GAVePed
Gruppo Accessi Venosi Pediatrici

GAVePed
2025 MILANO

Il documento di consenso GAVePed sulla scelta dell'accesso venoso neonatale

Giovanni Barone
Ospedale Infermi di Rimini

GdS Accessi Vascolari Neonatali

GAVeCeLT
Gli Accessi Venosi Centrali a Lungo Termine

Il documento di consenso GAVePed sulla scelta dell'accesso venoso neonatale

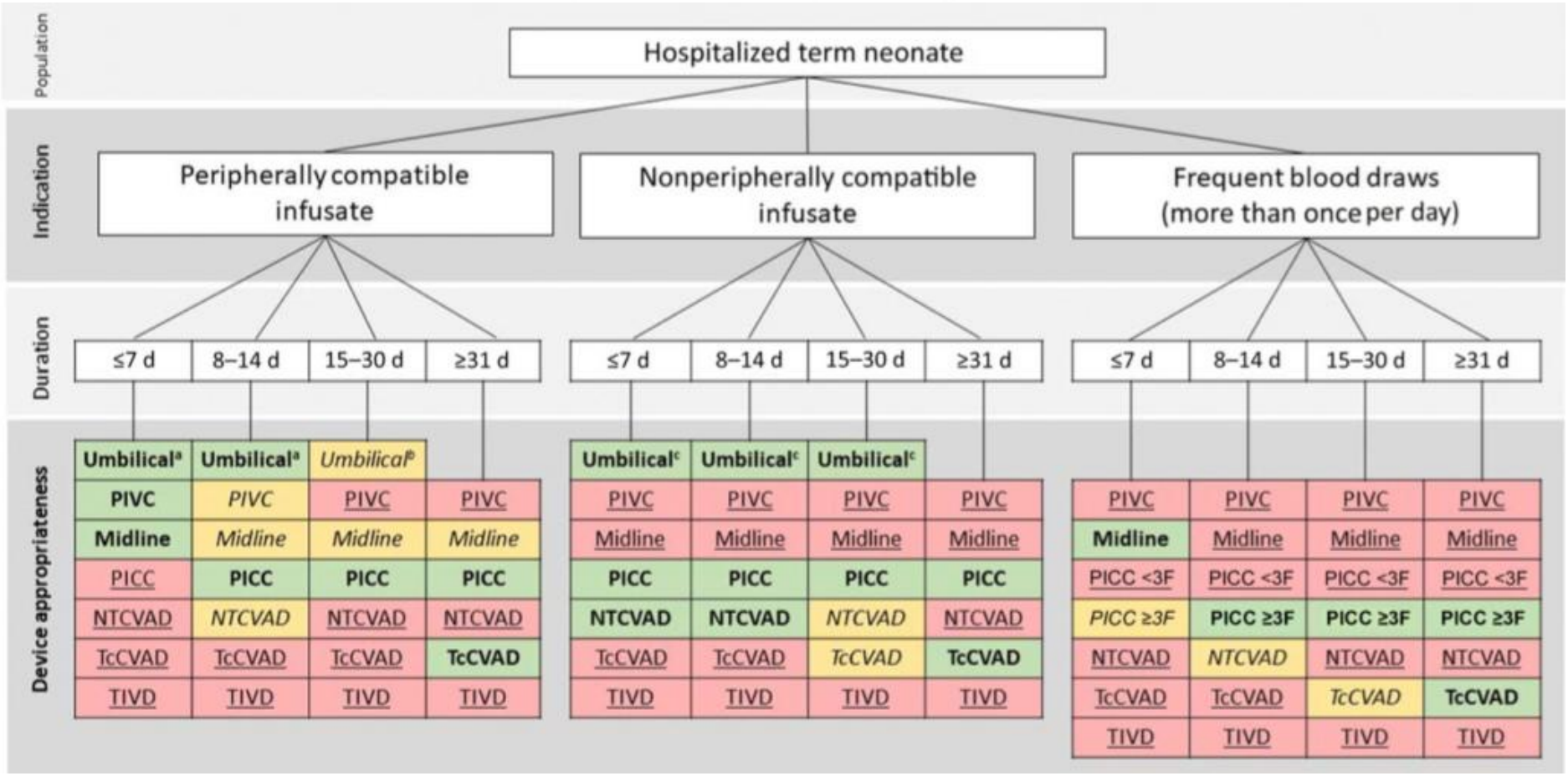
I have no actual or potential conflict of interest in relation to this presentation

Perchè abbiamo bisogno di un algoritmo?

- La scelta del dispositivo di accesso venoso più appropriato è particolarmente complessa nei neonati.
- In questa popolazione, un accesso venoso affidabile è spesso indispensabile per la somministrazione di farmaci, liquidi, nutrizione parenterale e emoderivati.
- Il neonato ha spesso un patrimonio venoso limitato.
- Tutti i dispositivi sono soggetti a frequenti complicanze.
- Negli ultimi anni, sono stati pubblicati tre algoritmi a supporto del processo decisionale.

The Michigan Appropriateness Guide for Intravenous Catheters in Pediatrics: miniMAGIC

