



GAVe Ped 2025 MILANO 12-13 maggio

La grande novità nell'ambito degli accessi venosi centrali neonatali:

**Il CICC ecoguidato, tunnellizzato e non,
anche nei neonati pretermine di basso peso.**

Dott. Ferdinando Spagnuolo

**Terapia Intensiva Neonatale
A.O.U. Università degli Studi della Campania «L. Vanvitelli». Napoli**

Novità e controversie nell'accesso venoso neonatale

- Femorally inserted central catheter

FICC



- Peripherally inserted central catheters

PICC



- epicutaneo-cava catheters (ECC) used in neonates and peripherally inserted central catheters
- (n-PICC) used in children and adults

ECC



CVAD—central venous access devices

Editorial

The NAVIGATE project: A GloVANet–WoCoVA position statement on the nomenclature for vascular access devices

Nomenclature Via Integrated Global Advancements in Terminology Efficiencies)

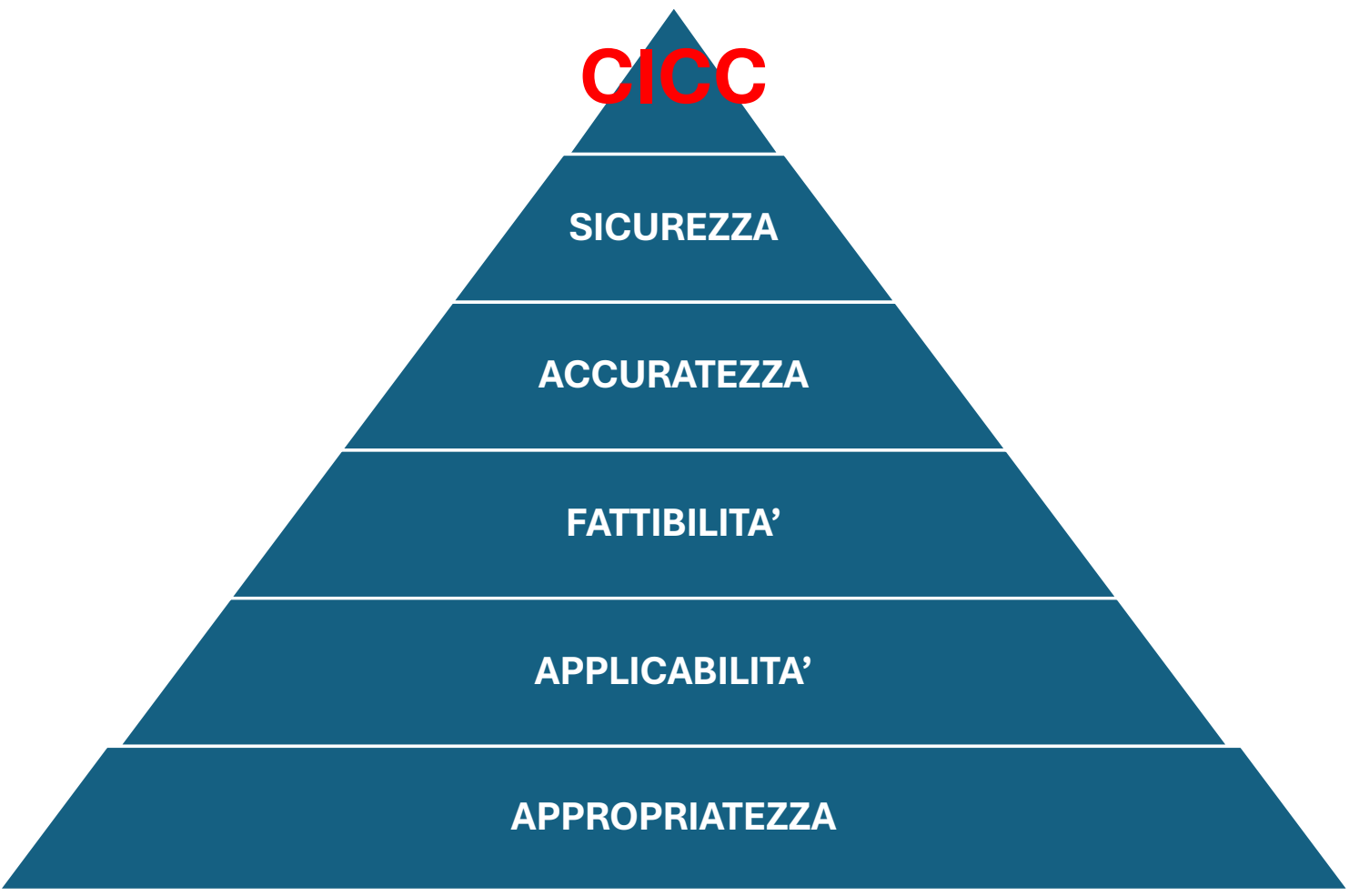
JVA The Journal of Vascular Access

The Journal of Vascular Access
1–8
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- Centrally inserted central catheter

