GAVeCeLT
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XVI PICC Day
Convegno Nazionale Annuale sui PICC

PICC in ICU: when and how?

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PICC in ICU: when and how?

Mmm, I am not so sure doc...!

No no, they've high thrombotic risk !!

No no, they increase the risk of infection!!

No no, I can't use them for hemodynamic monitoring!

No no, they're too time consuming!

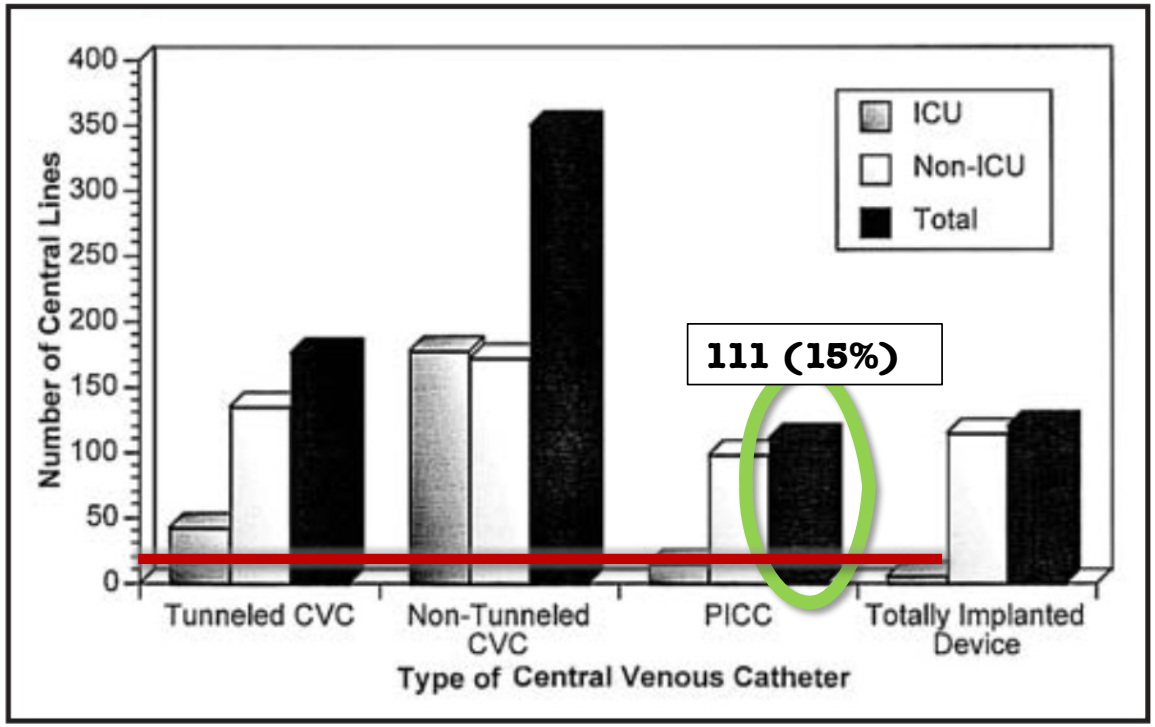
PICC in ICU: some data

942 INFECTION CONTROL AND HOSPITAL EPIDEMIOLOGY December 2003

PREVALENCE OF THE USE OF CENTRAL VENOUS ACCESS DEVICES WITHIN AND OUTSIDE OF THE INTENSIVE CARE UNIT: RESULTS OF A SURVEY AMONG HOSPITALS IN THE PREVENTION EPICENTER PROGRAM OF THE CENTERS FOR DISEASE CONTROL AND PREVENTION

