378 (13.3)
Diabetes mellitus:		
Diet controlled	304 (8.6)	172 (6.0)
Drug controlled	1251 (35.5)	1049 (36.9)
Immunosuppressant use	472 (13.4)	372 (13.1)

Table 2 | Characteristics of haemodialysis catheters during baseline and intervention phases of trial

Characteristics	Baseline phase		Intervention phase	
	Catheters	Catheter days	Catheters	Catheter days
Total No of catheters	5431	497 875	5862	648 390
Insertion on left side of body	1003 (18.5)	82 479	1080 (18.4)	104 582
Vein of insertion:				
Internal jugular	4653 (85.7)	457 083	5130 (87.5)	615 014
Femoral	592 (10.9)	15 058	554 (9.4)	15 034
Subclavian	152 (2.8)	21 752	139 (2.4)	13 447
Other or unknown	34 (0.7)	3982	39 (0.7)	4895
Catheter type*:				
Tunnelled	4069 (74.9)	482 001	4696 (80.1)	633 820
Non-tunnelled	1361 (25.1)	15 838	1165 (19.9)	14 297
Reason for central venous access:				
Acute kidney injury	1898 (34.9)	95 340	1865 (31.8)	118 947
Start of maintenance dialysis without functioning access	1808 (33.3)	215 685	2235 (38.1)	302 293
Transfer from peritoneal dialysis (temporary or permanent)	644 (11.8)	75 709	612 (10.4)	85 541
Arteriovenous fistula or graft thrombosis	645 (11.9)	70 056	742 (12.7)	89 175
Arteriovenous fistula or graft infection	95 (1.7)	6636	78 (1.3)	8730
Other	344 (6.1)	587	331 (5.6)	3514



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4. New bundle among haemodialysis patients in Australia

Table 3 | Trial outcomes. Rates are shown per 1000 catheter days

Outcomes			P value
Primary outcome:			
Confirmed haemodialysis C			0.20
Secondary outcomes:			
Suspected or possi			0.06
Total			0.97
in		(0.52 to 1.01)	0.06

CRB

*Mu
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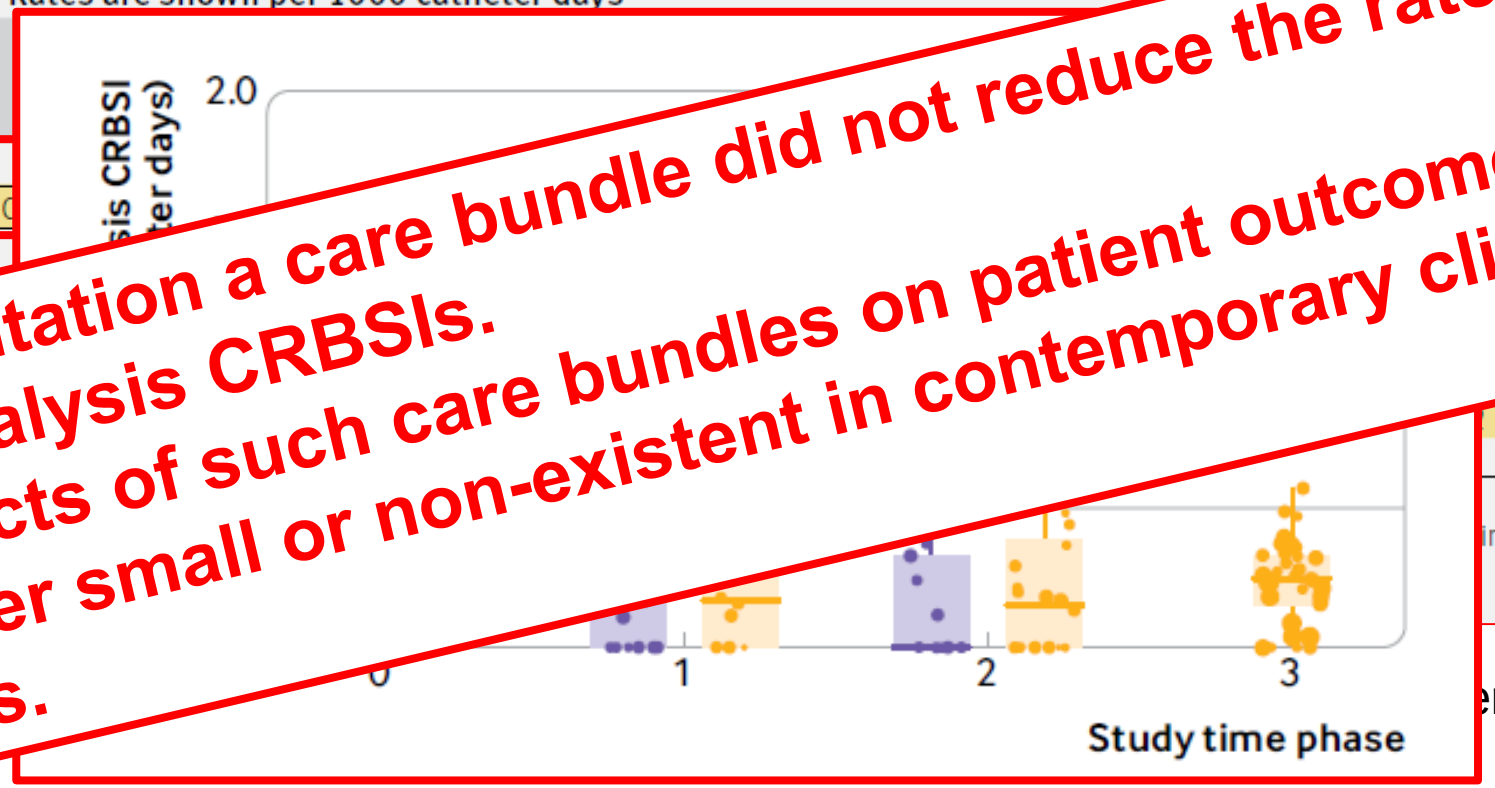
†Inclu