CICC





CICC

SICUREZZA

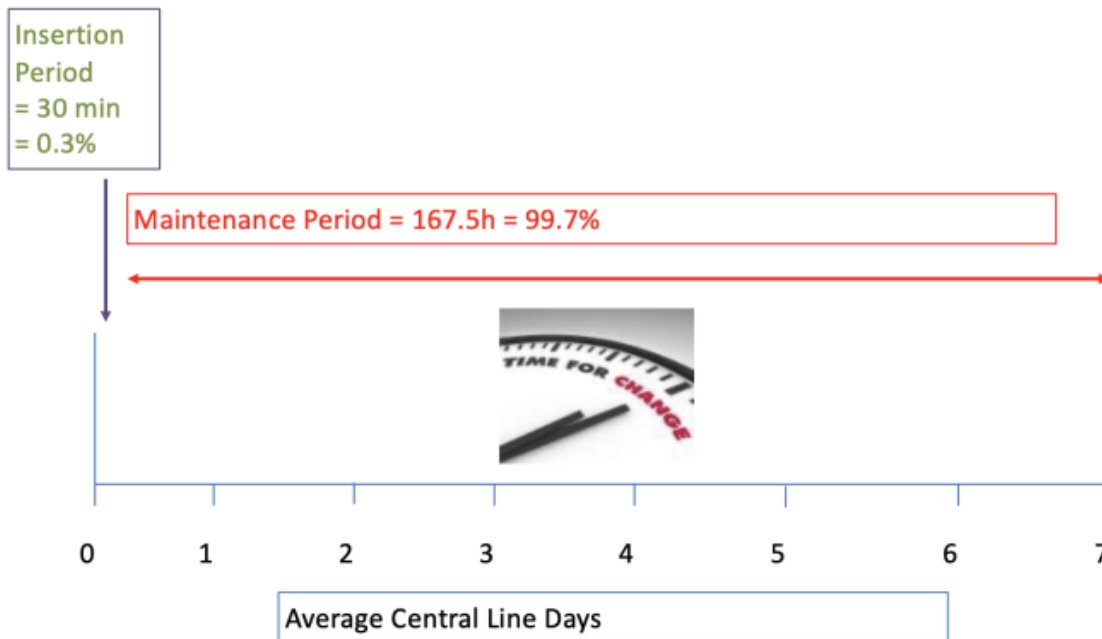
ACCURATEZZA

FATTIBILITA'

APPLICABILITA'

APPROPRIATEZZA

Why Proper CL Maintenance is Critical



Modified, courtesy of J. LeDonne, MD

L'efficienza è fare
bene le cose, l'efficacia
è fare le cose giuste.



Peter Drucker
Saggista

APPROPRIATEZZA

L'intervento sanitario (preventivo, diagnostico, terapeutico, riabilitativo) è correlato al bisogno del paziente, fornito nei modi e nei tempi adeguati, sulla base di standard riconosciuti, con un bilancio positivo tra benefici, rischi e costi ?

DI SCOPO

DI MEZZI

European Journal of Pediatrics
<https://doi.org/10.1007/s00431-023-04984-4>

REVIEW

The neonatal DAV-expert algorithm: a GAVeCeLT/GAVePed consensus for the choice of the most appropriate venous access in newborns

Giovanni Barone¹ · Vito D'Andrea² · Gina Ancora¹ · Francesco Cresi³ · Luca Maggio⁴ · Antonella Capasso⁵ · Rossella Mastroianni⁶ · Nicola Pozzi⁷ · Carmen Rodriguez-Perez⁸ · Maria Grazia Romitti⁹ · Francesca Tota¹⁰ · Ferdinando Spagnuolo¹¹ · Francesco Raimondi⁵ · Mauro Pittiruti¹²

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APPROPRIATEZZA

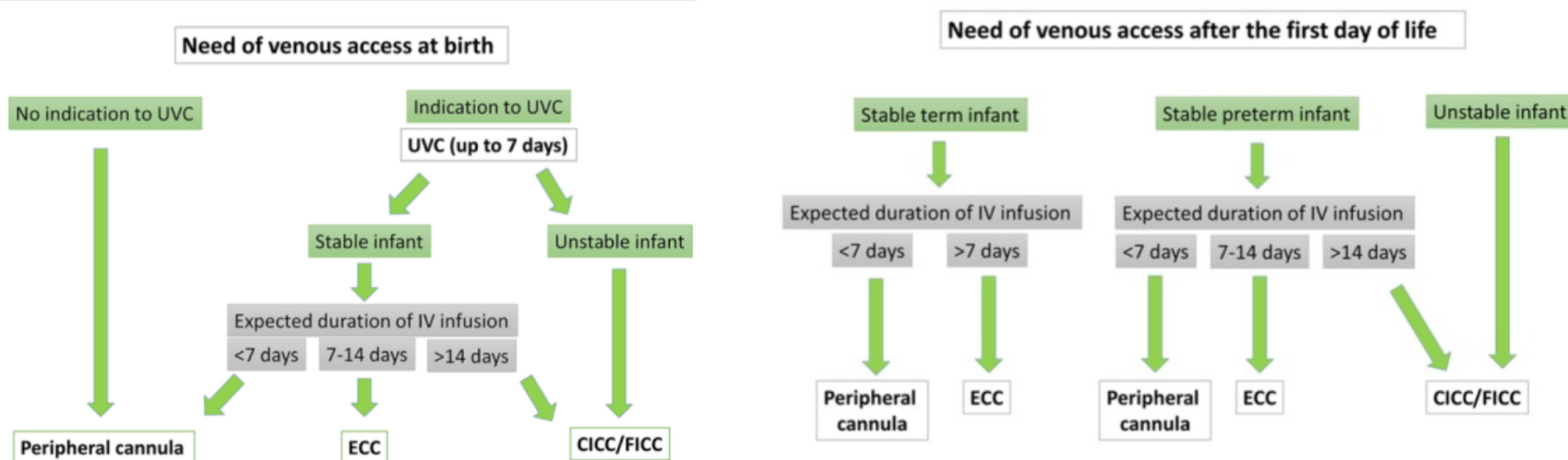
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APPLICABILITA'

utilizzabile, usabile, eseguibile, attuabile ?