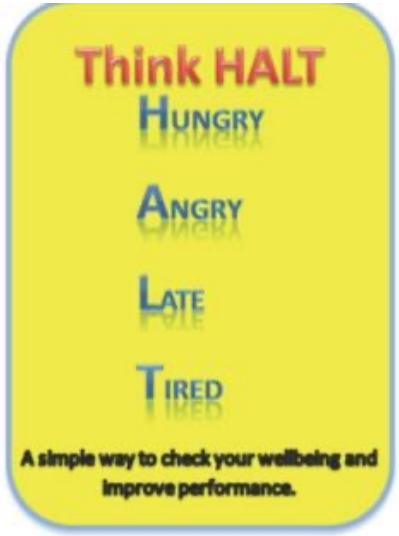
2020



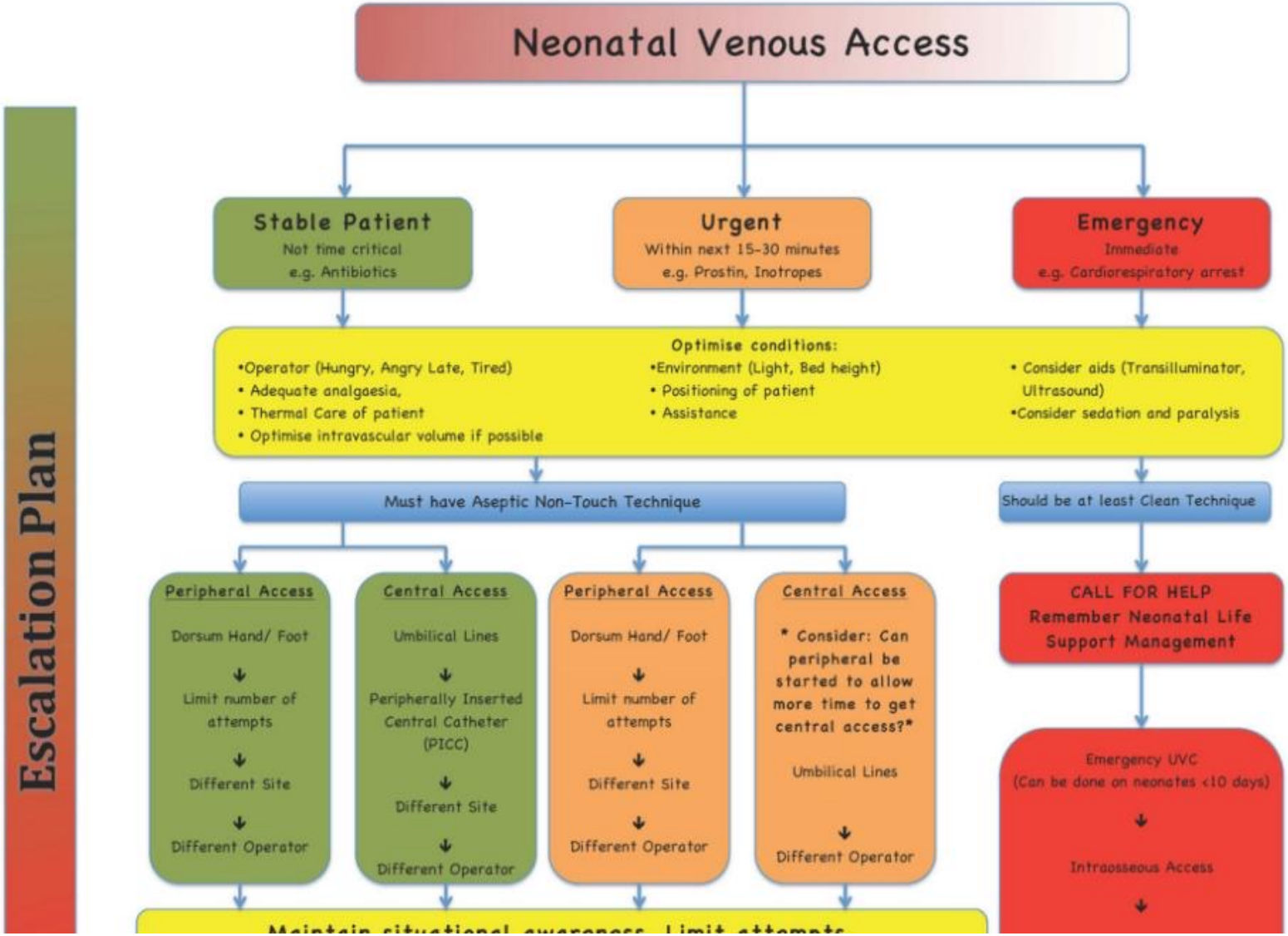
Fifteen-minute consultation: Decision-making pathway for neonatal vascular access

2021

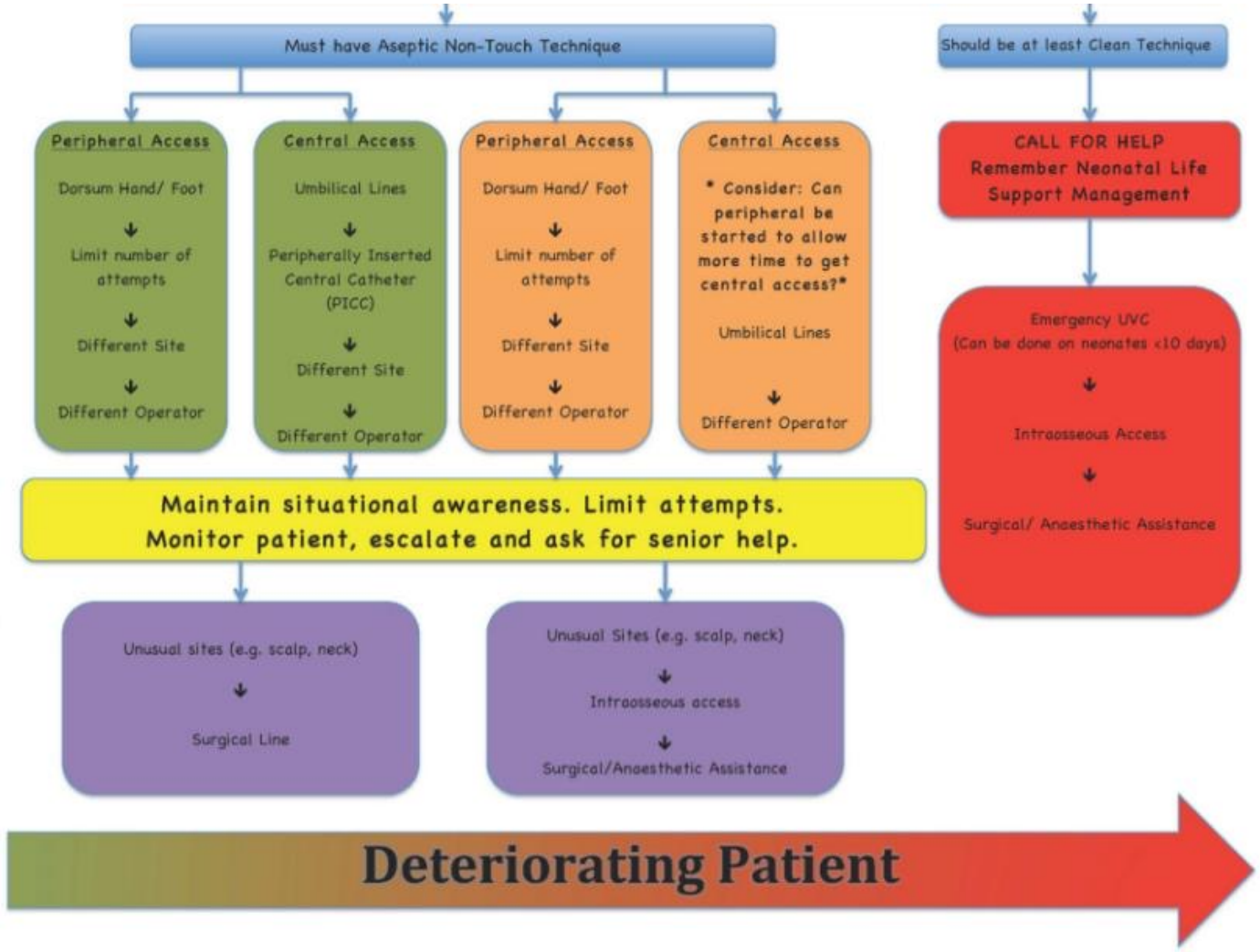
Elizabeth Osmond , Nicholas Williams



2021


Escalation Plan
Neonatal Venous Access
Stable Patient
Not time critical
e.g. Antibiotics
Urgent
Within next 15-30 minutes
e.g. Prostin, Inotropes
Emergency
Immediate
e.g. Cardiorespiratory arrest
Optimise conditions:
•Operator (Hungry, Angry Late, Tired)
• Adequate analgaesia,
• Thermal Care of patient
• Optimise intravascular volume if possible
•Environment (Light, Bed height)
• Positioning of patient
• Assistance
• Consider aids (Transilluminator, Ultrasound)
•Consider sedation and paralysis
Must have Aseptic Non-Touch Technique
Should be at least Clean Technique
Peripheral Access
Dorsum Hand/ Foot
Limit number of attempts
Different Site
Different Operator
Central Access
Umbilical Lines
Peripherally Inserted Central Catheter (PICC)
Different Site
Different Operator
Peripheral Access
Dorsum Hand/ Foot
Limit number of attempts
Different Site
Different Operator
Central Access
* Consider: Can peripheral be started to allow more time to get central access?*
Umbilical Lines
Different Operator
CALL FOR HELP
Remember Neonatal Life Support Management
Emergency UVC
(Can be done on neonates <10 days)
Intraosseous Access

