



Le retrait systématique des cathéters périphériques

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CONTENT

- Introduction
- Literature update: routine replacement *versus* clinically indicated replacement
- Large «*before-after-before*» study conducted in Geneva
- New data on dwell time and COVID-19 time
- Conclusions

INTRODUCTION

- A global audit across 13 countries:
 - almost 60% of inpatients had at least one peripheral venous catheter (PVC) in place
- In Switzerland, 48.6% of patients in acute care have a PVC in place every single day
- Approximately 330 million PVCs were sold annually in the US
- PVC-related complications:
 - Hematoma
 - Phlebitis
 - Extravasation
 - Bruising
- Little is known about the bloodstream infection (BSI) risk associated with PVCs

INTRODUCTION

PVCs and BSI risk

- Short-term PVCs accounted for:
 - a mean of 6.3% of nosocomial BSIs
 - 23% of nosocomial catheter-related BSIs
- Relative risk of CVC-BSI compared to PVC-BSI varied from **1.5** to 64
- Proportion of *S. aureus* PVC-BSI among CRBSI is high

Table 2. Risk of *Staphylococcus aureus* Bloodstream Infections due to Infected Peripheral Vascular Catheters

Study, First Author [Ref]	CRBSI	
	<i>Staphylococcus aureus</i> CR-BSIs due to PVCs	<i>Staphylococcus aureus</i> BSIs due to PVCs
Mylotte [50]	50% of 28 CR-BSIs	18% of 79 BSIs
Thomas ^a [51]	50% of 305 CR-BSIs	
Kok [52]	41% of 75 CR-BSIs	25% of 123 BSIs
Bruno [55]		35% of 31 BSIs ^b
Trinh [53]	12% of 196 CR-BSIs ^c	
Mestre [46]	64% of 14 CR-BSIs	28% of 32 BSIs
Stuart [56]		24% of 583 BSIs
Morris [54]	44% of 121 CR-BSIs	20% of 261 BSIs
Rhodes [57]		24% of 151 BSIs ^d
Austin ^a [49]		76% of 445 BSIs

- Prolonged dwell time and catheter insertion under emergent conditions increased risk of PVC-BSI...

INTRODUCTION

PVCs and BSI risk – dwell time

- No correlation between the number of catheter days per site for patients with a peripheral IV device, and hospital-acquired bacteraemia

- The mean PVC dwell time in PVC-BSI cases was 3.9 days (± 2.1 days)
- One study found that 54% of PVC-BSI occurred in PVC in place for ≥ 3 days
- One study found that 61% of PVC-BSIs occurred in PVC in place for ≥ 3 days
- Other study found that 1, 32% of PVC-BSIs occurred in PVC in place for 1 day, 2–4 days, and ≥ 5 days
- 30 of 45 PVC-BSIs occurred in PVCs with a dwell time of ≥ 4 days

Moreover... Several studies \rightarrow reductions in risk of *S. aureus* BSI after instituting infection prevention initiatives involving limits in PVC dwell time to 3 days or doing so along with other interventions

INTRODUCTION

Several prevention measures – one of them...

- Whether to replace PVCs routinely or when clinically indicated was categorized as an unresolved question by the US CDC:

Replacement of Peripheral and Midline Catheters Recommendations

1. There is no need to replace peripheral catheters more frequently than every 72-96 hours to reduce risk of infection and phlebitis in adults [36, 140, 141]. *Category IB*
2. No recommendation is made regarding replacement of peripheral catheters in adults only when clinically indicated [142-144]. *Unresolved issue*
3. Replace peripheral catheters in children only when clinically indicated [32, 33]. *Category IB*
4. Replace midline catheters only when there is a specific indication. *Category II*

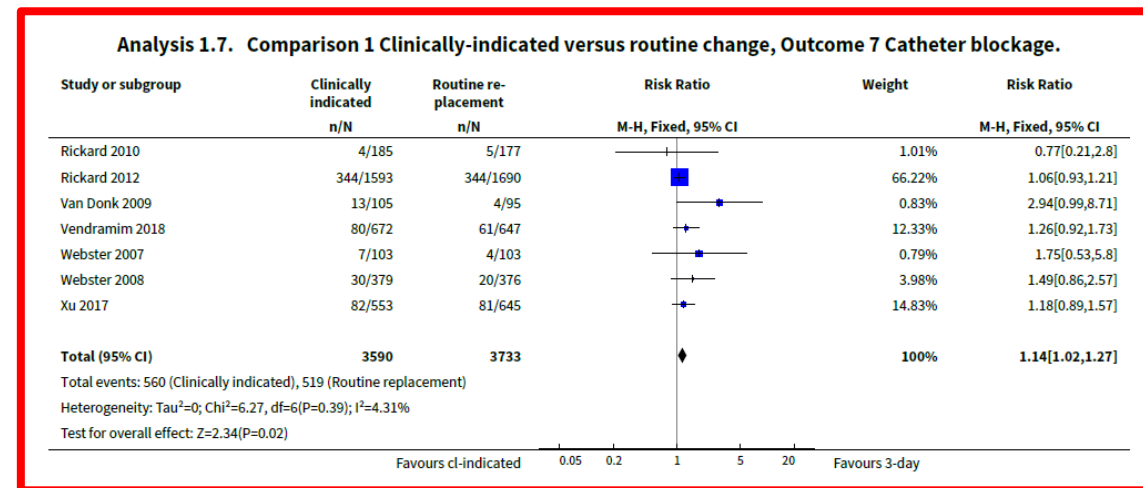
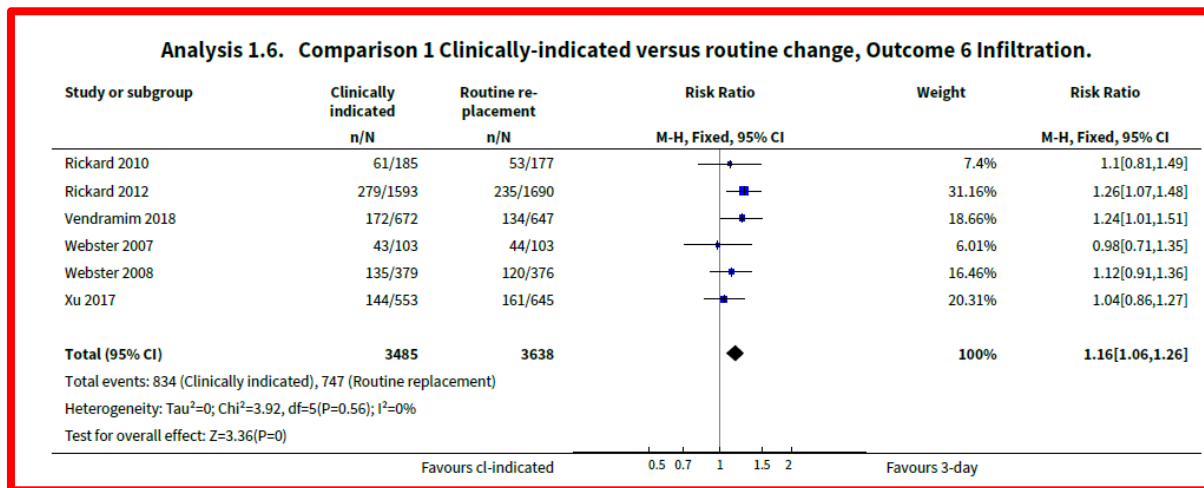
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LITERATURE UPDATE