Original Paper

Neonatology

Neonatology 2019;115:335–340
DOI: 10.1159/000496848

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Published online: March 15, 2019

A Systematic Ultrasound Evaluation of the Diameter of Deep Veins in the Newborn: Results and Implications for Clinical Practice

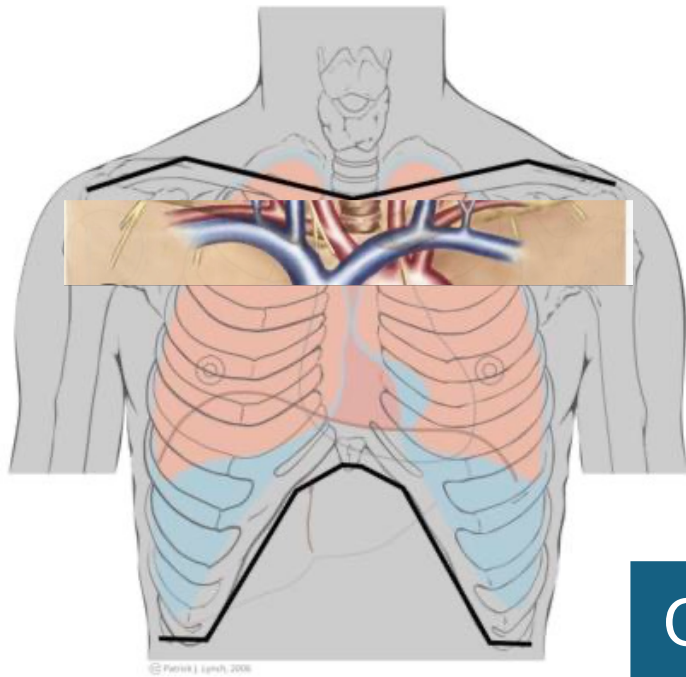
Giovanni Barone^a Vito D'Andrea^a Giovanni Vento^a Mauro Pittiruti^b

^aNeonatal Intensive Care Unit, Fondazione Policlinico A. Gemelli IRCSS, Rome, Italy; ^bDepartment of Surgery, Fondazione Policlinico A. Gemelli IRCSS, Rome, Italy

Table 1. Measurements of the diameters of the most relevant deep veins in the 5 weight groups

Vein	Whole cohort (n = 100)	500–1,000 g (n = 20)	1,001–1,500 g (n = 20)	1,501–2,000 g (n = 20)	2,001–2,500 g (n = 20)	2,501–3,000 g (n = 20)	ICC
R IJV		2.4±0.5 (1.8–3.1)	2.8±0.5 (2.0–3.3)	→ 3.0±0.6 (2.1–4.2)	3.2±0.3 (2.8–3.6)	4.2±0.7 (3.2–6.0)	0.85
L IJV		2.5±0.4 (1.9–3.1)	2.7±0.5 (2.0–3.4)	3.2±0.6 (2.2–4.4)	3.2±0.2 (2.8–3.6)	4.4±0.9 (3.3–7.0)	0.87
R BCV		→ 3.0±0.3 (2.6–3.6)	3.3±0.3 (2.7–3.7)	3.4±0.3 (2.7–3.6)	3.8±0.4 (3.1–4.2)	4.5±0.6 (3.7–5.7)	0.96
L BCV		3.0±0.3 (2.2–3.3)	2.9±0.4 (2.0–3.6)	3.4±0.5 (2.4–4.2)	3.5±0.3 (2.9–4.1)	4.6±0.9 (3.5–6.5)	0.97
R SBV		1.1±0.3 (0.8–1.7)	1.5±0.3 (1.2–2.2)	1.8±0.3 (1.3–2.3)	2.0±0.3 (1.5–2.4)	2.5±0.4 (2.0–3.0)	0.91
L SBV		1.1±0.3 (0.8–1.6)	1.4±0.3 (0.8–1.7)	1.8±0.3 (1.3–2.2)	2.0±0.3 (1.5–2.3)	2.5±0.3 (1.9–3.2)	0.92
R EJV		1.0±0.2 (0.8–1.3)	1.3±0.2 (0.9–1.5)	1.2±0.2 (0.9–1.5)	1.3±0.2 (1.0–1.5)	1.7±0.3 (1.1–2.2)	0.89
L EJV		0.9±0.2 (0.6–1.2)	1.2±0.3 (0.8–1.5)	1.4±0.2 (1.1–1.7)	1.5±0.2 (1.2–1.7)	1.8±0.2 (1.5–2.4)	0.90
R AxVc		1.5±0.1 (1.2–2.0)	1.7±0.4 (1.3–2.3)	1.8±0.3 (1.3–2.2)	2.0±0.3 (1.5–2.3)	2.5±0.5 (1.9–3.5)	0.91
L AxVc		1.6±0.2 (1.3–1.9)	1.9±0.5 (1.3–2.8)	2.0±0.3 (1.4–2.2)	2.2±0.2 (1.9–2.5)	2.5±0.4 (2.0–3.2)	0.93
R AxVa		1.2±0.3 (0.8–1.5)	1.5±0.3 (1.0–1.9)	1.5±0.3 (1.1–2.1)	1.8±0.3 (1.3–2.2)	2.1±0.2 (1.5–2.4)	0.92
L AxVa		1.2±0.2 (0.8–1.7)	1.5±0.4 (1.0–2.1)	1.7±0.3 (1.0–2.1)	1.8±0.2 (1.4–2.1)	2.0±0.3 (1.6–2.6)	0.91
R BrV		0.9±0.2 (0.7–1.2)	0.8±0.2 (0.5–1.0)	0.8±0.2 (0.6–1.1)	1.1±0.1 (0.9–1.3)	1.5±0.2 (1.2–2.1)	0.89
L BrV		0.9±0.2 (0.7–1.3)	0.8±0.2 (0.6–1.0)	1.0±0.2 (0.7–1.3)	1.2±0.1 (1.0–1.4)	1.6±0.2 (1.3–1.9)	0.90
R BaV		0.7±0.2 (0.5–1.1)	1.0±0.2 (0.7–1.2)	0.9±0.2 (0.6–1.2)	1.2±0.2 (0.7–1.4)	1.3±0.1 (1.1–1.5)	0.91
L BaV		0.7±0.1 (0.5–1.0)	0.9±0.1 (0.7–1.1)	0.9±0.1 (0.6–1.1)	1.3±0.2 (0.8–1.5)	1.3±0.1 (1.1–1.5)	0.92
R FeV		1.4±0.2 (1.1–1.8)	2.1±0.4 (1.3–2.7)	2.2±0.3 (1.8–2.6)	2.8±0.4 (2.1–3.4)	→ 3.2±0.2 (2.9–3.5)	0.89
L FeV		1.4±0.3 (1.1–1.9)	2.1±0.5 (1.6–2.9)	2.0±0.4 (1.4–2.6)	2.9±0.2 (2.5–3.3)	3.1±0.2 (2.9–3.5)	0.91
R SaV		0.8±0.2 (0.5–1.2)	1.0±0.3 (0.7–1.8)	1.3±0.2 (0.9–1.5)	1.7±0.4 (1.2–2.3)	1.8±0.3 (1.3–2.3)	0.88
L SaV		0.8±0.2 (0.4–1.1)	1.1±0.2 (0.7–1.5)	1.2±0.2 (0.8–1.4)	1.8±0.3 (1.4–2.3)	1.8±0.3 (1.4–2.3)	0.89