2021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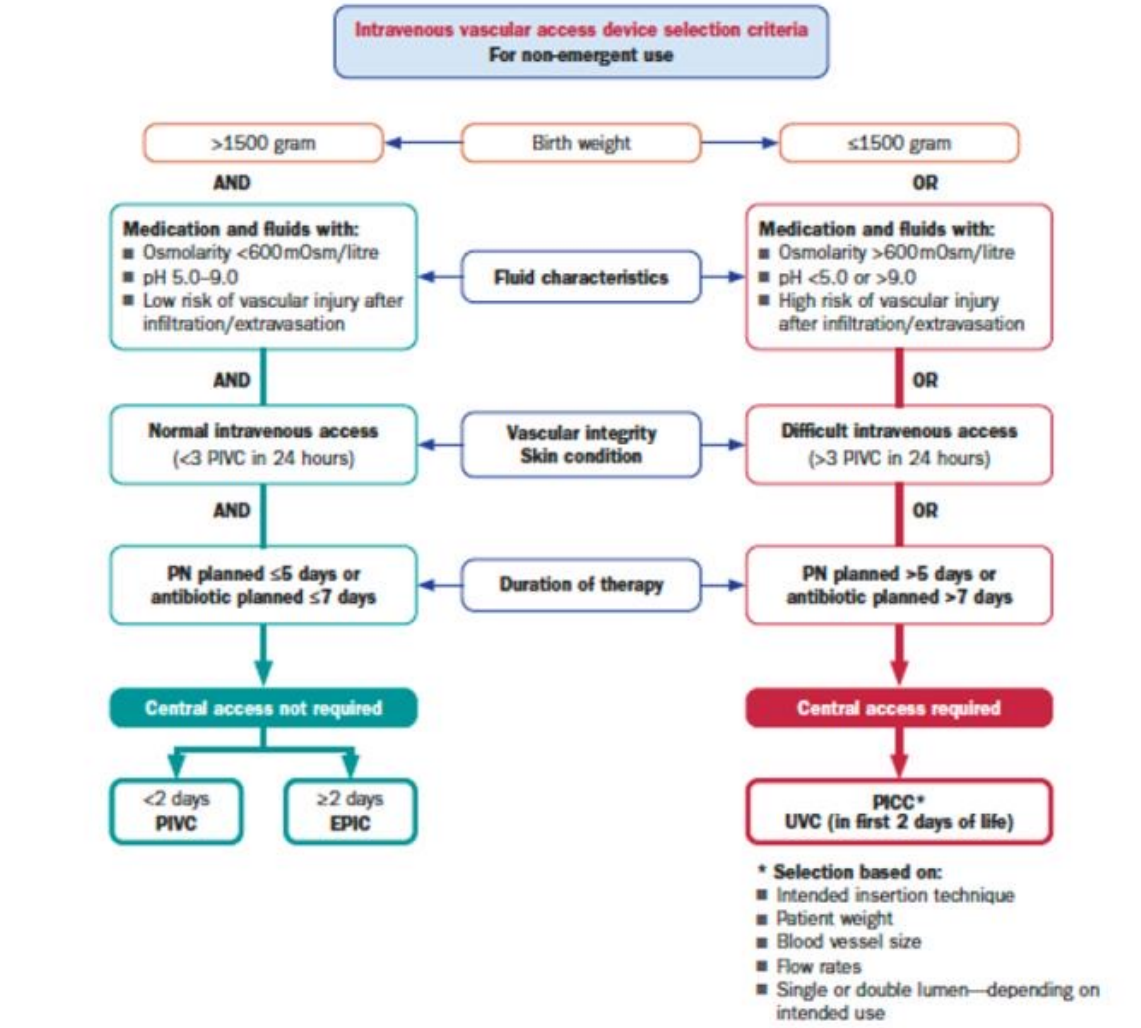
* Consider: Can peripheral be started to allow more time to get central access?*
Umbilical Lines
Different Operator
CALL FOR HELP
Remember Neonatal Life Support Management
Emergency UVC
(Can be done on neonates <10 days)
Intraosseous Access
Surgical/ Anaesthetic Assistance
Maintain situational awareness. Limit attempts.
Monitor patient, escalate and ask for senior help.
Unusual sites (e.g. scalp, neck)
Surgical Line
Unusual Sites (e.g. scalp, neck)
Intraosseous access
Surgical/Anaesthetic Assistance
Deteriorating Patient

THE ABBA WAY

2022

- **A**ssess the situation and patients **B**etter **B**efore initiating vascular **A**ccess
- NeoVAT
- 112 NICU Bed
- 5Rights for Vascular Access" i.e., the Right device, for the Right vein, with the Right therapy, for the Right duration, for the Right patient (same as Steere)
- 23858 VAD: 89.3% SPC; 2.9% LPC; 5.6% ECC; 2.2% UVC

2022



EPIC=extended dwell peripheral intravenous catheter; PICC=peripherally inserted central catheter; PIVC=peripheral intravenous catheter; PN=parenteral nutrition; UVC=umbilical venous catheter

Limiti degli algoritmi esistenti

- Gli algoritmi proposti da Ullman et al. e da Osmond et al. non prendono in considerazione i **neonati pretermine**, che rappresentano una delle principali cause di ricovero in TIN.
- In entrambi gli articoli di Ullman et al. e di Osmond et al., gli autori perpetuano la confusione terminologica tra **catetere epicutaneo-cavale (ECC)** e **catetere centrale ad inserzione periferica (PICC).**
- Negli algoritmi proposti da Ullman et al. e da Van Rens et al., gli autori non distinguono tra **neonati critici (instabili) e neonati stabili**.
- Nell'articolo di Ullman et al., gli autori suggeriscono il posizionamento di un "**PICC >3 Fr**" (??).
- Nell'articolo di Osmond et al., gli autori propongono l'utilizzo di linee centrali inserite tramite **cutdown chirurgico (!).**
- Nell'articolo di Van Rens et al., gli autori non prendono in considerazione **l'uso di cateteri centrali inseriti con guida ecografica**.

La consensus italiana

- Poiché nessuno di questi algoritmi risultava pienamente soddisfacente, il GAVePed ha deciso di sviluppare un nuovo algoritmo denominato «**Neonatal DAV-Expert».**
- Considerando l'impatto di questo tema sulla pratica clinica quotidiana e la carenza di evidenze provenienti da studi di alta qualità, si è ritenuto che la metodologia **della consensus** fosse lo strumento più appropriato per fornire raccomandazioni solide.

2023

European Journal of Pediatrics (2023) 182:3385–3395
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 Barone[1] · Vito D'Andrea[2] · Gina Ancora[1] · Francesco Cresi[3] · Luca Maggio[4] · Antonella Capasso[5] · Rossella Mastroianni[6] · Nicola Pozzi[7] · Carmen Rodriguez-Perez[8] · Maria Grazia Romitti[9] · Francesca Tota[10] · Ferdinando Spagnuolo[11] · Francesco Raimondi[5] · Mauro Pittiruti[12]

Received: 13 February 2023 / Revised: 11 April 2023 / Accepted: 15 April 2023 / Published online: 17 May 2023

Metodologia

- Identificazione di un panel di esperti

Giovanni Barone[1] · Vito D'Andrea[2] · Gina Ancora[1] · Francesco Cresi[3] · Luca Maggio[4] · Antonella Capasso[5] · Rossella Mastroianni[6] · Nicola Pozzi[7] · Carmen Rodriguez-Perez[8] · Maria Grazia Romitti[9] · Francesca Tota[10] · Ferdinando Spagnuolo[11] · Francesco Raimondi[5] · Mauro Pittiruti[12]

- Membri del GAVePed.
- Esperti nazionali di Nutrizione Parenterale Neonatale.
- Personalità di spicco della SIN che abbiano un expertise in abito di accessi vascolari.
- Tutti panelists hanno avuto una produzione scientifica valida sugli accessi vascolari neonatali negli ultimi anni.