Recent systematic review and meta-analysis

- 7,412 catheters (from RCTs) included
- Routine replacement:
 - ↓ **infiltration** of fluid into surrounding tissues
 - ↓ rates of catheter failure due to **blockage**

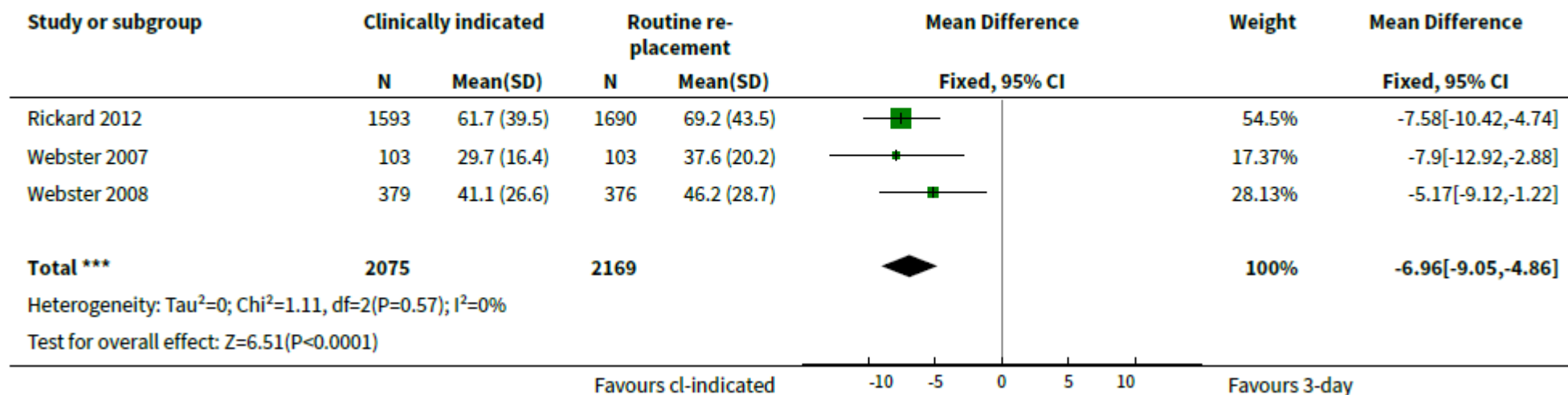


LITERATURE UPDATE

Recent systematic review and meta-analysis

- 7,412 catheters (from RCTs) included
- Clinically indicated removal:
 - ↓ device-related costs

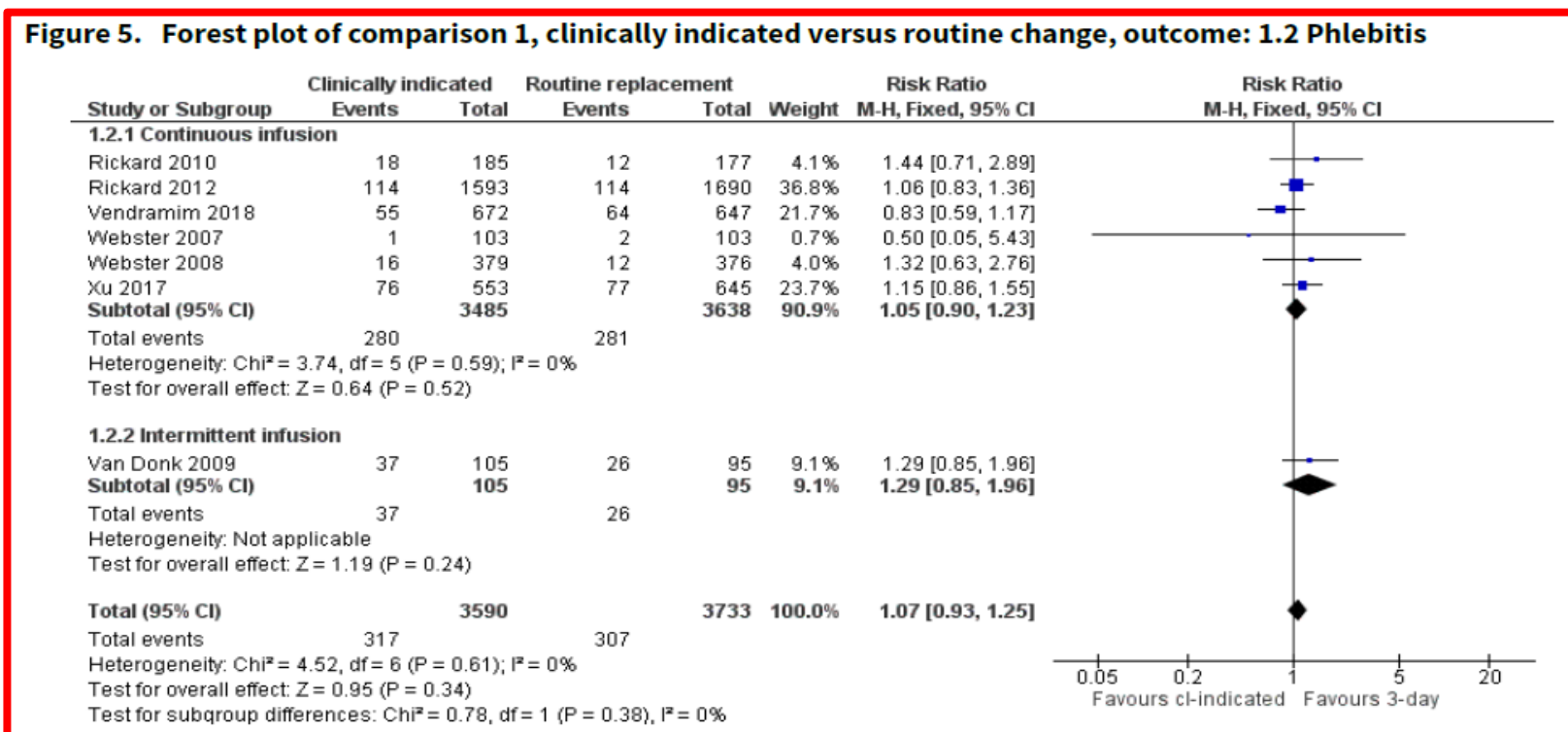
Analysis 1.5. Comparison 1 Clinically-indicated versus routine change, Outcome 5 Cost.