55.4% of ICU vs 24.4% hospital ward patients received CVCs

30% of ICU vs 70% hospital ward total CVCs placed



Climo, Infect Control Hosp Epidemiol 2003;24:942-945

PICC in ICU: some data

Main findings	
Patients enrolled	89
Adult	65
Pediatric	24
Dwell time (days)	25±12
Insertion complications	
Major complications	0
Minor complications	
Local hematoma	3 (3.4%)
Repeated punctures	5 (5.6%)
Difficulties in progression	4 (4.5%)
Tip malposition	1 (1.1%)
CRBSI	0
Thrombosis	1 (1.1%)
Occlusion	0
Dislodgments	0

RESEARCH Open Access

CRITICAL CARE

Clinical experience with power-injectable PICCs in intensive care patients

- Rate of complications at insertion has been extremely low, especially considering the anatomical difficulties expected in acutely ill patients
- PICCs are associated with a lower rate of infection if compared with CVCs
- Dislodgement has been described as a problem only in studies not using ultrasound-guided insertion in the upper mid-arm and/or not using sutureless devices for PICC securement

Contraindications to PICC insertion are few, such as the need for an emergency central line, need for a central line with more than three lumens, and lack of availability of a vein > 4 mm in the upper mid-arm

Pittiruti *et al. Critical Care* 2012, **16**:R21
http://ccforum.com/content/16/1/R21

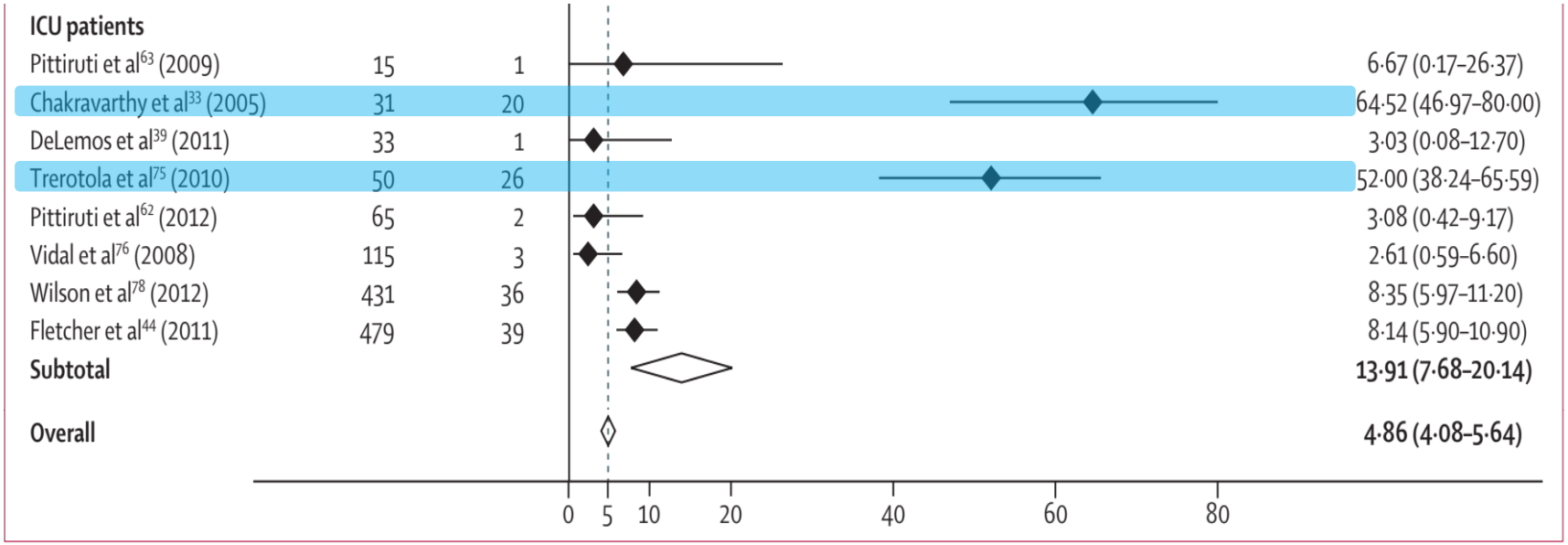
PICC in ICU: when and how?

No no, they've high thrombotic risk !!