Metodologia -1

1. PRIMO STEP: Ricerca bibliografica limitata agli ultimi 20 anni
2. Applicazione **RAND/University of California at Los Angeles (UCLA) Appropriateness Methodology as a three-step consensus process – METODO DELPHI modificato**
3. Elaborazione di un set di 4 domande

Metodologia -2

- Quali sono le appropriate indicazioni per l'uso dei CVO?
- Quali sono le appropriate indicazioni per l'uso delle cannule periferiche corte?
- Quali sono le appropriate indicazioni per l'uso degli ECC?
- Quali sono le appropriate indicazioni per l'uso di CICC e FICC?

Metodologia -3

1. Stesura di una iniziale bozza degli statements sulla base della letteratura.
2. Espressione da parte di ogni panelistis del livello di agreement

DISAGREE **UNCERTAIN** **AGREE**

3. Meeting online e discussione degli statements
4. Modifica degli statements
5. Espressione da parte di ogni panelistis del livello di agreement

DISAGREE **UNCERTAIN** **AGREE**

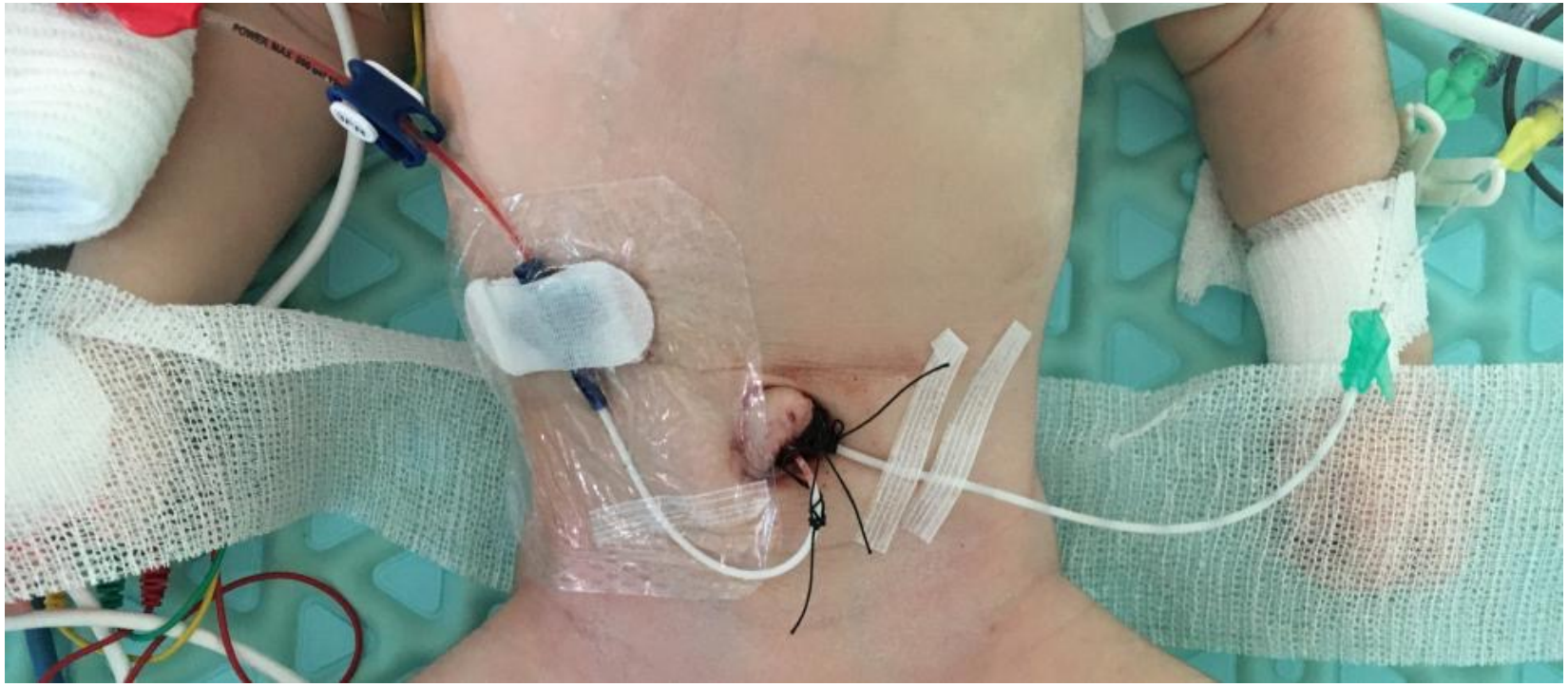
Metodologia -4

6. Meeting online e discussion finale degli statements.
7. Creazione dell'algoritmo di scelta.
8. Condivisione del lavoro finale per l'approvazione finale.

Il panel ha deciso di non includere accessi vascolari "speciali" come per es i cateteri per dialisi, le cannule ECMO et c

Risultati - 1

Quali sono le appropriate indicazioni per l’uso dei CVO?



Quali sono le appropriate indicazioni per l'uso dei CVO?

1. Appropriate indications for UVC include (a) preterm infants born at or less than 28 weeks of gestation at the time of birth; (b) neonates with severe respiratory distress (intubated or on non-invasive ventilation with FiO2 > 40%), or with hemodynamic instability, or with difficulty in finding peripheral venous access at the time of birth; (c) neonates affected by asphyxia requiring therapeutic hypothermia.
2. UVCs should be in polyurethane.
3. Silver-coated polyurethane UVCs should be considered in selected cases of preterm infants which are expected to require a prolonged dwelling time of the device.
4. Double lumen UVCs should be preferred (a) in infants requiring repeated blood samples; (b) in infants requiring multiple continuous infusions; (c) in infants simultaneously requiring parenteral nutrition (PN) + intravenous drugs not compatible with PN.
5. UVCs should be preferably removed early (within 4–5 days), for the purpose of reducing infective and thrombotic complications.

Quali sono le appropriate indicazioni per l'uso dei CVO?

Special considerations.

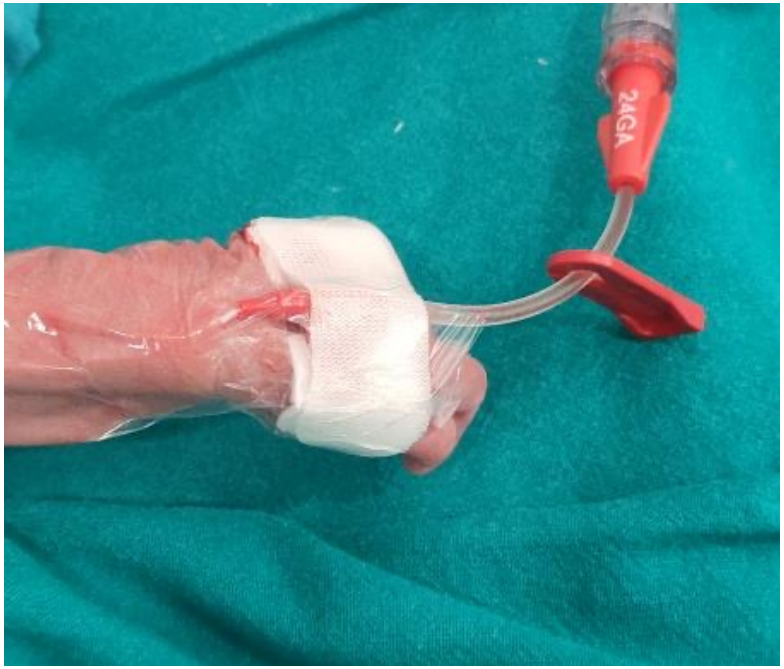
- The use of UVC should also be considered in neonates who need PN at birth but are not included in the categories mentioned above [43, 44], such as preterm infants with severe growth restriction and abnormal antenatal Doppler.
- The UVC should also be inserted in neonates which soon require at birth the infusion of non-peripherally compatible solutions (as for instance IV solutions with pH < 5 or > 9; drugs with osmolarity > 600 mOsm/L; vesicant drugs, drugs potentially associated with endothelial damage) [45–47].