LITERATURE UPDATE

Recent systematic review and meta-analysis

- 7,412 catheters (from RCTs) included
- No clear difference in the incidence of **thrombophlebitis**

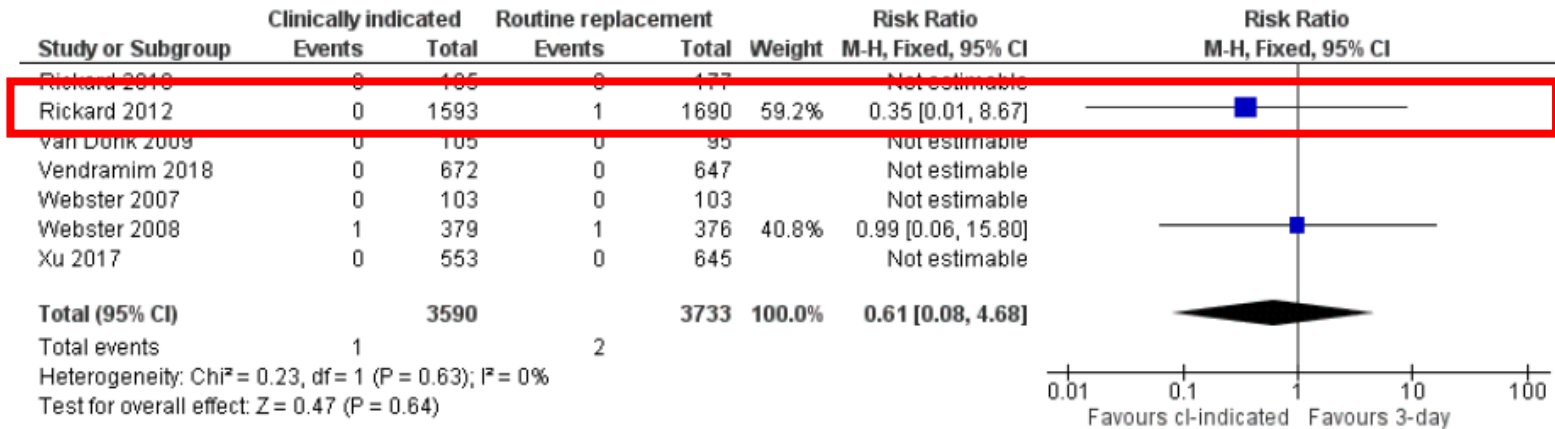


LITERATURE UPDATE

Recent systematic review and meta-analysis (BSI):

- Similar incidences of CRBSI

Figure 4. Forest plot of comparison 1, clinically indicated versus routine change, outcome: 1.1 Catheter-related bloodstream infection

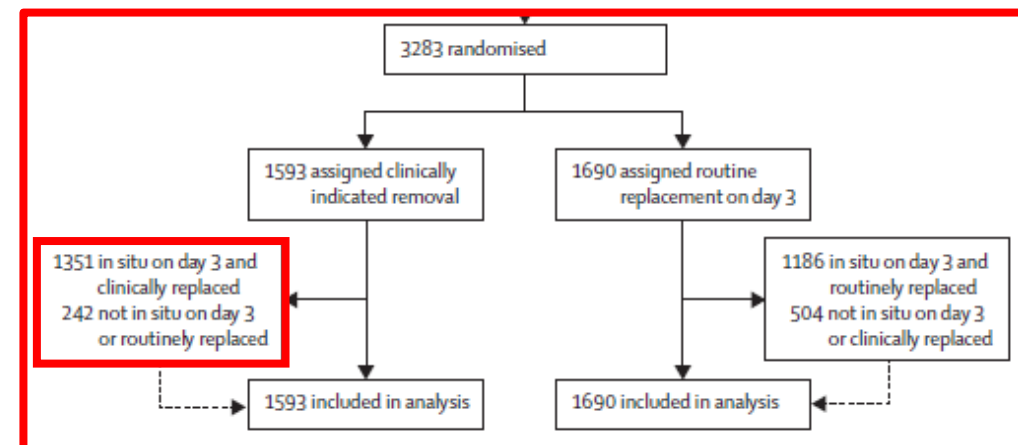


...3 CRBSI in total...