PICC in ICU: thrombotic risk

Risk of venous thromboembolism associated with peripherally inserted central catheters: a systematic review and meta-analysis

Vineet Chopra, Sarah Anand, Andy Hickner, Michael Buist, Mary A M Rogers, Sanjay Saint, Scott A Flanders



PICC in ICU: thrombotic risk

Risk of venous thromboembolism associated with peripherally inserted central catheters: a systematic review and meta-analysis

Vineet Chopra, Sarah Anand, Andy Hickner, Michael Buist, Mary A M Rogers, Sanjay Saint, Scott A Flanders

No information regarding appropriate vein selection, number of punctures and management of implanted device!

PICC in ICU: thrombotic risk

Contents lists available at ScienceDirect

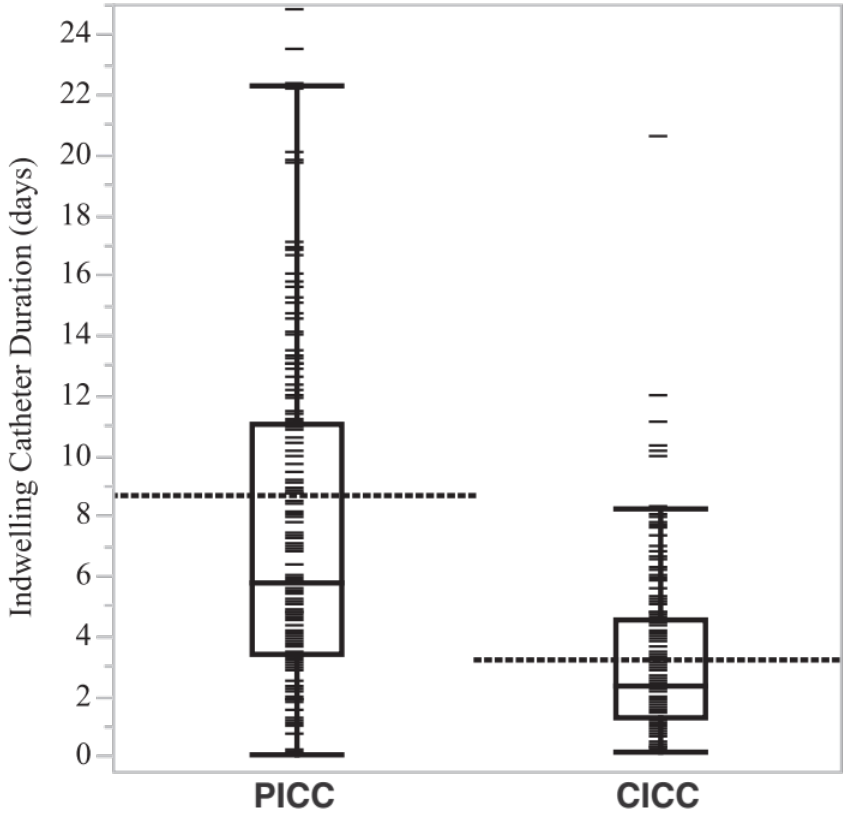
Journal of Critical Care

journal homepage: www.jccjournal.org

Complication rates among peripherally inserted central venous catheters and centrally inserted central catheters in the medical intensive care unit ☆

Matthew E. Nolan, MD [a], Hemang Yadav, MBBS [a], Kelly A. Cawcutt, MD [b], Rodrigo Cartin-Ceba, MD [a,*]

		PICC (n = 200)	CICC (n = 200)	*P* value
Indwelling MICU catheter days	Total days	750	535	
	Median days (IQR)	2.3 (1.0-4.5)	2.0 (1.1-3.8)	.266
CRDVT	n (%)	4 (2%)	2 (1%)	.685
	Per 1000 MICU catheter-days	5.3	3.7	
	Median time-to-DVT (range), d	6.1 (2.3-18.8)	3.3 (1.7-4.8)	
CLABSI	n (%)	0	0	–
	Per 1000 MICU catheter-days	0	0	