Even though multiple continuous infusions can be administered sometimes through a single lumen, the risk of inadvertent boluses must be considered, especially in preterm neonates receiving inotropic drugs, since blood pressure fluctuations might have long-term neurological consequences [48–51].

Longer dwelling time of UVC might be considered in babies with severe skin disease such as infants with collodion baby syndrome or harlequin ichthyosis.

Risultati - 2

Quali sono le appropriate indicazioni per l'uso delle cannule periferiche corte?



Quali sono le appropriate indicazioni per l'uso delle cannule periferiche corte?

Panel recommendations.

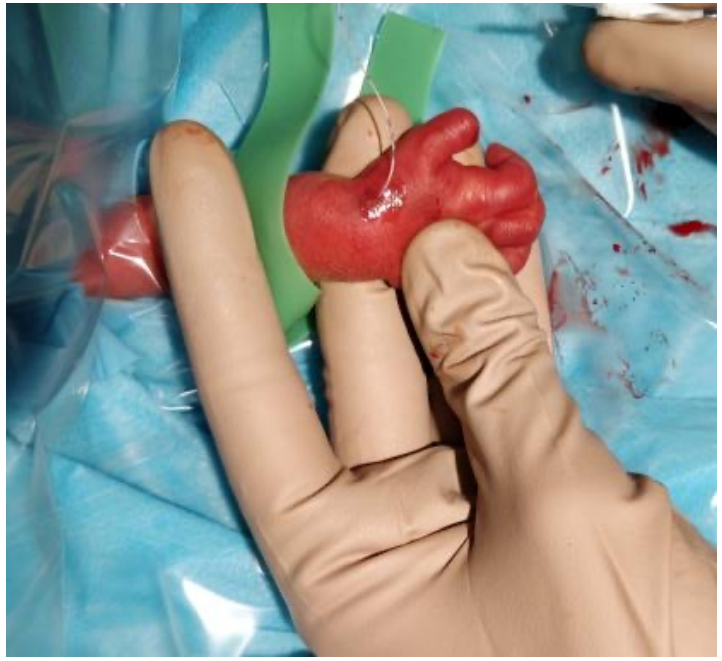
1. Indications for SPCs include (a) stable preterm newborns with less than 7 days of the expected duration of PN; (b) stable newborns with venous access required for less than 7 days. LPCs may be considered when more than 3 days of IV infusions are expected.
2. SPCs should be made of polyurethane; the caliber should be 24G-26G (depending on the size of the vein).

Special considerations.

- In recent years, "integrated" SPCs and LPCs are becoming particularly interesting in adults and children [60], though data about the neonatal population are still scarce. However, considering the short duration of SPCs in NICU [53] (48 h), these devices might offer a theoretical advantage, prolonging the mean dwelling time of peripheral VADs in neonates.

Risultati - 3

Quali sono le appropriate indicazioni per l'uso degli ECC?



Quali sono le appropriate indicazioni per l'uso degli ECC?

Panel recommendations.

1. ECCs are indicated in stable preterm newborns with an expected duration of PN of more than 7 days. If PN is expected to last more than 14 days, a tunneled CICC or FICC should be preferred.
2. ECCs should be in polyurethane; 1-Fr catheters should be preferred in infants below 2 kg, so to reduce the risk of thrombosis.
3. Double lumen ECCs are indicated when an infusion of multiple continuous non-compatible drugs is required if a 2 Fr ECC is esteemed to be appropriate for the diameter of the vein.

Special considerations.

- ECCs coated with rifampicin (antibiotic) and miconazole (antifungal) are now available on the market, though a recent randomized controlled trial proved that the use of such antimicrobial ECCs does not reduce the risk of central-line-associated bloodstream infection [70, 71].

Risultati - 4

Quali sono le appropriate indicazioni per l'uso di CICC e FICC?

Quali sono le appropriate indicazioni per l'uso di CICC e FICC?

Panel recommendations.

1. Indications for ultrasound-guided CICCs or FICCs include the following: (a) newborns (at any gestational age) with hemodynamic instability developed after the first 24 h of life, or even within the first 24 h of life, if UVC insertion is not feasible or if the UVC cannot be placed in a proper position; (b) newborns who need or might need rapid fluid repletion (in emergency and/or before major surgery); (c) newborns with major malformation pathologies requiring surgery (e.g., major exomphalos; esophageal atresia); (d) stable newborns requiring a central line, if ECC cannot be placed in a proper position; (e) newborns requiring repeated blood samplings; (f) newborns requiring multiple transfusions; (g) CICCs or FICCs should also be considered in stable preterm newborns with an expected duration of PN longer than 2 weeks.
2. Ultrasound-guided CICCs and FICCs should be preferably power injectable and made of polyurethane. Calibers between 3 and 4Fr are usually appropriate, depending on the size of the vein being cannulated.
3. Consider the benefit of tunneling all ultrasound-guided CICC/FICC, especially in elective conditions.

Quali sono le appropriate indicazioni per l'uso di CICC e FICC?

Special considerations.

- Even though 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.
- 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.

Quali sono le appropriate indicazioni per l’uso di CICC e FICC?

Quali sono le appropriate indicazioni per l'uso di CICC e FICC?

Original research article

Centrally inserted central catheters in preterm neonates with weight below 1500 g by ultrasound-guided access to the brachio-cephalic vein

Giovanni Barone[1], Mauro Pittiruti[2], Gina Ancora[1], Giovanni Vento[3], Francesca Tota[4] and Vito D'Andrea[3]

Table 4. Differences between epicutaneo-caval catheters (ECCs) and central inserted central catheters (CICCs).