LITERATURE UPDATE

Largest RCT 2012

- Exclusion criteria:
 - Bloodstream infection, planned removal of intravenous catheter within 24h, or intravenous catheter already in situ for more than 72 h.
 - PVCs inserted in an emergency were not eligible
- Other methodological problems:
 - Not blinded
 - Phlebitis assessed by research nurses



LITERATURE UPDATE

Largest RCT 2012

	Clinically indicated (n=1593)	Routine replacement (n=1690)	Risk (95%CI)	p value
Primary outcome, intention-to-treat analysis				
Phlebitis per patient, n (%)	114 (7%)	114 (7%)	RR 1.06 (0.83 to 1.36); ARD 0.41% (-1.33 to 2.15)	0.64
Phlebitis/1000 intravenous catheter days (95% CI)	13.08 (10.68-15.48)	13.11 (10.71-15.52)	HR 0.94 (0.73 to 1.23)	0.67
Primary outcome, per-protocol analysis*				
Phlebitis per patient	63/1351 (5%)	47/1186 (4%)	RR 1.18 (0.81 to 1.70); ARD 0.70% (-0.88 to 2.28)	0.39
Phlebitis/1000 intravenous catheter days (95% CI)	11.4 (8.6-14.2)	13.8 (9.9-17.8)	IRR 0.83 (0.56 to 1.23)	0.32
Secondary outcomes, n (n per 1000 intravenous catheter days)				
Any infusion failure†	670 (76.9)	636 (73.2)	HR 0.99 (0.89 to 1.11)	0.87
Infiltration	279 (32.0)	235 (27.0)	HR 1.06 (0.89 to 1.27)	0.51
Occlusion	344 (39.5)	344 (39.6)	HR 0.92 (0.79 to 1.07)	0.92
Accidental removal	166 (19.0)	159 (18.3)	HR 0.98 (0.79 to 1.23)	0.88
CRBSI‡	0 (0)	1 (0.11)
All BSI	4 (0.46)	9 (1.03)	HR 0.46 (0.14 to 1.48)	0.19
Venous (local) infection‡	0	0
Mortality, n (%)§	4 (<1%)	4 (<1%)	RR 1.06 (0.27 to 4.23)	0.93

ARD=absolute risk difference. BSI=bloodstream infection. CRBSI=catheter-related bloodstream infection. HR=hazard ratio. IRR=incident rate ratio. RR=relative risk. *First catheter per patient only. †Combined endpoint of phlebitis, infiltration, occlusion, accidental removal, and CRBSI. ‡Risk and p value inestimable because of 0 incidence in one or both groups. §In all cases, mortality was unrelated to intravenous catheter treatment.

Table 3: Study outcomes by treatment group (per-patient analysis)

External validity:

- <1% mortality
- CR-BSI 1/3283 (0.03%) patients (1/5907 PVCs)
- Data only from Australia...

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Research

JAMA Internal Medicine | [Original Investigation](#)

Comparison of Routine Replacement With Clinically Indicated Replacement of Peripheral Intravenous Catheters

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Stephan Harbarth, MD, MSc; Walter Zingg, MD

MATERIAL & METHODS

Setting, patients and PVCs:

- Observational study: prospectively collected data at the University of Geneva Hospitals (**ten sites**)
- Included patients and PVCs: 1 January 2016 and 29 February 2020
- Hospital-wide **prospective surveillance** of all healthcare-associated bloodstream infections including PVC-BSI (IPC team)
- Individual-level data on PVC: electronic health record

BSI

PVC

MATERIAL & METHODS

Definitions:

- PVC-BSI:

- BSI occurring from day of insertion until 48h after catheter removal and positive culture with the same microorganism of:
 - either a quantitative PVC tip culture $\geq 10^3$ CFU/ml **or**
 - positive superficial culture with the same microorganism from pus from insertion site

Catheter-related

OR

- A BSI was associated with a catheter if occurring from day of insertion until 48h after catheter removal, the resolution of symptoms in 48h after catheter removal and the absence of any other infectious focus.

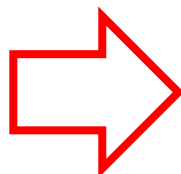
Catheter-associated

MATERIAL & METHODS

Intervention

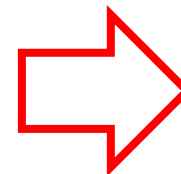
1st January 2016-
31st March 2018:
Routine
replacement of
PVCs every 96h.

BASELINE



1st April 2018-14th
October 2019:
Replace PVCs
when **clinically**
indicated only.

INTERVENTION



15th October 2019-
29th February
2020: **Routine**
replacement of
PVCs every 96h.

