Editorial

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

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Abstract

The field of vascular access has witnessed significant advancements in recent years, improving healthcare delivery across various patient populations through the use of diverse intravascular access devices. Despite these innovations, a critical issue remains: the lack of a globally standardized set of descriptors for these devices. This gap impedes clear communication and coordination within the healthcare community. Recognizing the necessity for standardized terminology, the Global Vascular Access Network (GloVANet), in collaboration with the World Congress of Vascular Access (WoCoVA), initiated the NAVIGATE project (**N**omencl**A**ture **V**ia **I**ntegrated **G**lobal **A**dvancements in **T**erminology **E**fficiencies). The aim of the project is to propose a clear and practical nomenclature for current vascular access devices, encompassing both central, peripheral venous, and arterial access devices. A panel of international vascular access experts from several clinical domains was selected by the Scientific Committee of WoCoVA to develop a position statement around vascular access device nomenclature. Following a comprehensive literature review, a consensus was reached using a modified Delphi process. The outcome of this collaborative effort is a WoCoVA/GloVANet position statement, which provides standardized nomenclature for vascular access devices. The adoption of unified terminology brings several benefits, firstly, it ensures clarity, reproducibility, and comparability when reporting in clinical studies, and secondly, reduces ambiguous or imprecise terms in communication between healthcare professionals in clinical practice.

Keywords

Terminology, nomenclature, venous access devices, peripheral venous catheters, central venous catheters, neonates, children, adults

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Introduction

The field of vascular access has witnessed remarkable changes and innovations during the last two decades, revolutionizing healthcare practices across the world, in different patient populations. The increased utilization of intravascular access devices has now evolved to provide more tailored and effective care in many clinical fields. However, a critical gap persists: the absence of a unified and globally standardized set of descriptors for the multitude of devices used in vascular access practice and clinical research. This gap often impedes clear communication and coordination within the global healthcare community. The need for a standardized nomenclature is suggested by the following examples.

First, terms such as "catheters," "devices," and "lines" have been inconsistently applied, leading to confusion and miscommunication; historically, a "catheter" is a specific

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Table 1. Main differences between epicutaneo-cava catheters (ECC) used in neonates and peripherally inserted central catheters (PICC) used in children and adults..

	ECC (n-PICC)	PICC
Patient population		
	Neonates	Children and adults
Design		
Caliber	1–2.7 Fr	3–6 Fr
Power injectability	No	Yes
Technique of insertion		
Vein chosen for cannulation	Any superficial vein of the upper limb, lower limb, or scalp	Veins of the arm (basilica, brachial, cephalic)
Technique of venipuncture	Direct puncture of visible veins	Ultrasound guided venipuncture
Technique of catheter insertion	Catheter through needle, or catheter through cannula	Catheter through introducer (modified Seldinger technique)
Tunneling, if required	No	Yes
Subcutaneous anchorage, if required	No	Yes
Performance		
Expected flow	Low	High
Blood sampling	No	Yes
Blood transfusions	No	Yes
Hemodynamic monitoring	No	Yes
Expected duration	1–2 weeks	Months
Complications		
Risk of lumen occlusion	High	Low
Risk of dislodgment	High	Low
Local thrombophlebitis	Frequent	Very rare

device designed for fluid introduction or withdrawal (as derived from the ancient Greek *kathiénai*, which means "to thrust into" or "to send down" and then first described in Latin during the Middle Age's as *katheter*); a "*line*" is a non-descriptive term that has been enigmatic in often describing various intravascular catheters. Unfortunately, there is a persistent written and spoken use of the inappropriate term "*lines*"; central venous catheters are frequently defined as "central lines," peripherally inserted central catheters "PICC lines," femoral catheters "femoral lines," and arterial catheters "arterial lines." The imprecise use of these terms may create confusion among various professionals, hindering accurate communication, accuracy of reporting, and understanding.