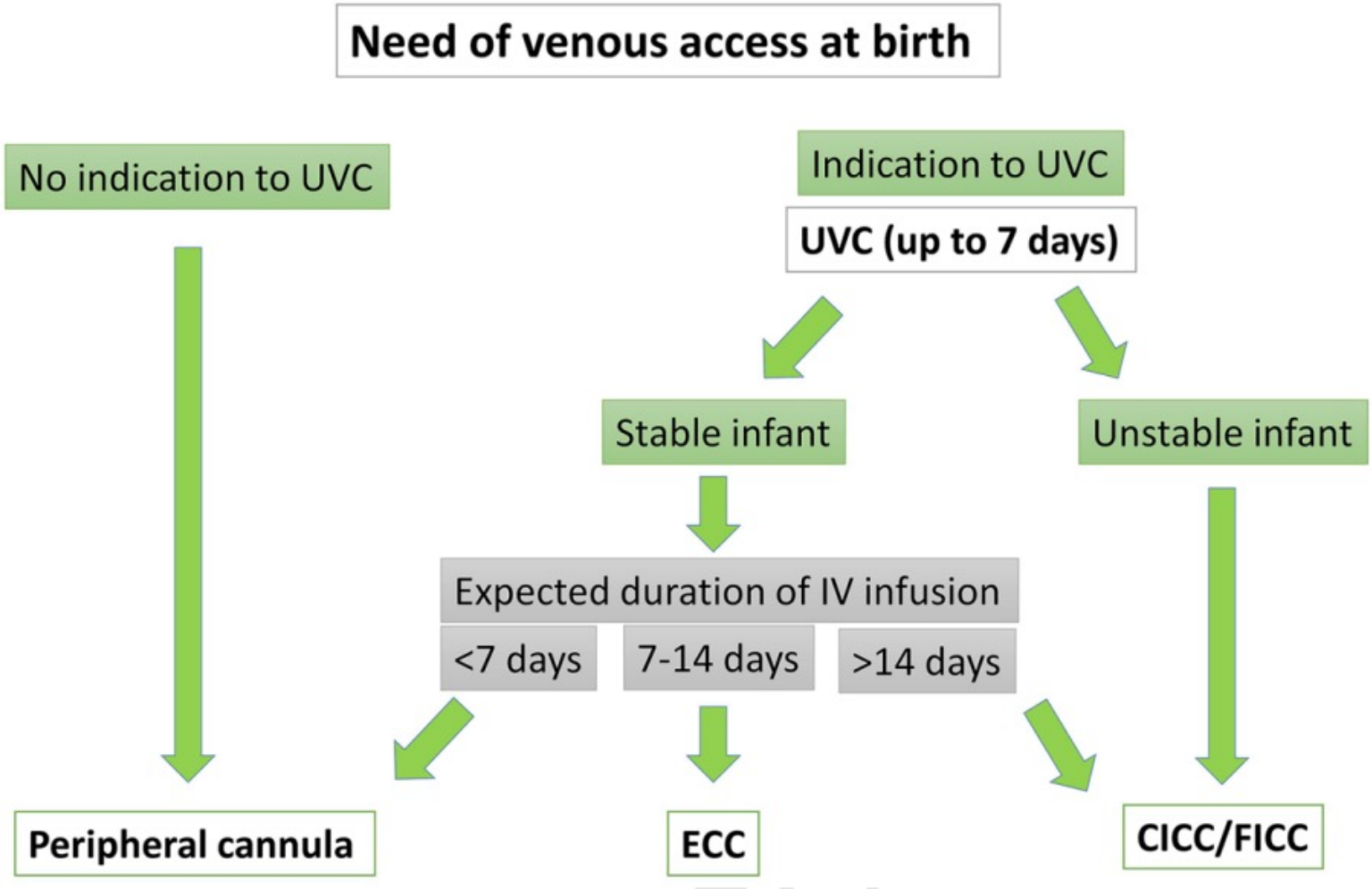
	CICC	ECC
Venipuncture	Deep veins	Superficial veins
Ultrasound guidance	Yes	No
Catheter diameter	3–4 Fr	1–2.7 Fr
Sedation required	Yes	No
Power injectability	Yes	No
Maximal flow rate	60 mL/min	1 mL/min
Infusion of blood products	Yes	No
Monitoring of central venous pressure	Yes	No
Monitoring of SvO_2	Yes	No
Blood sampling	Yes	No
Tunneling	Yes	No
Tip location by intracavitary ECG	Yes	Yes
Limited dwell time	No	Yes
Possibility of CRBSI diagnosis by DTP	Yes	No

SIC-Ped
Safe Insertion of Central access in Pediatric patient

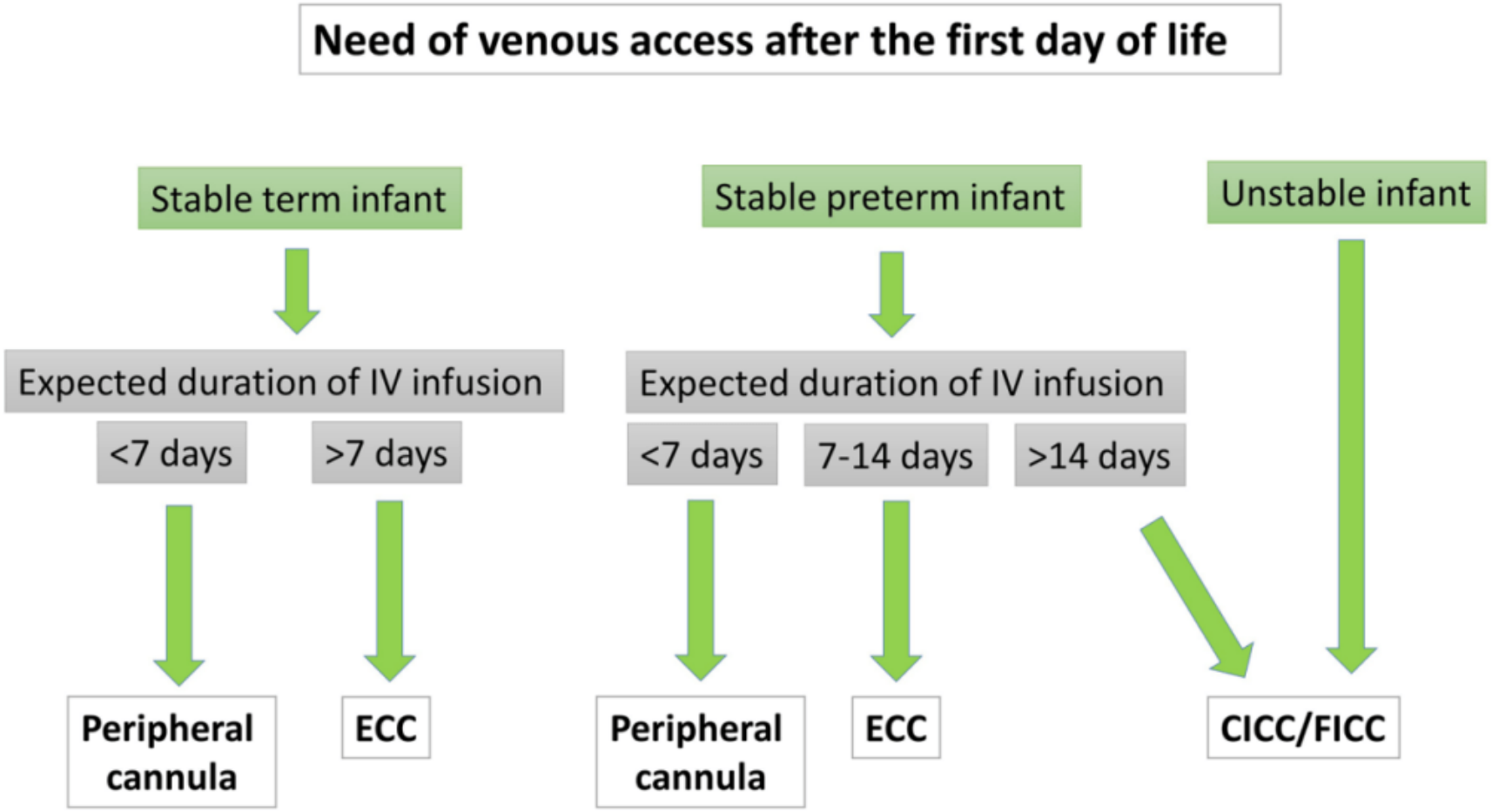
- 345 neonati.
- Nessuna complicanza al momento dell'impianto.
- Rimozione elettiva del dispositivo nel 98% dei casi.
- Incidenza di CRBSI 0.3/1000 giorni catetere.
- Nessun caso di trombosi o migrazione del catetere.
- 4 pubblicazioni scientifiche.