REVERSION

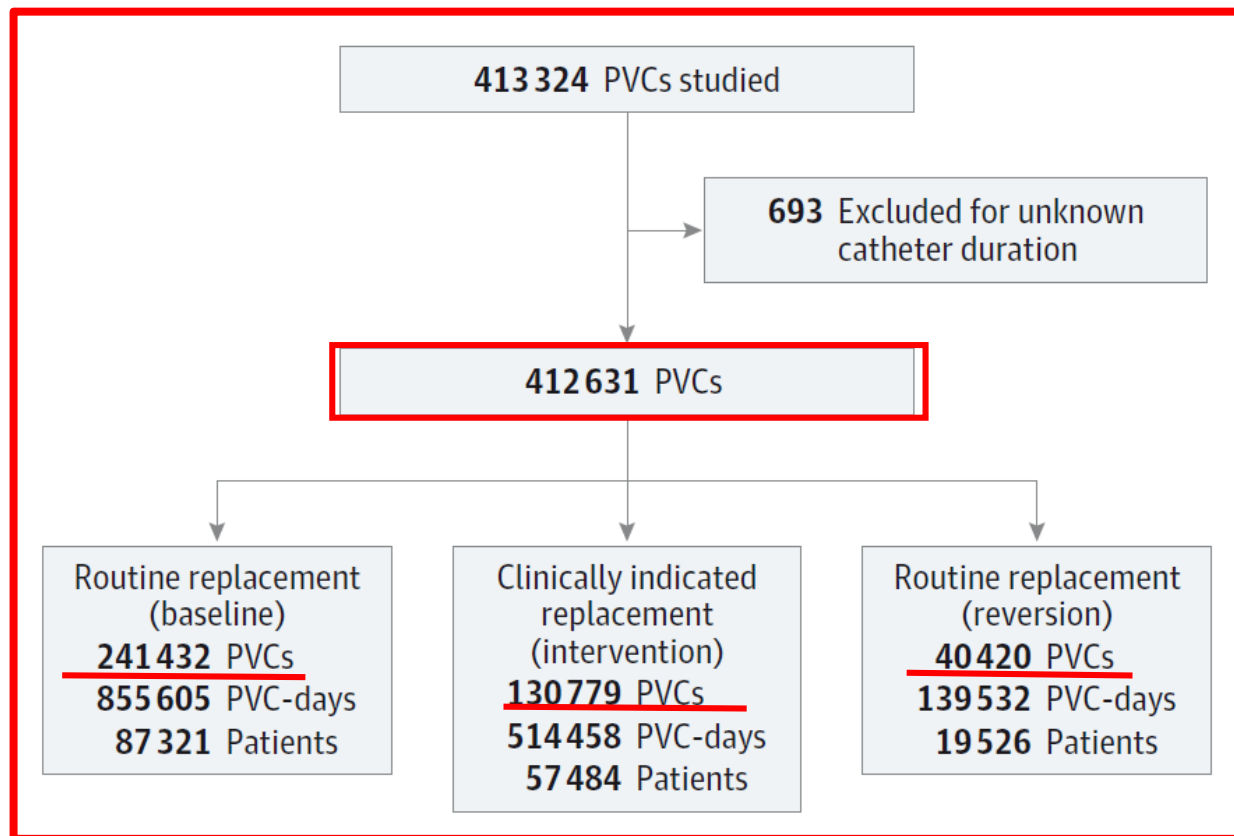
MATERIAL & METHODS

Statistics:

- Monthly aggregated data on PVCs and PVC-days were **graphically summarized** (2016 – 2020)
- **Incidence rate ratios [IRR]** were calculated for the intervention and reversion periods [baseline period as a reference] → segmented Poisson regression models on aggregated monthly data
 - Three sensitivity analyses:
 - Excluding catheters inserted during the year 2016
 - Excluding children
 - Excluding PVCs inserted in the ICU

RESULTS

Flow-chart:



RESULTS

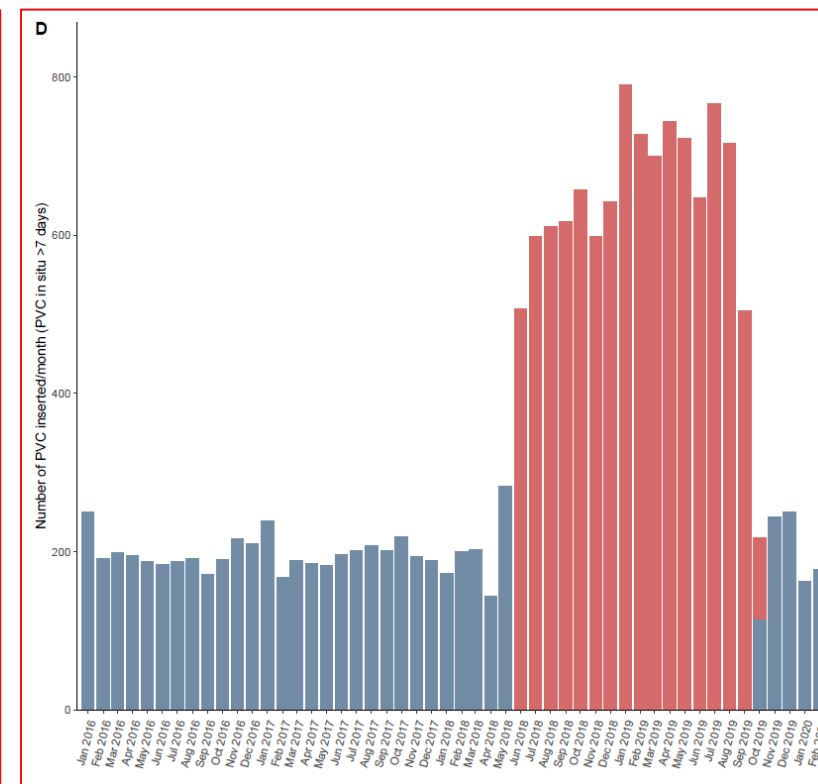
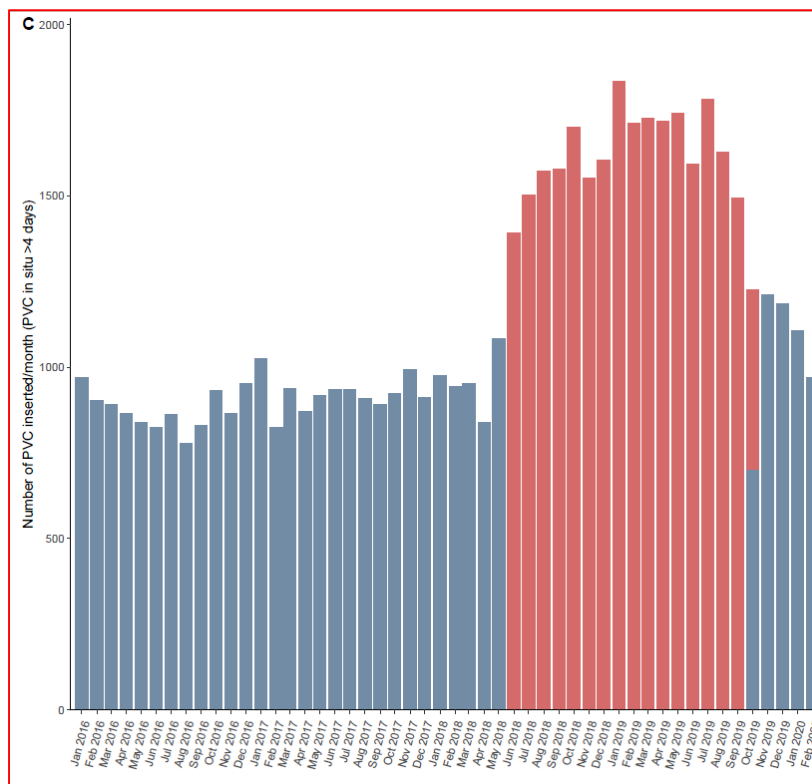
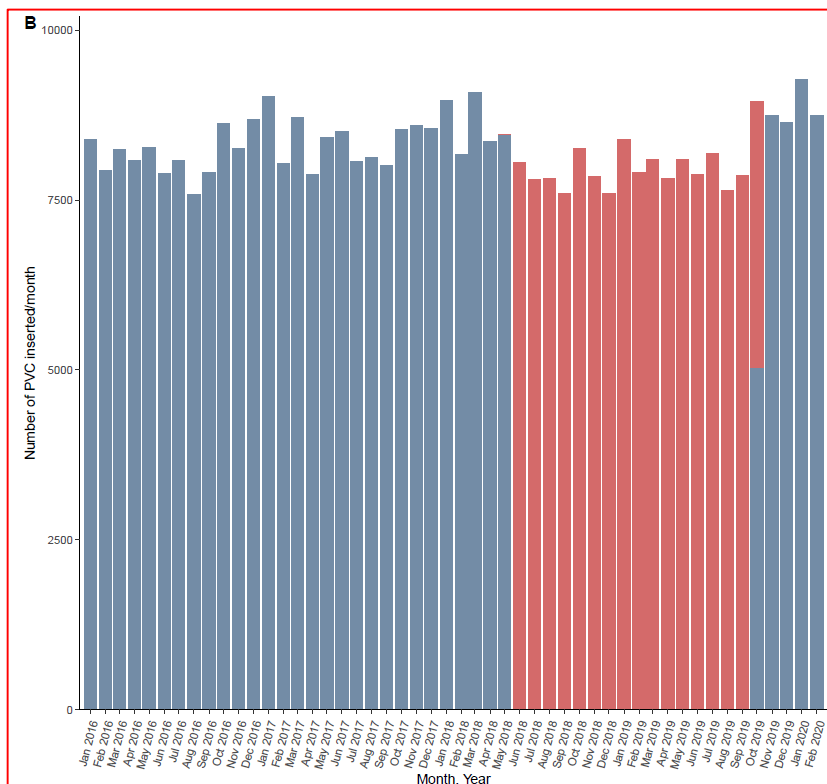
Description of the study population by study period