PICC in ICU: thrombotic risk

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Journal of Critical Care

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Complication rates among peripherally inserted central venous catheters and centra
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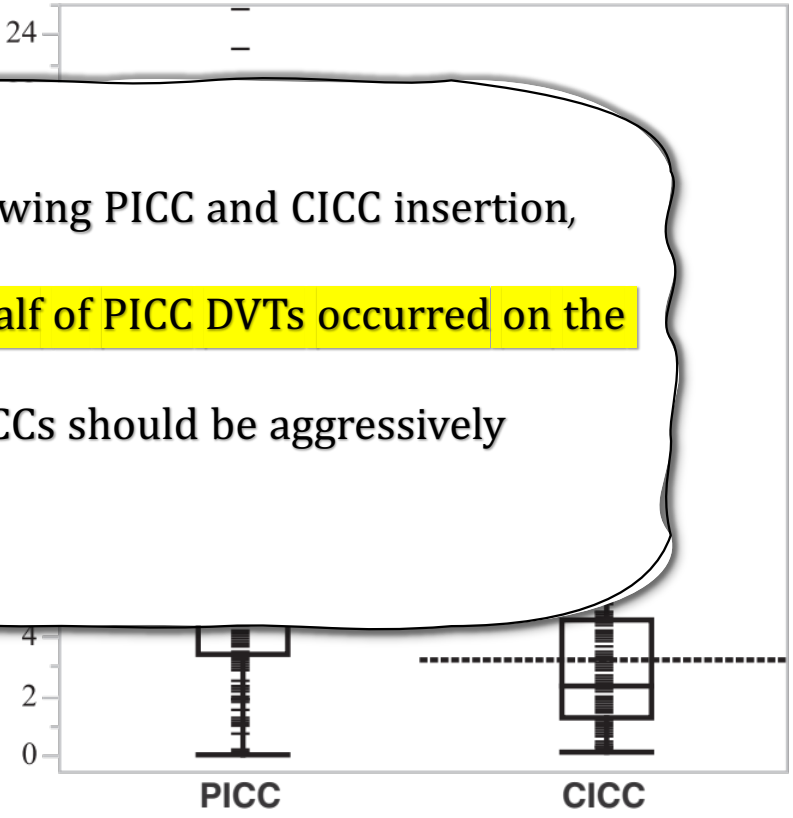
CLABSI	n (%)	0	0	–
	Per 1000 MICU catheter-days	0	0	

Thrombotic and infectious complications were uncommon following PICC and CICC insertion, with no significant difference in complication rates observed. Half of PICC DVTs occurred on the general floor, and like all central catheters placed in the ICU, PICCs should be aggressively discontinued when no longer absolutely needed.



PICC in ICU: when and how?

No no, they increase the risk of infection!!

PICC in ICU:risk of infection

SCIENTIFIC REPORTS

OPEN

The microbiological characteristics and risk factors for PICC-related bloodstream infections in intensive care unit

Received: 8 November 2016
Accepted: 20 January 2017
Published online: 08 November 2017

Shumin Zhang[1], Xiaofeng Sun[2] & Yan Lei[3]

Manipulation - reducible

Patient's factors

Parameters	Logistic analysis		Cox analysis	
	OR (95%CI)	*P*	OR (95%CI)	*P*
Power PICC	4.239 (1.857–9.678)	0.001	4.197 (1.932–9.119)	0.000
Charison scores	1.137 (1.004–1.287)	0.044	1.120 (1.001–1.253)	0.048
Diabetes mellitus	2.663 (1.293–5.482)	0.008	2.370 (1.224–4.588)	0.011
Lumens				
1	Reference		Reference	
2	3.352 (1.343–8.368)	0.010	2.939 (1.233–7.010)	0.015
3	8.018 (2.771–23.202)	0.000	6.352 (2.433–16.580)	0.000