Also, the widespread use of new devices, such as the long peripheral venous catheters—also known as "*short* or *mini-midlines*," "*extended dwell catheters*," or just "*midlines*"—has introduced ambiguity into the terminology landscape, with several global regions differing in their agreeance with the use of these terms.[1–9] At the same time, the availability of these new peripheral venous devices has made ambiguous the term "PIVC," which originally described only short peripheral venous cannulas, but actually means "Peripherally Intra-Venous Catheters," which incorporates all peripheral venous access devices, including also long peripheral catheters and midline catheters.[5,10–14]

There is also ambiguity in the world of pediatrics/neonatology, where the term "PICC" (peripherally inserted central catheter) is used both for the ECC (epicutaneo-cava catheter) in neonates and for the ultrasound-guided PICCs in children (two devices very different in terms of indications, the technique of insertion, performance, duration, and risk of complications, as shown in Table 1).[15–17]

Another example pertains to the term "tunneled catheter": in North America, clinicians commonly interpret this term as a synonym of "tunneled-cuffed CICCs" (centrally inserted central catheters).[18–20] However, globally, the utilization of non-cuffed tunneled central catheters (either PICCs, CICCs, or FICCs) is becoming increasingly prevalent.[11,14,17,21–23]

Furthermore, there are countless published papers still using the abbreviation "CVC" (central venous catheter) when referring to CICCs; often, the generic term "CVC" includes not only CICCs and FICCs but also short (acute) and long-term (tunneled) hemodialysis catheters, but excludes PICCs and ports.[10,24–27]

Last, the persistent use of industry brand names (e.g. Hickman™, Broviac™, Accucath™, Port-a-cath™)—rather than more accurate device nomenclature—adds ambiguity and imprecision to communication inside the healthcare community.

In acknowledgment of the intricate challenges surrounding vascular access terminology, the Global Vascular Access Network (GloVANet) and the Scientific Committee of the World Congress on Vascular Access (WoCoVA) have undertaken a specific project, nicknamed "NAVIGATE" (**N**omencl**A**ture **V**ia **I**ntegrated **G**lobal **A**dvancements in

Terminology **E**fficiencies), with the primary goal of releasing a position statement containing a structured and coherent terminology for naming the main vascular access devices mostly used in clinical practice.

Methods

The project was initially proposed by two experts of WoCoVA (MVR and RVL), and subsequently approved by the main coordinators of WoCoVA/GloVANet: the past-president (TVB), the president-elect (TS), and the chairman of the WoCoVA Scientific Committee (MP). A panel of experts was established so to include not only the five WoCoVA clinicians named above but also three WoCoVA experts in vascular access with specific competence in neonates (GB), children (AC), and adults (FP).

The subsequent phase involved a comprehensive literature review to assess existing terminologies, classifications, and potential ambiguity in the naming of intravascular access devices. The already published terminology proposed by WoCoVA and by GAVeCeLT, along with other relevant previous consensus documents, served as a starting point.

Following the literature review, a Delphi procedure involving the selected panelists was used as the structure of the consensus. Multiple rounds were conducted to methodically gather and distill expert opinions, fostering consensus on issues pertinent to naming vascular access devices. The first round explored some key aspects of the classification of vascular access devices, gathering individual perspectives and insights from the panelists. Based on the results of this first consultation, a second round refined queries and summaries of collective responses, with participants engaging in structured feedback to converge toward shared perspectives while acknowledging areas of agreement and divergence. The culmination of the Delphi process occurred as a live confrontation during the 8th WoCoVA conference (Prague, April 17–19th, 2024), where experts convened face-to-face to discuss, refine, and harmonize their perspectives, enriching the consensus-building process through dynamic interaction.

A subsequent round led to the drafting of a manuscript containing comprehensive nomenclature tables, integrating inputs from all previous Delphi rounds and direct email conversations among the panelists, to establish a unified terminology reflecting collective expertise. The final manuscript was approved by the panelists and then shared with the Scientific Committee of WoCoVA.

Results

As a first step, the panel decided to address separately intravenous access devices and arterial access devices.

The panel also decided to differentiate the terminology for venous access devices used in neonates from the terminology used in children and adults. This was considered appropriate, since the newborns are characterized by two central venous access devices which cannot be taken into consideration in other populations, that is, umbilical venous catheters and epicutaneo-cava catheters. Also, the standard classification of peripheral venous access devices in children and adults cannot be extended to neonates.