Table. Characteristics of the Study Population by Study Period^a

Characteristic	Baseline	Intervention	Reversion	P value
Sex^b				
Female	47 114 (54.0)	31 259 (54.4)	10 555 (54.1)	.28
Male	40 207 (46.0)	26 225 (45.6)	8971 (45.9)	
Age, median (IQR) ^b	51 (33-71)	52 (33-72)	55 (35-74)	<.001
ICU admission	7120 (2.9)	2782 (2.1)	732 (1.8)	<.001
No. of catheters per patient, median (IQR) ^c	1 (1-2)	1 (1-2)	1 (1-2)	<.001
Dwell time, d				
>4	26 372 (10.9)	26 656 (20.4)	5170 (12.8)	<.001
>7	5745 (2.4)	10656 (8.1)	947 (2.3)	<.001
Insertion site				
Forearm	130 877 (54.2)	50 584 (38.7)	15 276 (37.8)	<.001
Arm	6930 (2.9)	2105 (1.6)	675 (1.7)	
Elbow	12 247 (5.1)	21 508 (16.4)	7530 (18.6)	
Hand	69 615 (28.8)	30 930 (23.7)	9141 (22.6)	
Other	6018 (2.5)	2636 (2.0)	771 (1.9)	
Wrist	15 745 (6.5)	23 016 (17.6)	7027 (17.4)	
Operator				
Out-of-hospital	18 909 (7.8)	10 573 (8.1)	2786 (6.9)	<.001
In-hospital	222 523 (92.2)	120 206 (91.9)	37 634 (93.1)	
PVC-BSI	11 (<0.1)	46 (<0.1)	4 (<0.1)	<.001

RESULTS

Number of PVCs stratified by catheter duration during the three study periods.



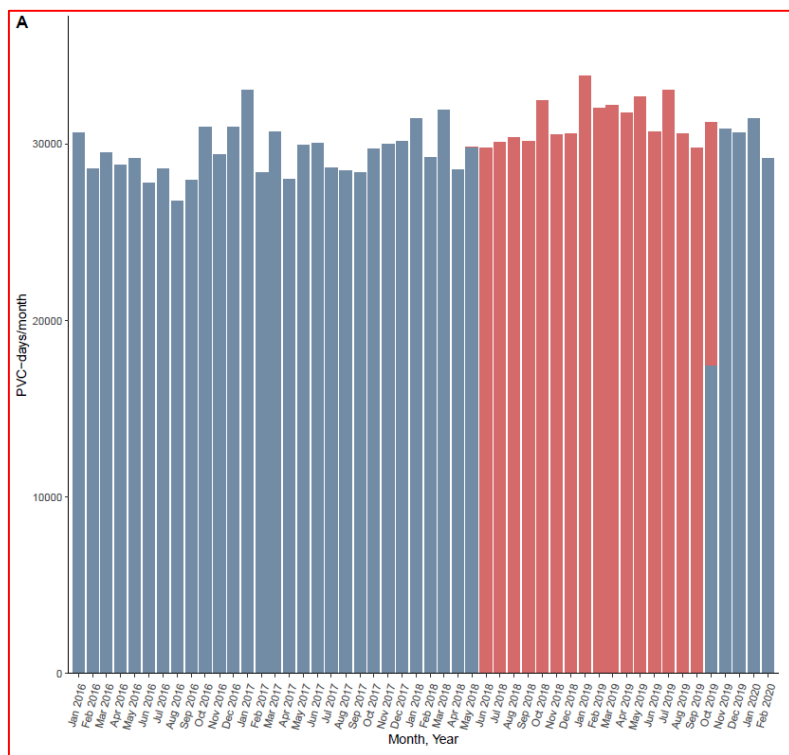
Number of PVC inserted/month

Number of PVC inserted/month (PVC in situ >4 days)