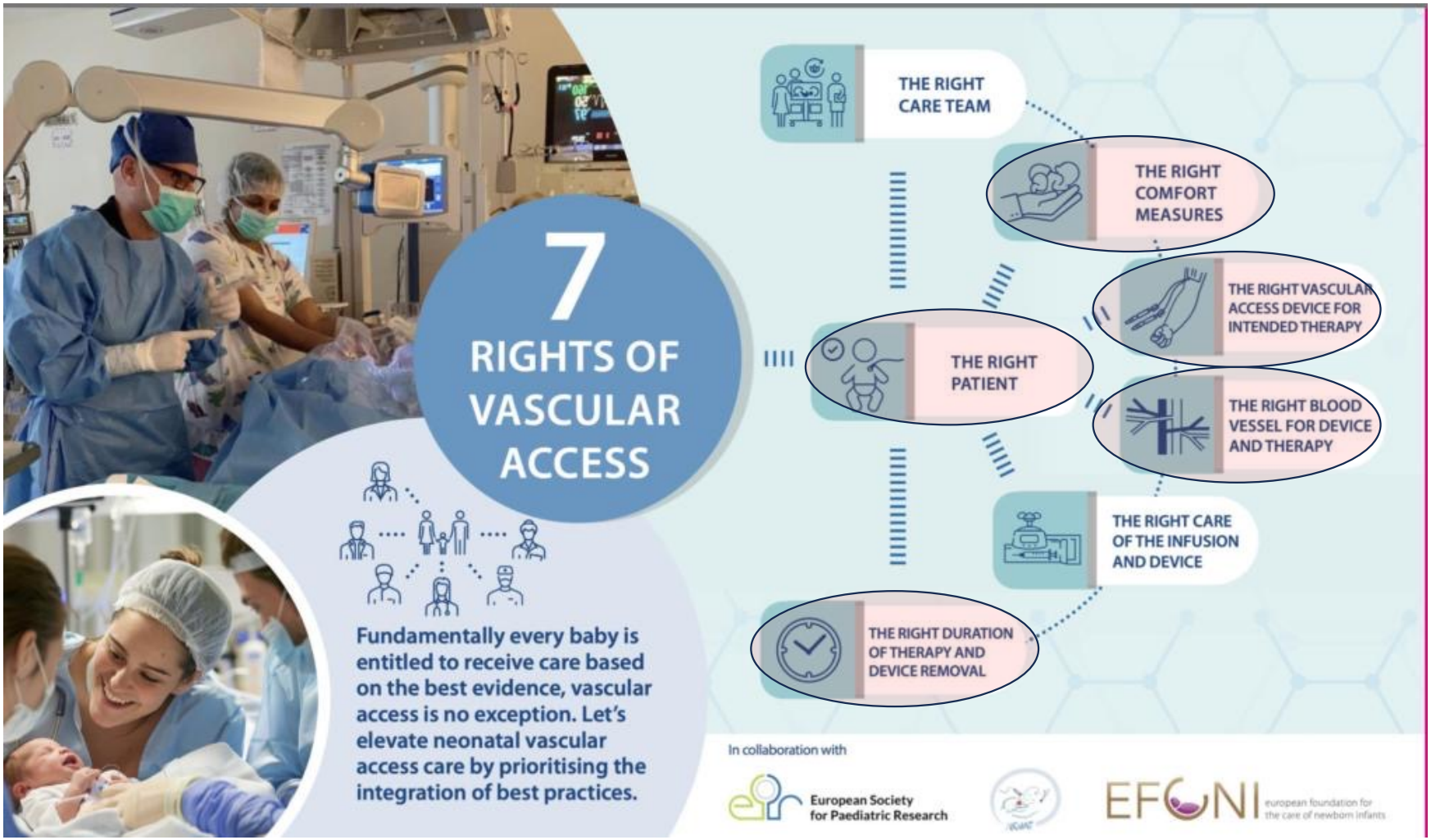
- **Centrally inserted central catheters in preterm neonates with weight below 1500 g by ultrasound-guided access to the brachio-cephalic vein. JVA 2021.** doi: 10.1177/1129729820940174
- **Securement of central venous catheters by subcutaneously anchored suturless devices in neonates. JMFNM 2021.** doi: 10.1080/14767058.2021.1922377
- **The intracavitary ECG method for tip location of ultrasound-guided centrally inserted central catheter in neonates. JVA 2022.** doi: 10.1177/11297298211068302
- **A GAVeCeLT bundle for central venous catheterization in neonates and children: A prospective clinical study on 729 cases. JVA 2022.** https://doi.org/10.1177/11297298221074472

Algoritmo di scelta



Algoritmo di scelta




7
RIGHTS OF VASCULAR ACCESS
THE RIGHT CARE TEAM
THE RIGHT COMFORT MEASURES
THE RIGHT VASCULAR ACCESS DEVICE FOR INTENDED THERAPY
THE RIGHT PATIENT
THE RIGHT BLOOD VESSEL FOR DEVICE AND THERAPY
THE RIGHT CARE OF THE INFUSION AND DEVICE
THE RIGHT DURATION OF THERAPY AND DEVICE REMOVAL
Fundamentally every baby is entitled to receive care based on the best evidence, vascular access is no exception. Let's elevate neonatal vascular access care by prioritising the integration of best practices.
In collaboration with
European Society for Paediatric Research
EFCNI
european foundation for the care of newborn infants

V. Rens

European Journal of Pediatrics
https://doi.org/10.1007/s00431-022-04400-3

ORIGINAL ARTICLE

Ultrasound-guided vascular access in the neonatal intensive care unit: a nationwide survey

Ignacio Oulego-Erroz[1,2,3,4] · Almudena Alonso-Ojembarrena[2,5,6] · Victoria Aldecoa-Bilbao[2,7,8] · María del Carmen Bravo[2,9] · Jon Montero-Gato[2,10] · Rocío Mosqueda-Peña[2,11,12] · Antonio Rodríguez Nuñez[2,13,14,15]

Received: 20 December 2021 /

Table 2 Neonatologist's personal experience using ultrasound-guided percutaneous vascular access according to NICU complexity

	ALL ($n=116$)	HC-NICU ($n=40$)	LC-NICU ($n=76$)	p
Number of USG central lines per year	72 (62.1%)	16 (40%)	56 (7.4%)	<0.001
<5 CICC/FICC per year	44 (37.9%)	24 (60%)	20 (26.3%)	
>5 CICC/FICC per year				
Percentage of CICC/FICC placements in VLBW infants	82 (70.7%)	26 (65%)	56 (73.7%)	0.329
<25%	34 (29.3%)	14 (35%)	20 (26.3%)	
>25%				
Main indication for USG-VA of CICC/FICC	62 (53.4%)	24 (60%)	38 (50%)	0.201
Rescue procedure after exhausted peripheral access	32 (27.6%)	12 (30%)	20 (26.3%)	
Hemodynamic instability	22 (18.9%(	4 (10%)	18 (23.7%)	
Elective insertion (multiple drugs, need for blood draws, high risk surgical patients)				
Preferred USG-CICC/FICC insertion site	38 (32.8%)	10 (25%)	28 (36.7%)	0.418
Internal jugular vein	6 (5.1%)	2 (5%)	4 (5.3%)	
Brachiocephalic/subclavian vein (supraclavicular approach)	72 (62.1%)	28 (70%)	44 (57.9%)	
Femoral vein	0 (0%)	0 (0%)	0 (0%)	
Other				