PICC in ICU:risk of infection

RESEARCH Open Access

Lower risk of bloodstream infections for peripherally inserted central catheters compared to central venous catheters in critically ill patients

Vassiliki Pitiriga[1], John Bakalis[2], Kalliopi Theodoridou[1], Petros Kanellopoulos[2], George Saroglou[2] and Athanasios Tsakris[1*]

	PICCs	CVCs	*P*-value
No of catheters	639	1187	
Total catheter-days	11,110	9774	
No of CLABSI	18	59	$X^2 = 4.74$ $P = 0.029$
CLABSI incidence rate (per 1000 cath-days)	1.62	6.03	*T*-test, $p < 0.001$
No of CLABSI-MDRO	4	31	$X^2 = 8.7$ $P = 0.003$
CLABSI-MDRO incidence rate (per 1000 cath-days)	0.36	3.17	*T*-test, $p < 0.001$

Pitiriga et al. Antimicrobial Resistance & Infection Control (2022) 11:137

ORIGINAL WORK

A Randomized Trial of Complications of Peripherally and Centrally Inserted Central Lines in the Neuro-Intensive Care Unit: Results of the NSPVC Trial

Nicholas J. Brandmeir[1,2,3*], Justin R. Davanzo[4], Russell Payne[4], Emily P. Sieg[5], Ashiya Hamirani[6], Annie Tsay[6], Jeffrey Watkins[6], Sprague W. Hazard[4,7] and J. Christopher Zacko[4]

Variable	PICC	CICC	P value
Classic complications	4 (5.5%)	1 (1.3%)	0.14
Thrombosis	4	0	0.07
CLABSI	0	0	-
Insertional trauma	0	1	0.64
Discharge with line	30 (37%)	10 (12.3%)	<0.001

Brandmeir et al. Neurocrit Care https://doi.org/10.1007/s12028-019-00843-z

PICC in ICU: when and how?

No no, I can't use them for hemodynamic monitoring!

PICC in ICU: hemodynamics

JVA
ISSN 1129-7298

J Vasc Access 2017; 18 (4): 273-278
DOI: 10.5301/jva.5000749

ORIGINAL RESEARCH ARTICLE

Central venous pressure monitoring via peripherally or centrally inserted central catheters: a systematic review and meta-analysis

Filippo Sanfilippo[1], Alberto Noto[2], Gennaro Martucci[1], Marco Farbo[1], Gaetano Burgio[1], Daniele G. Biasucci[3]

Although limited, the available evidence support that CVP monitoring is feasible with PICC lines and that the possibility of monitoring CVP should not be a criteria to prefer a CICC over a PICC line. Open-ended non-valved PICCs coupled with a continuous infusion device can be considered an accurate alternative for CVP monitoring.

PICC in ICU: hemodynamics

RESEARCH Open Access

Are single-lumen 5Fr and triple-lumen 6Fr PICCs suitable for hemodynamic assessment by trans-pulmonary thermodilution? A pilot study

Variables	6 Fr triple-lumen PICC	CICC	*p* value	Bias [LoA]
Measurements, *n*	40	40	–	–
CI, L/min/m^2	3.3 (0.8)	3.0 (0.7)	0.107	0.28 [− 0.32; 0.88]
GEDVI, mL/m^2	685 (133)	632 (102)	0.05	52.8 [− 75.7; 181]
EVLWI, mL/kg	14.0 (5.1)	12.2 (4.9)	0.178	1.5 [− 2.2; 5.2]
SVI, mL/m^2	44.4 (10.4)	40.6 (8.5)	0.077	3.8 [− 4.2; 1.8]
CVP, mmHg	11.3 (4.8)	11.7 (5.5)	0.764	–
Δ*T*, °C	0.33 (0.07)	0.34 (0.08)	0.514	− 0.01 [− 0.06; 0.03]

PICC in ICU: hemodynamics

RESEARCH Open Access

Are single-lumen 5Fr and triple-lumen 6Fr PICCs suitable for hemodynamic assessment by trans-pulmonary thermodilution? A pilot study

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SVI, mL/m^2	44.4 (			
CVP, mmHg	11.3 (			
Δ*T*, °C	0.33 (			

Our study showed that power injectable PICCs of adequate lumen size can be used as an alternative to CICCs for hemodynamic assessment using TPTD in adult ICU patients

PICC in ICU: when and how?