Values are expressed in millimeters as mean ± standard deviation (range). ICC, intraclass correlation; R, right; L, left; IJV, internal jugular vein; BCV, brachiocephalic vein; SBV, subclavian vein; EJV, external jugular vein; AxVc, axillary vein at the chest; AxVa, axillary vein at the axilla; BrV, brachial vein; BaV, basilic vein; FeV, femoral vein; SaV, saphenous vein.



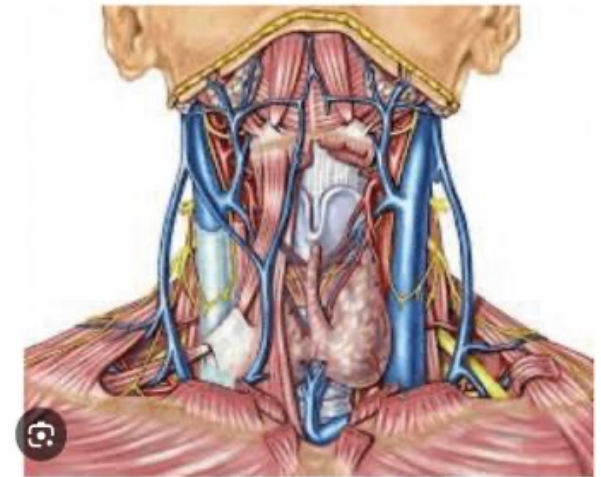
Il torace umano, compreso tra le linee cervico-toracica e toraco-addominale.

- Centrally inserted central catheter

NEONATO

CICC

CICC-t



CICC- c

- inserted by ultrasound-guided venipuncture of deep veins of the supra-clavicular area (mainly the internal jugular vein or the brachiocephalic vein)

FATTIBILITÀ

C'è la possibilità di avere concreta realizzazione, di raggiungere risultati positivi ?

Journal of Ultrasound
<https://doi.org/10.1007/s40477-023-00813-4>

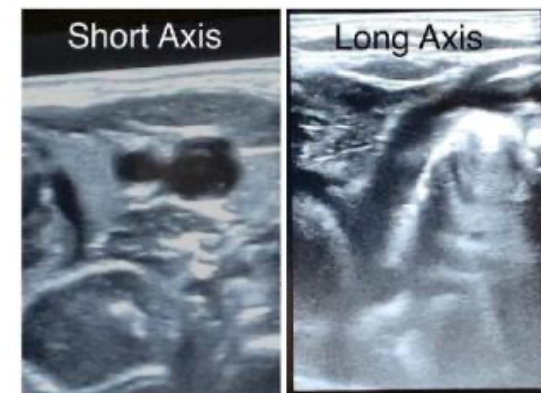
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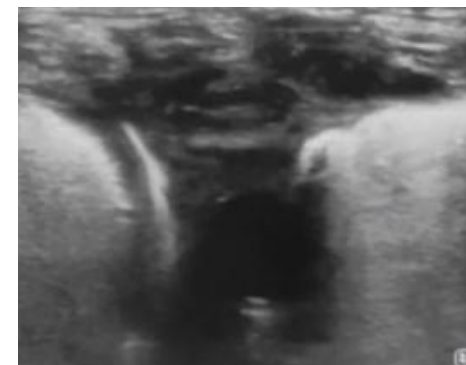
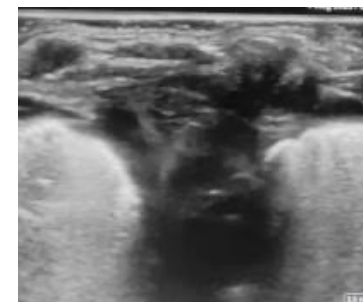
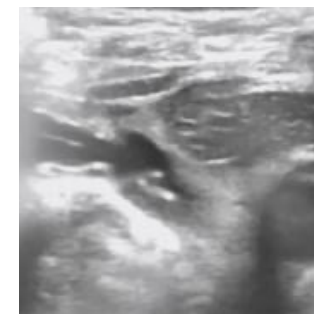
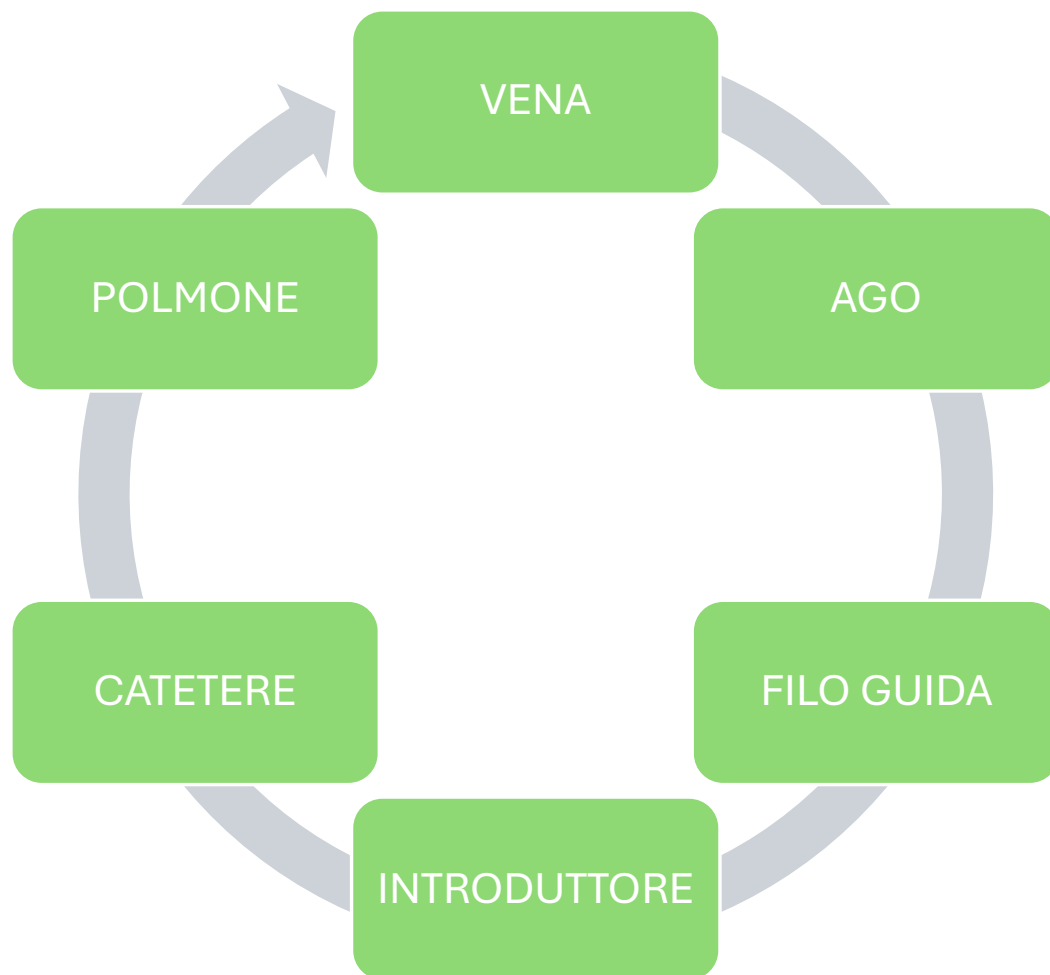
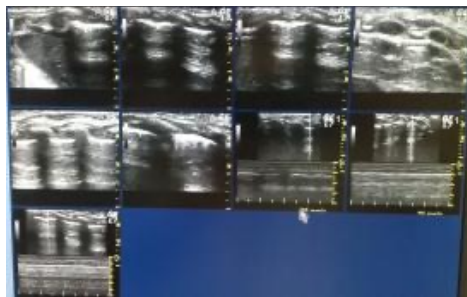
Global use of ultrasound in newborn vascular access: RA. CE. VA: implantation and management of complications