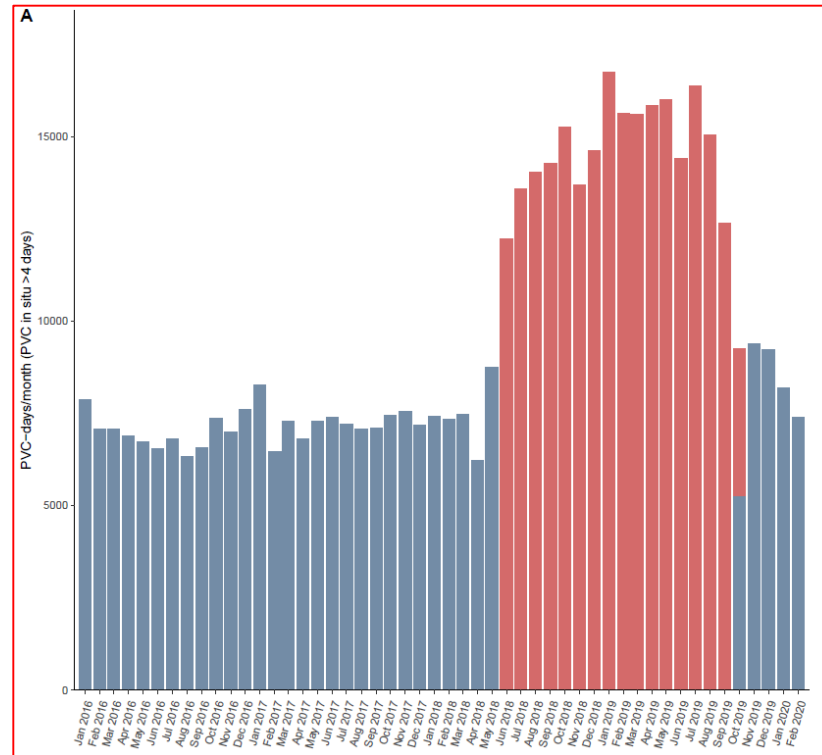
Number of PVC inserted/month (PVC in situ >7 days)

RESULTS

Number of PVC-days stratified by catheter duration during the three study periods.



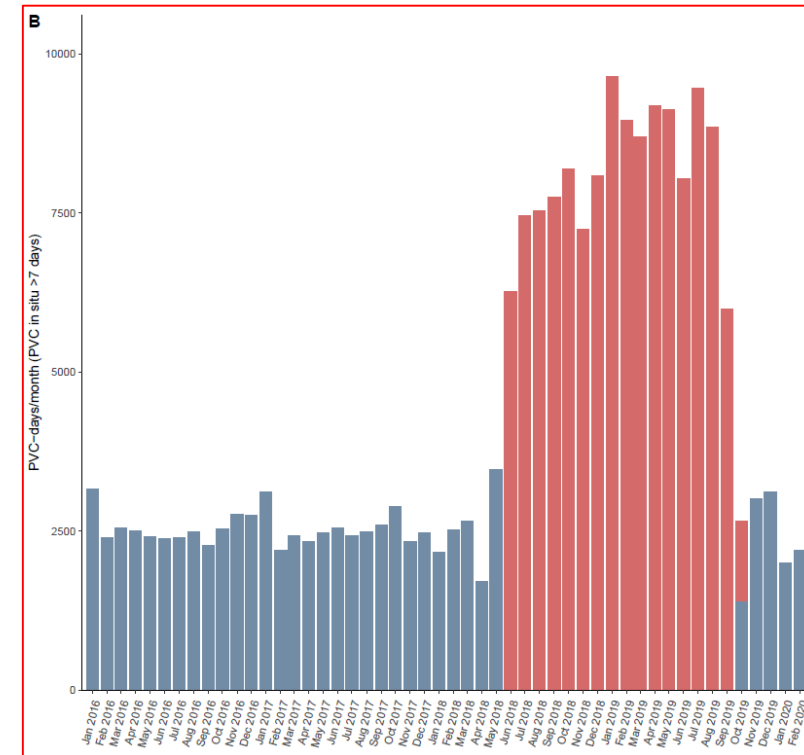
Number of PVC-days /month



Number of PVC-days /month
(PVCs in situ >4 days)

Buetti

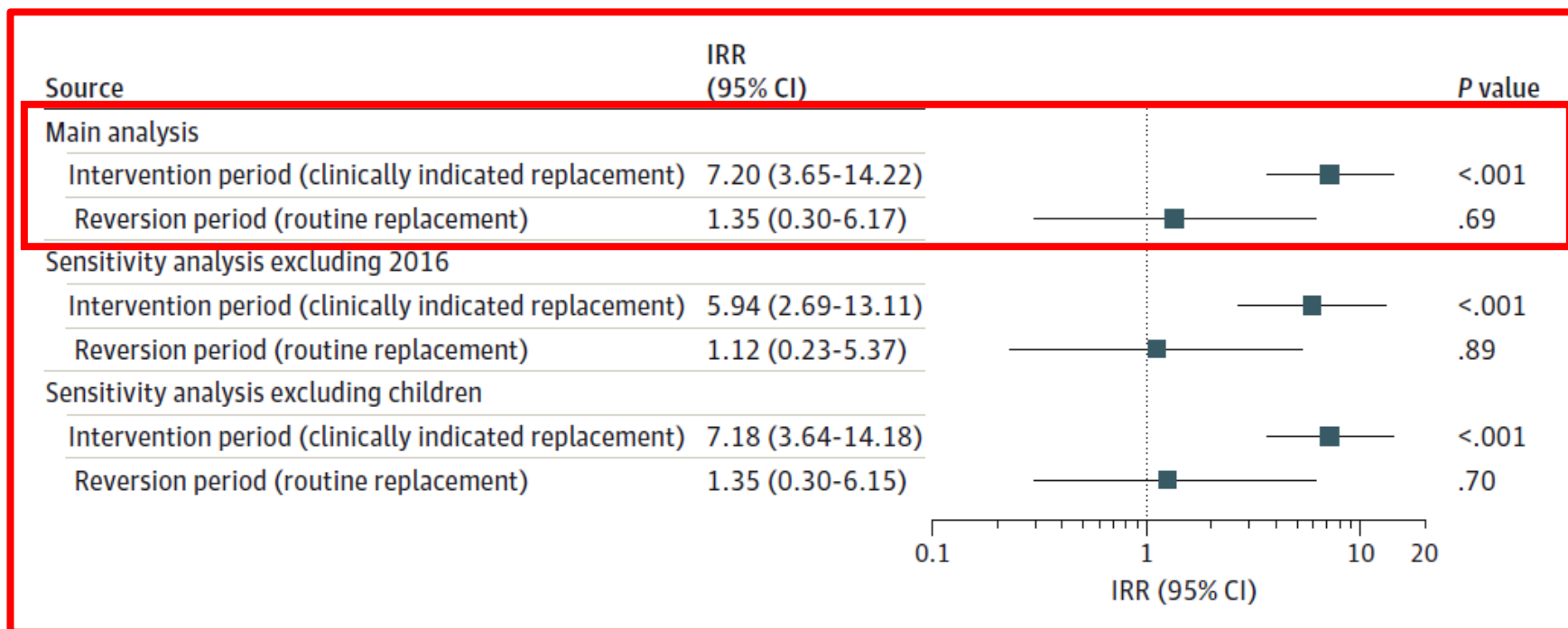
1-1478.