Regarding venous access devices (VADs), the panel approved the previous definitions of peripheral versus central venous access devices proposed by WoCoVA and GAVeCeLT, which consider "central" venous access devices (CVADs) all venous catheters with the tip located in the superior vena cava, right atrium or inferior vena cava.[5,11] Though the panel acknowledged that each device may have a specific ideal location of the tip,[14] it was considered wise to draw a clear line between "central" and "peripheral" venous devices. It is noteworthy that—adopting such a definition—catheters with the tip in the pulmonary arteries (such as Swan Ganz catheters) cannot be considered "central." Also, 20 cm catheters inserted into the common femoral vein in emergency cannot be considered "central" by default, at least in adult patients, since the tip is not likely to reach the inferior vena cava.[28] Also, catheters intended to be "central," but with an inappropriate position of the tip (i.e. outside the right atrium and the cava veins) because of primary or secondary malposition should be regarded as "peripheral."[14]

For PVADs and CVADs in children and adults, the panel has decided to discuss only central venous catheters inserted by percutaneous venipuncture, considering that access by venous cutdown is an obsolete practice,[17,22,23] unacceptable in 2024.

In the area of peripheral venous access devices (PVADs) for children and adults, the panel has adopted the terminology and the abbreviations proposed by a WoCoVA document published a few years ago, the European Recommendations for the Proper Indication and Use of Peripheral venous access devices (the so-called "ERPIUP" consensus).[5] The WoCoVA classification proposed in the ERPIUP is precise and unambiguous since it classifies the PVADs based on their length: short peripheral cannulas (SPC) if <6 cm, long peripheral catheters (LPC) if 6–15 cm (a.k.a. "mini-midlines" or "short midlines"), and midline catheters (MC) if >15 cm (a.k.a. "midclavicular"). A similar classification has been proposed by Australian authors.[6–8] This updated nomenclature helps to obviate the uncertainties and ambiguities of the terms used in clinical practice and in many published studies; in particular, the abbreviation "PIVC" is often used as a synonym of SPC, while PIVC stands for "peripheral intravenous cannula," that is, a synonym for PVAD.[14,29] Also, the term "midline" has been the source of persistent confusion, since in North America it refers to any peripheral VAD longer than 6 cm, thus pooling together two devices that are very different in terms of indication, site of insertion, the technique of insertion, location of the tip, duration, performance, risk of

Table 2. Main differences between long peripheral catheters (LPC) and midline catheters (MC).

	LPC	MC
Design		
Length	6–15 cm	>15 cm
Technique of insertion		
Veins chosen for cannulation	Superficial and deep veins of forearm and arm	Deep veins of the arm
Technique of venipuncture	Direct venipuncture, or ultrasound guided venipuncture	Ultrasound guided venipuncture
Technique of catheter insertion	Catheter over needle, or catheter over guidewire (simple Seldinger technique)	Catheter through introducer (modified Seldinger technique)
Tunneling, if required	No	Yes
Position of the tip	Veins of the upper limb	Axillary vein (thoracic tract) or subclavian vein
Subcutaneous anchorage, if required	No	Yes
Performance		
Blood sampling	No	Yes
Expected duration	1–3 weeks	Months
Complications		
Risk of dislodgment	High	Low
Local thrombophlebitis	Frequent	Very rare
Risk of malfunction	High	Low

complications, and cost (see Table 2): the long peripheral catheter (LPC) and the midline catheter (MC). In the field of PVADs, most systematic/narrative reviews or meta-analyses are biased by these ambiguities of terminology.[1–3,6–8,14]