Ferdinando Spagnuolo¹ 

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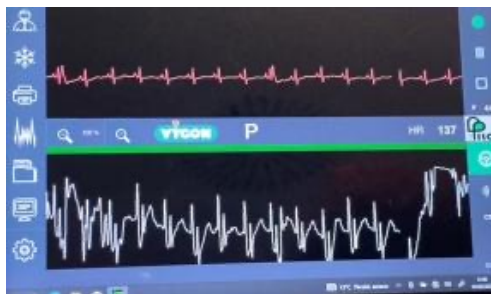
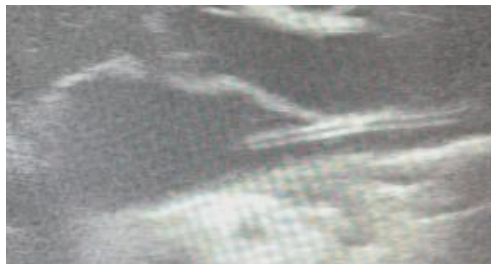
STEP 1





ACCURATEZZA

C'è corrispondenza del dato teorico, desumibile da una serie di valori misurati con il dato reale ?



Review

A narrative review on tip navigation and tip location of central venous access devices in the neonate: Intracavitary ECG or real time ultrasound?

Miria Natile¹, Gina Ancora¹, Vito D'Andrea², Mauro Pittiruti³ and Giovanni Bai

JVA The Journal of Vascular Access

The Journal of Vascular Access
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Table 1. Tip location by intracavitary ECG.

Vascular Access Device	Applicability	Feasibility	Accuracy
UVC	Applicable, but not recommended	Yes	Low
ECC – upper limbs	Applicable, but not recommended	Not always feasible	High
ECC – lower limbs	Not always applicable	Not always feasible	Low
CICC	Applicable and highly recommended	Yes	High
FICC	Not always applicable	Not always feasible	Low

IC-ECG = never applicable for tip navigation.

Table 2. Tip location by real time ultrasound.

Vascular Access Device	Applicability	Feasibility	Accuracy
UVC	Applicable, highly recommended	Yes	High
ECC – upper limbs	Applicable, recommended	Yes	High
ECC – lower limbs	Applicable, recommended	Yes	High
CICC	Applicable	Yes	High
FICC	Applicable, recommended	Yes	High

Real time ultrasound = always applicable for tip navigation.

Editorial

JVA The Journal of Vascular Access

An Italian expert consensus on the choice of the method of tip location for central venous access devices

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Vincenzo Faraone¹, Mauro Pittiruti², Maria Giuseppina Annetta³, Giovanni Barone⁴, Fabrizio Brescia⁵, Maria Calabrese⁶, Antonella Capasso⁷, Giuseppe Capozzoli⁸, Vito D'Andrea⁹, Sonia D'Arrigo¹⁰, Daniele Elisei¹¹, Stefano Elti¹², Igor Giarretta¹³, Antonio Gidaro¹⁴, Davide Giustini¹⁵, Emanuele Iacalone¹⁶, Rossella Mastroianni¹⁷, Fulvio Pinelli¹⁸, Giancarlo Scoppettuolo¹⁹, Ferdinando Spagnuolo²⁰, Geremia Zito Marinocchi²¹, Gilda Pepe¹ and Daniele G. Biasucci²²

INTRAPROCEDURAL Tip location by intracavitary ECG technique and/or echocardiography;

SICUREZZA

Ci sono le condizioni che danno la possibilità di prevenire, eliminare o rendere meno gravi danni, rischi, difficoltà, evenienze spiacevoli ?