Number of PVC-days/month
(PVC in situ >7 days)

RESULTS

IRRs of PVC-BSI during intervention and reversion periods



Reference:
baseline
period

Without ICU:

- Intervention: IRR 6.81, 95% CI 3.53-13.13, $p < .001$
- Reversion: IRR 1.26, 95% CI 0.28-5.68, $p = 0.76$

RESULTS

Microbiological etiology of PVC-BSI, stratified by routine and clinically indicated replacement periods

	Routine replacement ^o	Clinically indicated replacement	p-value*
Achromobacter, n (%)	0 (0)	1 (2.2)	0.64
CoNS or other skin commensals, n (%)	9 (60)	23 (50)	
Enterobacter spp, n (%)	1 (6.7)	3 (6.5)	
Fungi, n (%)	1 (6.7)	1 (2.2)	
Klebsiella spp, n (%)	1 (6.7)	3 (6.5)	
MRSA, n (%)	0 (0)	3 (6.5)	
MSSA, n (%)	1 (6.7)	7 (15.2)	
Pseudomonas aeruginosa, n (%)	0 (0)	3 (6.5)	
Serratia marcescens, n (%)	1 (6.7)	0 (0)	
Sphingomonas paucimobilis, n (%)	0 (0)	1 (2.2)	
Polymicrobial, n (%)	1 (6.7)	1 (2.2)	

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CONCLUSIONS

The debate is (still) open:

- Evidence from RCTs:
 - Two trials reported 2 suspected BSI and one CRBSI, respectively
 - RCTs usually did not specifically target PVC-BSI as primary outcome (rare occurrence)
 - Despite large numbers at first glance, all RCTs were underpowered for detecting differences in PVC-BSI
 - PVC inserted in non-critical situations

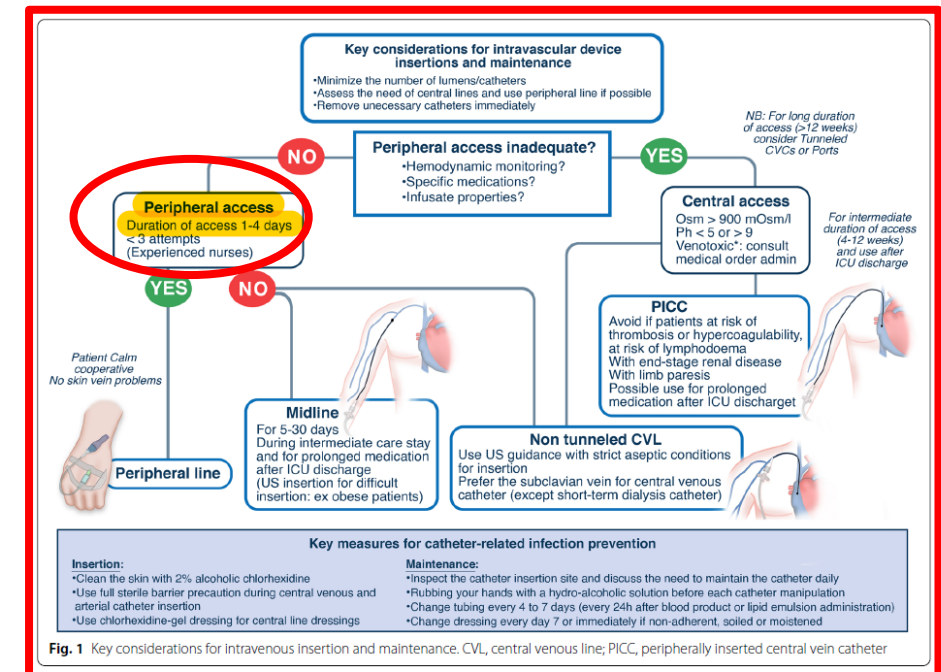
CONCLUSIONS

The debate is (still) open:

- According to “insertion recommendations”:
 - PVC should not be inserted for long infusions

Figure 3. Venous access device recommendations for infusion of peripherally compatible infusate.

Device Type	Proposed Duration of Infusion			
	≤5 d	6–14 d	15–30 d	≥31 d
Peripheral IV catheter	No preference between peripheral IV and US-guided peripheral IV catheters for use ≤5 d			
US-guided peripheral IV catheter		US-guided peripheral IV catheter preferred to peripheral IV catheter if proposed duration is 6–14 d		
Nontunneled/acute central venous catheter		Central venous catheter preferred in critically ill patients or if hemodynamic monitoring is needed for 6–14 d		
Midline catheter		Midline catheter preferred to PICC if proposed duration is ≤14 d		



CONCLUSIONS

The debate is (still) open:

- **1 PVC-BSI per 10'000** catheter-days → justification for routine replacement of PVCs?
 - PVC-BSI is the rarest among many complications around vascular access.
- Routine replacement → **high number of used catheters** per hospital stay
- Clinically indicated removal maybe reduced device-related **costs**
- Repeated insertions
 - Patient discomfort and decreased venous capital for patients
 - HCWs → increased risks of needle-stick injuries and is time-consuming for vascular access teams
- **Phlebitis**: similar between the two groups

- Longer dwell-time may also cause phlebitis (?)
- Routine replacement reduces **extravasation**
- Rates of catheter failure due to **blockage** were probably lower in the routine replacement group
- **CRBSI**
 - CRBSI → morbidity & mortality.
 - *S. aureus* infections?

CONTRA

PRO

!!!BANALIZATION!!!



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!!!!!!THANK YOU!!!!!!