For all CVADs in children and adults, the panel has decided to adopt the classification proposed by GAVeCeLT[11,25] and then adopted by WoCoVA,[5] which differentiates three types of devices: CICCs (central venous catheters inserted by ultrasound-guided cannulation of veins of the supraclavicular/infraclavicular area: internal jugular vein, brachiocephalic vein, subclavian vein, the deep tract of the external jugular vein, the thoracic tract of the cephalic vein, the thoracic tract of the axillary vein), PICCs (central venous catheters inserted by ultrasound-guided cannulation of veins of the arm: basilic vein, brachial veins, brachial tract of the axillary vein, cephalic vein), and FICCs (central venous catheters inserted by ultrasound-guided cannulation of veins of the lower limb: common femoral vein, superficial femoral vein, saphenous vein).[28] The use of the abbreviation "CVC" (i.e. central venous catheter) as a synonym for CICC should be abandoned. The inappropriate and inconsistent differentiation between "CVC" and "PICC" is still ubiquitous in many clinical studies and in many official documents. It is obviously an error since the term "CVC" (synonym of CVAD) includes also peripherally inserted central venous catheters (PICC).

When a central venous catheter is connected with a reservoir to be implanted subcutaneously, the resulting device is a port, or—more precisely—a Totally Implanted (or Implantable) Venous Access Device, that is, a TIVAD.[11,30–32] The most precise term would probably be "TICVAD" (Totally Implanted Central Venous Access Device), but the term TIVAD is easier and quite widespread in the medical literature; also, totally implanted "peripheral" VADs do not exist, so there is no margin of ambiguity. The panel strongly recommends avoiding the term "Port-a-cath™," which replaces the appropriate name of the device with the brand name of a specific product marketed by a specific industry manufacturer.

Considering that ports can be implanted using different venous accesses and different locations of the pocket for the reservoir, the panel suggests differentiating three types of ports: (a) ports inserted by ultrasound-guided access to veins of the arm, with the reservoir usually implanted above the biceps muscle (brachial port, or arm port, or PICC-port); (b) port inserted by ultrasound-guided access to veins of the supra/infraclavicular area, with the reservoir usually implanted above the major pectoral muscle (chest port, or CICC-port); interestingly, recent clinical studies report the option of implanting the reservoir of the CICC-port over the ipsilateral biceps muscle after appropriate tunneling (this has been called a "chest-to-arm" port)[33]; (c) ports inserted by ultrasound-guided access to the common or superficial femoral vein, with the reservoir implanted either at mid-thigh or on the abdomen (femoral port, or FICC-port).[34]

Another important issue in terminology is to define whether the central venous catheter is tunneled or not. Tunneling is a strategy that was once limited to cuffed catheters since the only possibility of persistent stabilization of a CVAD was considered to be the cuff. In the last decade, many clinical studies have reported the technique of tunneling non-cuffed catheters, that can be secured by sutureless devices, including subcutaneous anchorage, which can be as effective as the cuff in terms of

Table 3. Terminology of venous access devices in the adult and pediatric population.

PVAD—peripheral venous access devices	
SPC	Short peripheral catheter - catheters with a length of <6 cm. - usually inserted in the forearm
LPC	Long peripheral catheter (a.k.a. mini-midline or short midline) - catheters with a length from 6 to 15 cm - inserted in the forearm or arm - tip located in the veins of the forearm or upper arm
MC	Midline catheter (a.k.a. midclavicular catheter) - catheters longer than 15 cm - inserted in deep veins of the upper arm - tip located in the axillary vein or subclavian vein
CVAD—central venous access devices	
PICC	Peripherally inserted central catheters inserted by ultrasound-guided venipuncture of deep veins of the arm (basilic vein, brachial veins, brachial tract of the axillary vein) or of the cephalic vein at the arm.
CICC	Centrally inserted central catheter inserted by ultrasound-guided venipuncture of deep veins of the supra-clavicular area (internal jugular vein, brachiocephalic vein, subclavian vein, deep tract of the external jugular vein) or of the infra-clavicular area (thoracic tract of the cephalic vein, thoracic tract of the axillary vein)
FICC	Femorally inserted central catheter inserted by ultrasound-guided venipuncture of veins of the lower limb (common femoral vein, superficial femoral vein, saphenous vein)
TIVAD	Totally implantable venous access device (or port) - Chest ports, a.k.a. CICC ports - Femoral ports, a.k.a. FICC port - Brachial ports, a.k.a. PICC-ports, a.k.a. arm ports
Tunneled CVAD	
Tc	- Tunneled, and cuffed: Tc-CICC, Tc-PICC, Tc-FICC
Tnc	- Tunneled, but non-cuffed: Tnc-CICC, Tnc-PICC, Tnc-FICC

securement.[17,22,23] Also, nowadays tunneling is not limited to CICCs, since clinical studies have shown the advantages of tunneling also PICCs and FICCs. Therefore, the panel suggests avoiding a generic term for tunneled CVAD but using prefixes that specify if a CVAD is tunneled cuffed (Tc) or tunneled non-cuffed (Tnc).