Clinical trial protocol

JVA The Journal of
Vascular Access

A GAVeCeLT bundle for central venous catheterization in neonates and children: A prospective clinical study on 729 cases

Mauro Pittiruti¹, Davide Celentano², Giovanni Barone³,
Vito D'Andrea⁴, Maria Giuseppina Annetta⁵ and Giorgio Conti²

The Journal of Vascular Access
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Ultrasound pre-puncture evaluation of central veins (RaCeVA)
Hand hygiene and maximal barrier precautions
Skin antisepsis with 2% chlorhexidine in alcohol
Ultrasound-guided venipuncture
Tip location by intracavitary echocardiography and/or echocardiography
Tunneling the catheter so as to obtain an exit site in the infraclavicular area
Securement with the sutureless device
Sealing of the exit site with glue
Coverage with transparent semipermeable dressing

- Nessuna complicanza al momento dell'impianto.
- Rimozione elettiva del dispositivo nel 98% dei casi.
- Incidenza di CRBSI 0.3/1000 giorni catetere.
- Nessun caso di trombosi o migrazione del catetere.

The Journal of Vascular Access
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<https://doi.org/10.1177/11297298241239998>

Sage Journals

Clinical trial protocol

Systematic application of SICA-PED protocol for central venous catheterization in neonates: A prospective clinical study on 104 cases

Ferdinando Spagnuolo¹, Anna Maietta¹, Umberto Pugliese¹, Emanuele Lettieri¹,
Fabrizio Minopoli¹, Nicola Coppola², Marco La Verde³, Margherita Macera⁴, Caterina
Monari⁴, Lorenzo Onorato², and Mauro Carpentieri¹

SEVEN BUNDLES for CICC/FICC INSERTION in NEWBORNS

SICA-Ped feasible in neonates?

- 104: CVC: 630-5,000g
– 103: ri BCV, 1: ri FV

Results

- Cannulation success: 100%
- 1.attempt cannulation success: 98%
- Long term complications

– 1 tunnelitis with dislodgement
– CRBSI: 2.4 × 1000 catheter days

Spagnuolo; J Vasc Access 2024

WoCova
The World Congress on Vascular Access

SICUREZZA

Ci sono le condizioni che danno la possibilità di prevenire, eliminare o rendere meno gravi danni, rischi, difficoltà, evenienze spiacevoli ?

- **PROTOCOLLO DI IMPIANTO: ISAC-Ped**

Stabilire la migliore pratica clinica per minimizzare il rischio di complicanze in un paziente clinicamente complesso ed aumentare il tasso di successo della procedura.

- Focalizzare il ruolo strategico della **TIP LOCATION INTRAPROCEDURALE** (preferibilmente con doppia metodica).

- Fornire chiare indicazioni sul «**SECURE&PROTECT**» dei cateteri venosi centrali neonatali.



Special considerations.

- Even though it is always advisable to tunnel the catheter, in some situations, this maneuver can be impractical, for example, because of the limited duration of sedation in extremely low birth weight infants, or because of the difficulty of using the modified Seldinger technique in babies weighing less than 750 g, or because of insufficient training of the operator.

European Journal of Pediatrics
<https://doi.org/10.1007/s00431-023-04984-4>

REVIEW

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CONCLUSION

- SICA-Ped for CICC, FICC applies to neonates

Spagnuolo; J Vasc Access 2024

However

- Unconditional need for deep sedation/GA
- Major limitations for bundles in neonates

- *limited option for the use of SAD*
- *limited option for tunneling*

- Insertion procedure should be **quick, least traumatic**

WOCOVA
Wound, Ostomy, and Continence
Association



< 3 mm



Special considerations.

- Even though it is always advisable to tunnel the catheter, in some situations, this maneuver can be impractical, for example, because of the limited duration of sedation in extremely low birth weight infants, or because of the difficulty of using the modified Seldinger technique in babies weighing less than 750 g, or because of insufficient training of the operator.

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< 3 mm < 500 gr





- Neonates, especially preterm ones, might need repeated peripheral venous cannulations sometimes this leads to a progressive exhaustion of available veins. In this context, an ultrasound-guided CICC or FICC might be considered even though a central line is not strictly indicated.

(g) CICC or FICC should also be considered in stable preterm newborns with an expected duration of PN longer than 2 weeks.

European Journal of Pediatrics
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REVIEW

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APPROPRIATEZZA

European Journal of Pediatrics
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REVIEW

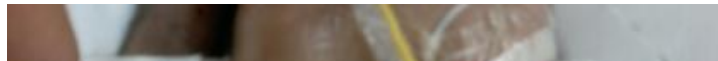
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Giovanni Barone¹, Vito D'Andrea², Gina Ancora¹, Francesco Cresti¹, Luca Maggio², Antonella Capasso¹, Rossella Mastrolia¹, Nicola Pozzi¹, Carmen Rodriguez Perez², Maria Grazia Raimondi¹, Francesca Tota¹, Ferdinando Spagnuolo¹, Francesco Raimondi², Mauro Pittiruti¹

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SIC-Ped

Safe Insertion of Central access in Pediatric patient



Stab

access after the first day of life

Stable preterm infant

Need of venous access at birth

SEVEN BUNDLES for CICC/FICC INSERTION in NEWBORNS

SICA-Ped feasible in neonates?