imes accumulated in specific service



Implementation a care bundle did not reduce the rate of haemodialysis CRBSIs. The effects of such care bundles on patient outcomes are either small or non-existent in contemporary clinical settings.

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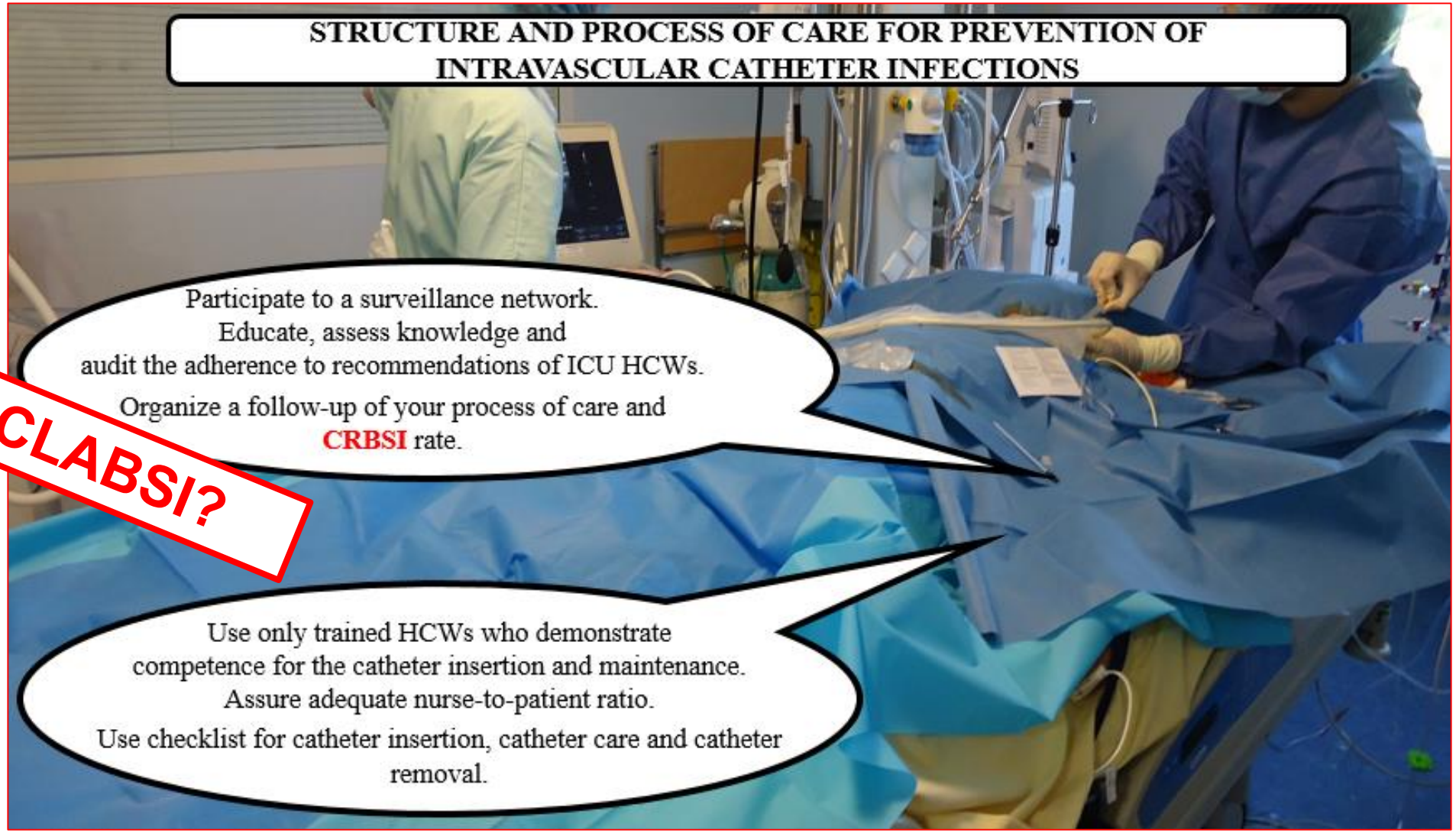
CONTENT