In neonates, PVADs have been classified as SPC or LPC depending on the length of the catheter, but with a different cut-off (2 cm) if compared to children and adults.[17,35]

Regarding CVADs in neonates, the panel has ignored the catheter inserted by venous cutdown (an antiquate and invasive technique that is discouraged by all current guidelines),[22,23,36–39] and has included catheters inserted by ultrasound-guided cannulation of the supra/infraclavicular veins (CICC: usually, via cannulation of the brachio-cephalic vein) and of the common femoral vein (FICC).[15,17] Still, the two main CVADs used in neonates are the umbilical vein catheter (UVC) and the epicutaneo-cava catheter (ECC). The latter has been causing persistent confusion in the literature, since its synonym, the term "PICC," commonly used by neonatologists, is technically correct but it overlaps with the "PICC" used in children, a completely different device.[16] For example, a literature search about "PICC" in "infants" would cumulate—without differentiation—clinical studies on neonatal ECCs and clinical studies on ultrasound-guided PICCs in children. The suggestion of the panel is to avoid ambiguity in clinical studies using consistently the term "ECC" or, as an alternative option, the term "neonatal PICC (n-PICC)."

Tables 3 and 4 and Figure 1 summarize the classification of VADs and the abbreviations proposed by the panel.

With all venous access devices, a precise definition of the type of device cannot be limited to the generic terms and abbreviations indicated in Tables 1 and 2. A complete definition of the device should include other attributions:

- the caliber of the VAD, using either the external diameter in French (3 Fr = 1 mm) or the internal area of the lumen (Gauge);
- the number of lumens;
- the actual length of the catheter (intravascular and extravascular tract);
- the material of the catheter: most PVADs are made of polyurethane (PUR), polytetrafluorethylene (PTFE), or poly-ether-bloc-amide (PEBA); CVADs are made of PUR or silicone;
- the material and size of the reservoir, in the case of TIVADs;
- the power-injectability of the VAD;

Table 4. Terminology of venous access devices in the neonatal population.

PVAD—peripheral venous access devices	
n-SPC	Neonatal short peripheral catheter - catheters with a standard length of <2 cm
n-LPC	Neonatal long peripheral catheter (a.k.a. mini-midline or short midline) - catheters with a length from 2 to 6 cm - tip located in the veins of the arm or leg
CVAD—central venous access devices	
UVC	Umbilical venous catheter - tip located at the junction between IVC and RA
ECC/n-PICC	Epicutaneo-cava catheter or neonatal peripherally inserted central catheter - for ECC/n-PICC coming through the SVC, the tip may be located (a) in the lower third of the SVC, (b) at the junction between the SVC and RA, (c) in the upper third of the RA - for ECC/n-PICC coming through the IVC, the tip may be located (a) in the subdiaphragmatic IVC (below the hepatic vein but above the renal vein), or (b) at the junction between IVC and RA.
CICC	Centrally inserted central catheter - inserted by ultrasound-guided venipuncture of deep veins of the supra-clavicular area (mainly the internal jugular vein or the brachiocephalic vein) - tip is located (a) at the junction between SVC and RA or (c) in the upper third of the RA
FICC	Femorally inserted central catheter; - ultrasound-guided venipuncture of deep veins of the groin (common femoral vein) - tip may be located (a) in the subdiaphragmatic IVC (below the hepatic vein but above the renal veins), or (b) at the junction between IVC and RA
Tunneling in CICC, FICC	
Tc	- Tunneled, cuffed
Tnc	- Tunneled, non-cuffed