No no, they’re too time consuming!

PICC in ICU: time consuming?

Original research article

JVA The Journal of Vascular Access

Peripherally inserted central catheter placement in a multidisciplinary intensive care unit: A preliminary study demonstrating safety and procedural time in critically ill subjects

The Journal of Vascular Access
2021, Vol. 22(1) 101–106

DOI: 10.1177/1129729820928618
journals.sagepub.com/home/jva
SAGE

	Shock	No shock	P value
Insertion time Median time (IQR) min	31 (25,44)	30 (24.3, 39.8)	0.71
	APACHE ≥ 55	**APACHE < 55**	
	29 (21,40.5)	33 (26,45)	0.25
	BMI ≥ 30	**BMI < 30**	
	29 (25.5,40)	30.5 (23.5,42.4)	0.89

PICC in ICU: time consuming?

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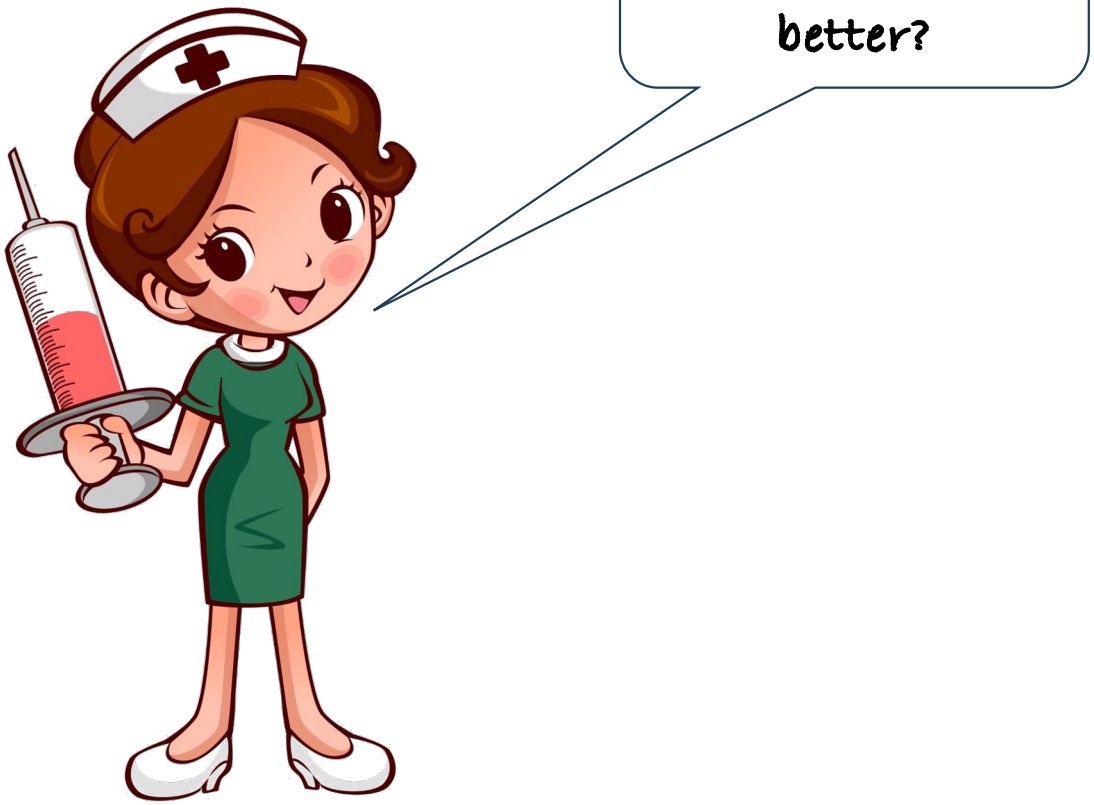
	31 (25,44)		
	APACHE ≥ 55		
	29 (21,40.5)		
	BMI ≥ 30	**BMI < 30**	
	29 (25.5,40)	30.5 (23.5,42.4)	0.89