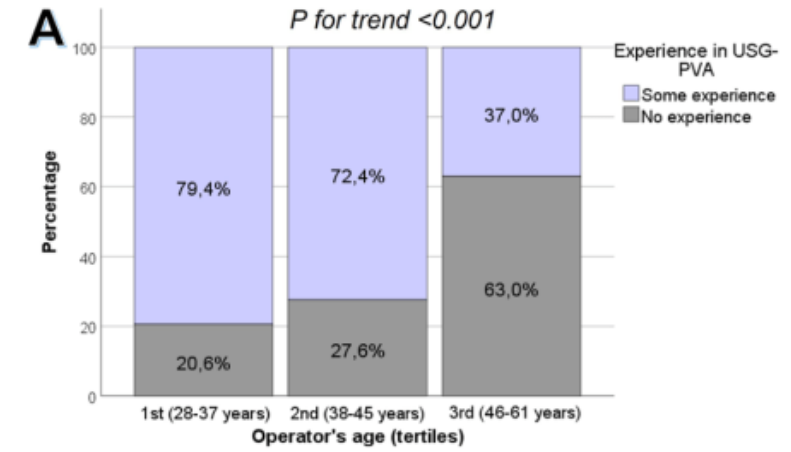


Fig. 2 Relationship between operator's age and experience in ultrasound-guided percutaneous vascular access procedures. **A** Clinical experience in ultrasound-guided percutaneous vascular access (USG-VA) procedures according to operator's age tertiles. *P* for lineal trend

In conclusion, despite most neonatologist perceive USG-VA as very useful in daily practice, currently these techniques are underused. The lack of adequate training is perceived as the most important barrier for implementation of USG-VA in the NICU. Our study highlights the need to develop and implement specific training programs in USG-VA during residency and Neonatology fellowship.

Retrospective evaluation of 599 brachiocephalic vein cannulations in neonates and preterm infants

Christian Breschan[1,*], Gudrun Graf[1], Christoph Arneitz[2], Haro Stettner[3], Stefan Neuwersch[1], Christian Stadik[4], Markus Koestenberger[1], Sandra Holasek[5] and Rudolf Likar[1]

[1]Department of Anaesthesia, Klinikum Klagenfurt, Klagenfurt, Austria, [2]Department of Pediatric Surgery, Klinikum Klagenfurt, Klagenfurt, Austria, [3]Department of Statistics, University of Klagenfurt, Klagenfurt, Austria, [4]Department of Neurorehabilitation, Krankenhaus Hermagor, Klagenfurt, Austria and [5]Institute of Pathophysiology, Medical University of Graz, Graz, Austria

*Corresponding author. E-mail: christian.breschan@kabeg.at

Keywords: brachiocephalic vein; central venous catheter; intravenous cannula; neonates; preterm infants; ultrasound

- Il più grande dataset sul neonato
- Success rate 97.8%

vessel, and cannula. We estimate that about 15 brachiocephalic vein cannulations are needed in neonates to achieve proficiency and about 5 per year to maintain proficiency.

Original research article

JVA The Journal of Vascular Access

The Journal of Vascular Access
1–7

DOI: 10.1177/11297298241278775
journals.sagepub.com/home/jva
Sage

Training for ultrasound-guided implantation of central venous catheters eliminates venolysis in pediatric patients

Paolo Finazzi[1], Carmen Rodriguez Perez[2], Francesco Maria Risso[2] and Alberto Michele Giannini[1]

Implementation of bundles

Fundamental to achieving this goal is the introduction of bundles that describe a set of basic steps to reduce the incidence of complications and improve the quality of vascular access in adults, children, and infants.

Initially, the SIP protocol was introduced in clinical practice,[18] but over the years, the GaVeCelt group studied and developed additional bundles that were gradually implemented in our group, up to the pediatric-specific SIC-Ped.[8,19,20]

The use of ultrasound guidance has made it possible to approach larger, non-collapsible veins with in-plane vision, even in low-weight infants.[21–23] This technique

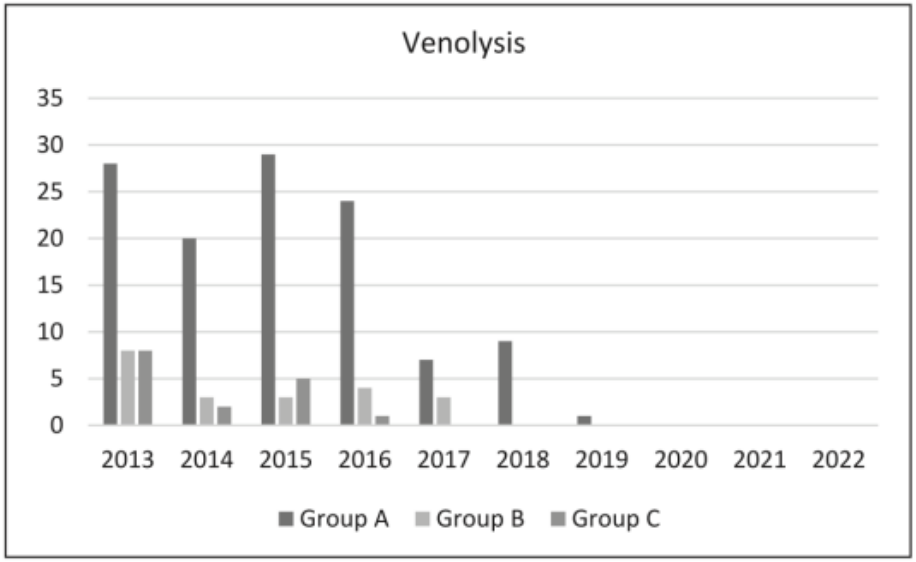


Figure 1. Venolysis into the groups during the years (Group A <1 year of age, Group B 1–5 years of age, Group C >5 years of age).

children

MDPI

Article

Ultrasound-Guided Centrally Inserted Central Catheter (CICC) Placement in Newborns: A Safe Clinical Training Program in a Neonatal Intensive Care Unit

Tommaso Zini [1], Lucia Corso [2], Cinzia Ma
Francesca Miselli [1], Luca Bedetti [1], Eugeni
Licia Lugli [1] and on behalf of the CVC S

Neonatologists	
Median age, years (IQR)	47 (41–54)
Median experience in neonatal care, years (IQR)	21 (11–22)
Newborns	
Median gestational age, weeks (IQR)	36 (26–40)
Median birth weight, g (IQR)	1200 (622–2930)
Median days of life at insertion, days (IQR)	16 (5–33)
US-guided CICC placements	
Number of procedures in the training program, n	41
Successful procedure, n (%)	41 (100)
Successful insertion at first venipuncture, n (%)	33 (80.5)
Procedure-related complications, n (%)	0 (0)

CICCs are of increasing use and importance in the NICUs. Achieving clinical competence in ultrasound-guided CICC insertion in term and preterm infants is of paramount importance. Our clinical training program for neonatologists proved to be safe and effective. Our training program included standardized theoretical teaching and clinical practice,

Conclusioni

Il DAV Expert è:

1. Il primo algoritmo sviluppato con il **METODO DELPHI modificato** incentrato interamente sul neonato.
2. Offre una serie di raccomandazioni sistematiche sulla scelta del dispositivo più appropriato, basate sulla letteratura più recente e cerca di coprire la maggior parte delle condizioni cliniche che si verificano in TIN.
3. Rappresenta uno strumento per facilitare il ragionamento clinico nella situzioni ad alta complessità in cui bisogna considerare PRO e CONTRO di ciascuna scelta.
4. É uno strumento fondamentale per garantire i “diritti” del neonato al corretto accesso vascolare

GAVeCeLT
Gli Accessi Venosi Centrali a Lungo Termine

WoCoVA
World Congress Vascular Access

SIN
Società Italiana di Neonatologia

GAVePed
Gruppo Accessi Venosi Pediatrici

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