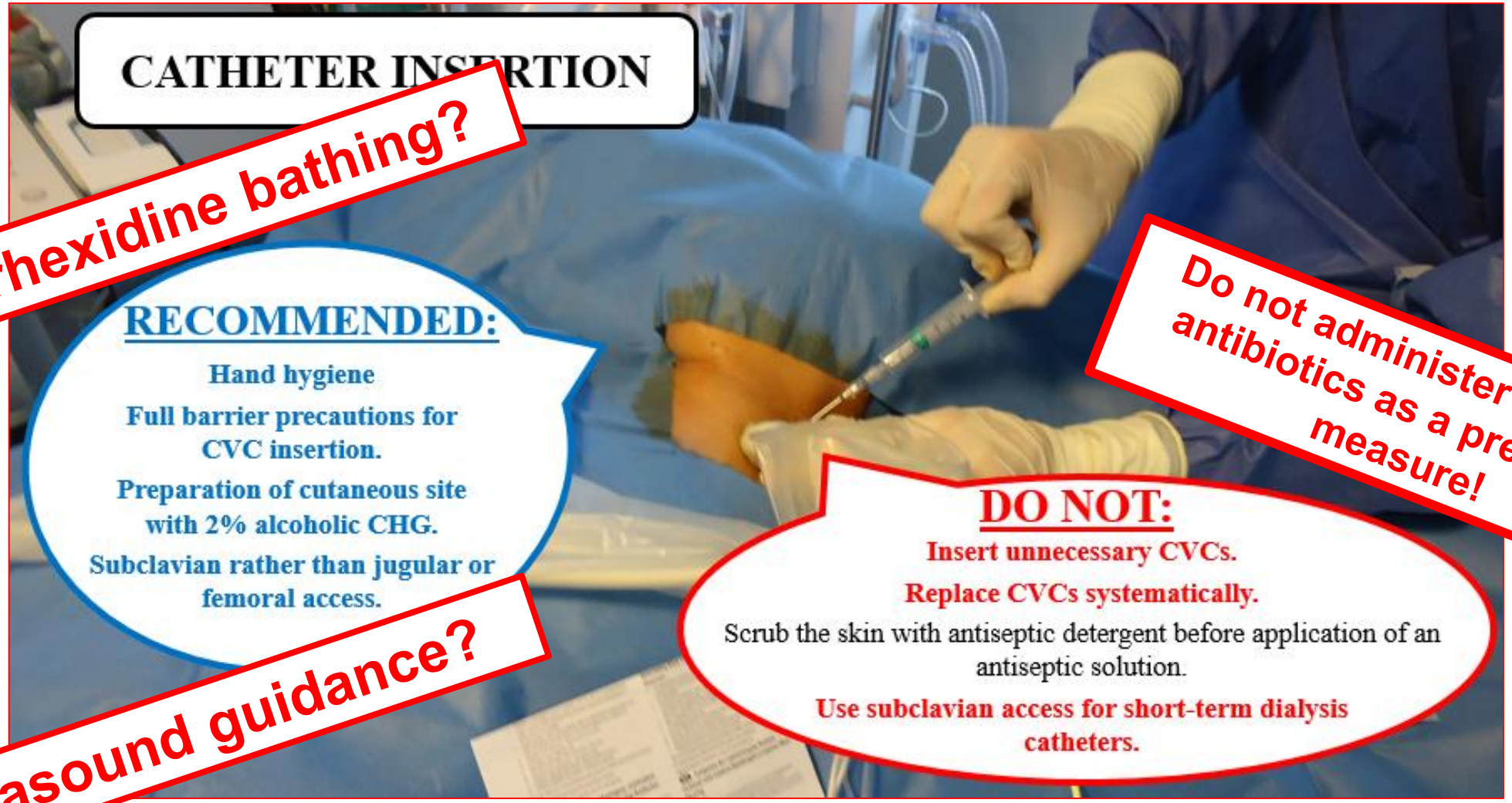
- Introduction
- SHEA/IDSA compendium 2022
- Selected recently published studies about the prevention of intravascular catheter infections
- Conclusions

CONCLUSIONS



Buetti N & JF Timsit, modified from Textbook of critical care 2022

CONCLUSIONS



Chlorhexidine bathing?

Do not administer systemic antibiotics as a prevention measure!

Ultrasound guidance?

Buetti N & JF Timsit, modified from Textbook of critical care 2022

CONCLUSIONS

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