Considering the aforementioned benefits of PICCs over CICCs, concerns of delayed vascular access in critically ill patients should not deter a physician from selecting a PICC to provide vascular access when it would otherwise be appropriate.

PICC in ICU: when and how?



PICC vs CICC in ICU

CICC and risk of bleeding

REVIEW

CME/SAM

Central venous catheter placement in coagulopathic patients: risk factors and incidence of bleeding complications

Emma K. van de Weerdt,[1] Bart J. Biemond,[2] Bart Baake,[1] Ben Vermin,[1] Jan M. Binnekade,[1] Krijn P. van Lienden,[3] and Alexander P.J. Vlaar[1]

- ✓ The 22 included studies indicated that major bleeding complications are rare in patients with thrombocytopenia and/or prolonged bleeding time
- ✓ A major shortcoming of the current literature on bleeding complications after CVC placement in the presence of coagulopathy is study design
- ✓ Except for one, all included studies had an observational cohort design. The rationale for correction of coagulopathy was often incompletely reported

TRANSFUSION Volume 57, October 2017

OBSERVATIONAL STUDY

OPEN

Contribution of Coagulopathy on the Risk of Bleeding After Central Venous Catheter Placement in Critically Ill Thrombocytopenic Patients

- ✓ In our study, we found no relation between severe coagulopathy and CVC-related bleeding complications in critically ill patients with severe thrombocytopenia and/or severe coagulopathy.
- ✓ In our study, an overall bleeding rate of 15% was found with a frequency of grade 3 bleeding events of 0.7%,which is higher than most of the studies mentioned
- ✓ In this cohort, the preprocedural use of plasma products was very low and prophylactic platelet transfusion before CVC placement was used more often.

van Baarle, Critical Care Explorations Jan 22 • Vol4 • No1

CICC and risk of bleeding

REVIEW

CME/SAM

Central venous cath
coagulopathic patients: ri
of bleeding co

*Emma K. van de Weerdt,[1] P
Krij*

OBSERVATIONAL STUDY

thy on the Risk
enous Catheter
hrombocytopenic

Patients

Observational data

Heterogeneity of thrombocytopenia and coagulopathy definition

Heterogeneity of bleeding (major and minor) definition

Heterogeneity of pre-procedural treatment (plasma and/or PLT transfusion)

- ✓ The 22 in
major bleeding complications are rare th
patients w
prolonged
- ✓ A major s
literature
after CVC
coagulopath
- ✓ Except for
an observa
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of
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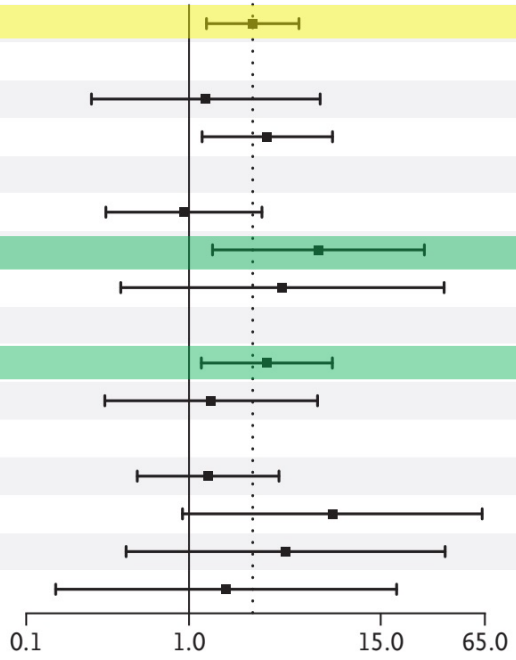
CICC and risk of bleeding