- **104: CVC: 630-5,000g**
- **103: ri BCV, 1: ri FV**

Results

- Cannulation success: **100%**
- 1.attempt cannulation success: **98%**
- Long term complications

– **1 tunnelitis with dislodgement**

– **CRBSI: 2.4×1000 catheter days**

Spagnuolo; J Vasc Access 2024

Methods: A retrospective cohort study of neonatal intensive care unit patients with a PICC insertion between January 1, 2011 and December 31, 2012 was conducted. We performed univariate and multivariate analyses with a logistic regression model to investigate the risk factors and the association between increased frequency of peripheral venipunctures during PICC use and the risk of CLA-BSI while adjusting for other variables.

Results: There were 123 neonates included in our study. Thirteen CLA-BSIs were recorded within the follow-up period. The incidence of PICC-associated CLA-BSI was 4.99 per 1000 catheter-days. There was no statistically significant association between the risk of CLA-BSI and gestational age, birth weight, chronological age, or other comorbidities. However, the odds of CLA-BSI increased to 12 times if the patient received six or more venipunctures within the period without concurrent antibiotic use [odds ratio (OR), 11.94; $p < 0.001$]. The OR of CLA-BSIs increased by 16% per venipuncture during PICC use (OR, 1.14; $p = 0.003$).

ECC (n-PICC)

Neonates

1–2.7 Fr

No

ion Any superficial vein of the upper limb, lower limb, or scalp

ne Direct puncture of visible veins

insertion Catheter through needle, or catheter through cannula

, if required

No

Low

No

No

No

1–2 weeks

High

High

Frequent

7-14 days

ECC

CICC/FICC

ORIGINAL ARTICLE

Increased frequent venipunctures raise associated bloodstream infections in neonates with peripheral venous catheters

Hao-Yuan Cheng¹, Chun-Yi Jong-Min Chen², Luan-Yin

WoCoVA
8th World Congress on Vascular Access

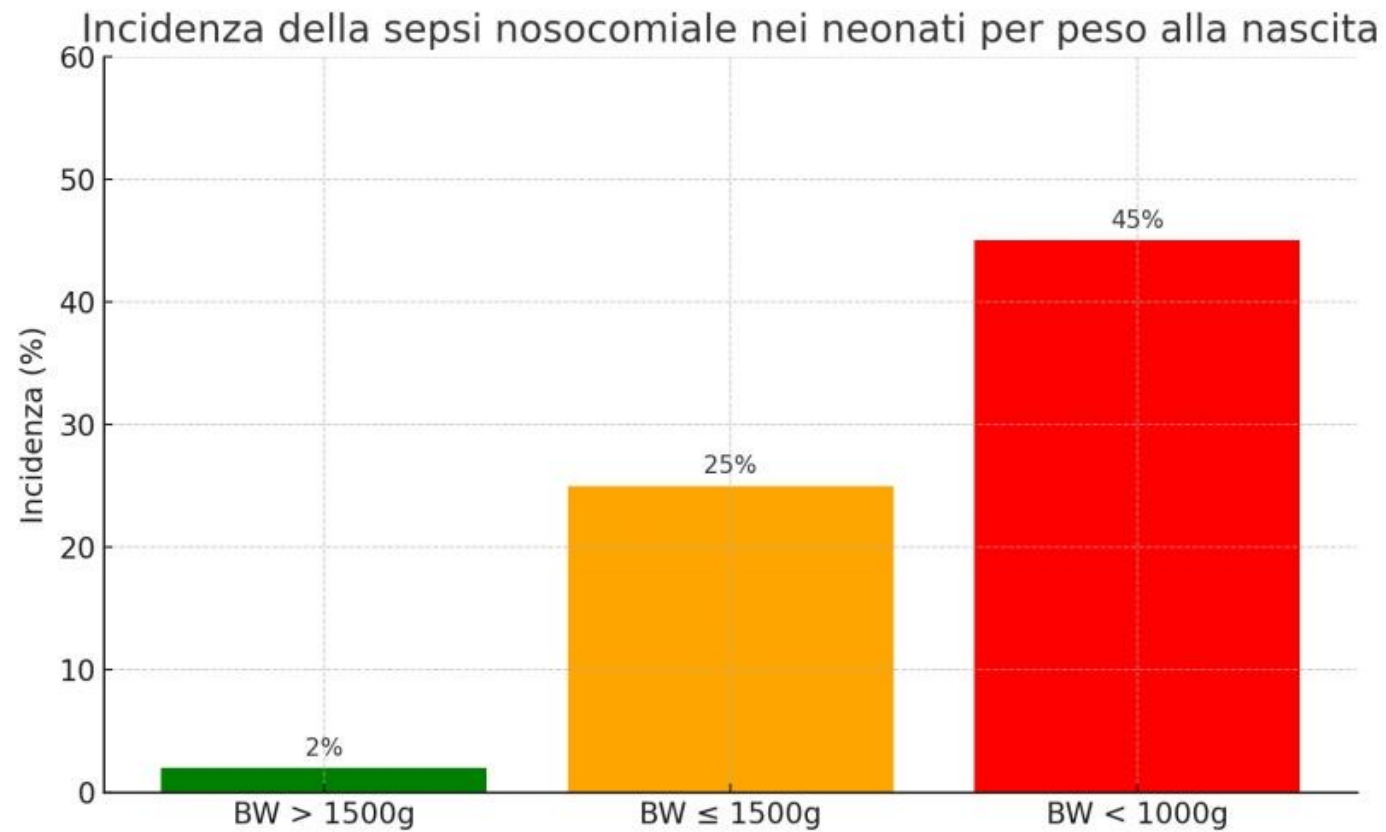
Editorial

Epicutaneo-caval catheters in neonates: New insights and new suggestions from the recent literature

Giovanni Barone¹ and Mauro Pittiruti²

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B. Fernandez Colomer, M. Cernada Badia, D. Coto Cotallo, J. Lopez Sastre.
The Spanish National Network “Grupo Castrillo”: 22 years of nationwide neonatal infection surveillance.
Am J Perinatol, 37 (2020), pp. S71-S75

Guidelines for the Prevention of Intravascular Catheter-related Infections

Naomi P. O'Grady,¹ Mary Alexander,² Lillian A. Burns,² E. Patricia Dellinger,⁴ Jeffrey Garland,⁵ Stephen G. Heard,⁶ Pamela A. Lipsett,⁷ Henry Masur,⁸ Leonard A. Mermel,⁹ Michelle L. Pearson,⁹ Issam I. Raad,¹⁰ Adrienne G. Randolph,¹¹ Mark E. Rupp,¹² Sanjay Saint,¹³ and the Healthcare Infection Control Practices Advisory Committee (HICPAC) (Appendix 1)

Table 1. Catheters Used for Venous and Arterial Access

Catheter type	Entry site	Length	Comments
Peripheral venous catheters	Usually inserted in veins of forearm or hand	<3 inches	Phlebitis with prolonged use; rarely associated with bloodstream infection
Peripheral arterial catheters	Usually inserted in radial artery; can be placed in femoral, axillary, brachial, posterior tibial arteries	<3 inches	Low infection risk; rarely associated with bloodstream infection
Midline catheters	Inserted via the antecubital fossa into the proximal basilic or cephalic veins; does not enter central veins, peripheral catheters	3 to 8 inches	Anaphylactoid reactions have been reported with catheters made of elastomeric hydrogel; lower rates of phlebitis than short peripheral catheters
Nontunneled central venous catheters	Percutaneously inserted into central veins (subclavian, internal jugular, or femoral)	≥8 cm depending on patient size	Account for majority of CRBSI
Pulmonary artery catheters	Inserted through a Teflon® introducer in a central vein (subclavian, internal jugular, or femoral)	≥30 cm depending on patient size	Usually heparin bonded; similar rates of bloodstream infection as CVCs; subclavian site preferred to reduce infection risk
Peripherally inserted central venous catheters (PICC)	Inserted into basilic, cephalic, or brachial veins and enter the superior vena cava	≥20 cm depending on patient size	Lower rate of infection than nontunneled CVCs
Tunneled central venous catheters	Implanted into subclavian, internal jugular, or femoral veins	≥8 cm depending on patient size	Cuff inhibits migration of organisms into catheter tract; lower rate of infection than nontunneled CVC
Totally implantable	Tunneled beneath skin and have subcutaneous port accessed with a needle; implanted in subclavian or internal jugular vein	≥8 cm depending on patient size	Lowest risk for CRBSI; improved patient self-image; no need for local catheter-site care; surgery required for catheter removal
Umbilical catheters	Inserted into either umbilical vein or umbilical artery	≤6 cm depending on patient size	Risk for CRBSI similar with catheters placed in umbilical vein versus artery

Linee guida per la prevenzione delle infezioni ospedaliere nel neonato



2.2. Selezionare il catetere e il sito di inserimento^{36,37,38}

Cateteri inseriti per via periferica e midline

Tipo di catetere	Sito d'ingresso	Note
Catetere venoso periferico	Posizionato in vene dell'avambraccio, della mano, degli arti inferiori o dello scalpo	Flebiti in relazione a lungo posizionamento. Elevato rischio di stravasamento delle soluzioni infuse. Raramente associato a sepsi
Catetere arterioso periferico	Posizionato solitamente in arteria radiale; occasionalmente nelle arterie femorali, ascellari, brachiali, tibiali posteriori	Basso rischio infettivo. Raramente insorgenza di CRBSI
Catetere midline	Inserito nelle vene basiliche, cefaliche o brachiali. Siti di inserzione aggiuntivi: le vene degli arti inferiori (safena, poplitea) e le vene dello scalpo. La punta del catetere non entra nelle vene centrali. Vanno considerati come cateteri periferici	I tassi di flebite sono maggiori rispetto ai cateteri periferici più corti
Catetere centrale non tunnellizzato	Inserito per via percutanea nelle vene centrali (sugli avambracci, giugulare interna, anonima o femorale)	Responsabili della maggior parte delle CRBSI
Catetere arterioso polmonare	Inserito attraverso una guida di Teflon in una vena centrale (sugli avambracci, giugulare interna o femorale)	Di solito trattati con l'eparina. Tassi simili di infezione del flusso sanguigno come gli altri CVC
Catetere epicutaneo cavale (ECC) ³⁹	Inserito nelle vene superficiali (poste entro 7 mm di profondità), con apice nella vena cava superiore o alla giunzione vena cava superiore – atrio destro	Tasso di infezione inferiore rispetto ai CVC non tunnellizzati
Catetere venoso centrale tunnellizzato	Impiantato nella vena sugli avambracci, giugulare interna, anonima o femorale	La tunnellizzazione inibisce la migrazione dei microrganismi nel tratto intravascolare del catetere
		Il tasso di infezione è inferiore rispetto ai CVC non tunnellizzati
Catetere totalmente impiantabile	Tunnellizzato sotto la cute con porta sottocutanea di accesso con un ago; impiantato in sugli avambracci o vena giugulare interna	Rischio di CRBSI più basso. Di più semplice gestione e tolleranza per il paziente. Non c'è bisogno di cure locali per il sito del catetere. Necessaria la chirurgia per la rimozione del CVC.
Catetere ombelicale	Inserito in vena o arteria ombelicale	Associato a rischio elevato di complicanze infettive e di trombotici

³⁶ O'Grady NP, Alexander M, Burns LA, Dellinger EP, Garland J, Heard SO et al. Healthcare Infection Control Practices Advisory Committee (HICPAC). Guidelines for the prevention of intravascular catheter-related infections. Clin Infect Dis 2011; 52(9):e162–193.

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³⁸ Barone G, Pittiruti M. Epicutaneo-caval catheters in neonates: New insights and new suggestions from the recent literature. J Vasc Access. 2020;21(6):805-809

³⁹ Barone G, Pittiruti M. Epicutaneo-caval catheters in neonates: New insights and new suggestions from the recent literature. J Vasc Access. 2020;21(6):805-809





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