ORIGINAL ARTICLE

Platelet Transfusion before CVC Placement in Patients with Thrombocytopenia

Subgroup of Bleeding Risk	Transfusion	No Transfusion	Relative Risk (90% or 95% CI)
	no. of events/total no. (%)		
Primary analysis	9/188 (4.9)	22/185 (11.9)	2.45 (1.27–4.70)
Type of catheter			
Tunneled	3/20 (15.0)	3/18 (16.7)	1.26 (0.25–6.34)
Nontunneled	6/168 (3.6)	18/167 (10.8)	3.01 (1.20–7.55)
Insertion site			
Internal jugular vein	7/93 (7.5)	6/93 (6.5)	0.93 (0.31–2.79)
Subclavian vein	2/71 (2.8)	13/70 (18.6)	6.19 (1.39–27.64)
Femoral vein	0/24	2/22 (9.1)	3.72 (0.38–36.52)
Department			
Hematology ward	6/108 (5.6)	18/104 (17.3)	2.99 (1.19–7.54)
Intensive care unit	3/80 (3.8)	4/81 (4.9)	1.36 (0.30–6.11)
Platelet count per mm^3			
10,000–19,000	7/45 (15.6)	9/41 (22.0)	1.30 (0.48–3.55)
20,000–29,000	0/46	8/51 (15.7)	7.53 (0.91–62.50)
30,000–39,000	1/59 (1.7)	3/51 (5.9)	3.90 (0.41–37.05)
40,000–50,000	1/38 (2.6)	2/42 (4.8)	1.68 (0.15–18.68)



PLT 10-50.000 and need for CICC

197

Transfusion

THETER-RELATED
RIORITY MARGIN 3.5

188

9/188 (4.8%)

van Baarle, N ENGL J MED 388;21

PICC and risk of bleeding

Review

JVA The Journal of Vascular Access

Management of antithrombotic treatment and bleeding disorders in patients requiring venous access devices: A systematic review and a GAVeCeLT consensus statement

The Journal of Vascular Access
2022, Vol. 23(4) 660–671

DOI: 10.1177/11297298211072407
journals.sagepub.com/home/jva
SAGE

Q1.Which is an appropriate classification of VAD-related procedures based on the specific bleeding risk?

Q2.Which is the appropriate management of the patient with bleeding disorders candidate to VAD insertion/removal?

Q3.Which is the appropriate management of the patient on antithrombotic treatment candidate to VAD insertion/removal?

Annetta, JVA 2022, Vol. 23(4) 660–671

PICC and risk of bleeding

Review

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	Type of venous access procedure		
	Minimally invasive (*all peripheral VADs, nontunneled PICCs, nontunneled FICCs at mid-thigh*)	**Moderately invasive** (*nontunneled CICCs, nontunneled FICCs at the groin, tunneled PICCs, nontunneled dialysis catheters*)	**Highly invasive** (*tunneled CICCs, tunneled FICCs, tunneled-cuffed dialysis catheters, ports and PICC-ports*)
Bleeding disorder			
PT/INR > 1.5 and/or aPTT ratio > 1.3	No contraindication	Relative contraindication (see text)	Absolute contraindication
Platelet $<50 \times 10^9$/L	No contraindication	Relative contraindication	Absolute contraindication (see text)
Antithrombotic treatment			
VKA	Do not withhold	Aim for PT/INR < 3 (see text)	Maintain PT/INR in the low therapeutic range (see text)

Annetta, JVA 2022, Vol. 23(4) 660–671

PICC in ICU: take home message

No data argue for an increased thrombotic and infectious risk

PICC are suitable for CVP and TPTD monitoring

PICC may require higher skill for vein choice and cannulation

PICC are not time-consuming and with low bleeding risk

PICC in ICU

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PICC in ICU: when and how?

Thank you!

Gemelli

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