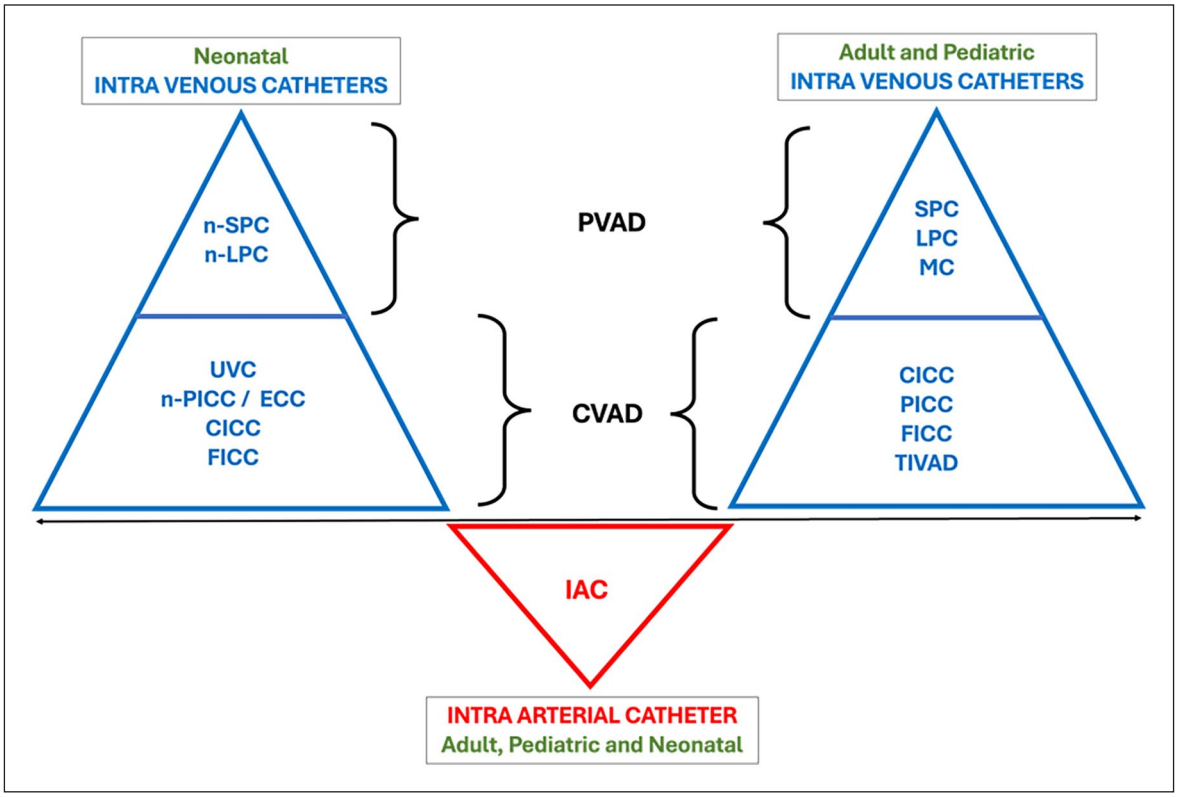

Figure 1. Nomenclature of venous and arterial devices in neonatal, pediatric, and adult populations.

Table 5. Terminology of arterial access devices in a neonatal, pediatric, and adult population.

Arterial access devices	
IAC	Intra-arterial catheter - label the catheter as per artery that has been cannulated (e.g. femoral artery, radial artery, umbilical artery, dorsalis pedis artery, posterior tibial artery, ulnar artery)

- the presence/absence of antimicrobial or antithrombotic activity;
- other structural characteristics that make the VAD appropriate for very specific aims (dialysis, ECMO, etc.).[26,27,39,40]

As regards intra-arterial catheters (IAC), the panel has decided to consider separately the catheters with the tip located in the pulmonary arteries (pulmonary artery catheters = PAC). Also, the panel has suggested labeling the IAC according to the artery that has been cannulated (e.g. femoral artery, radial artery, umbilical artery; Table 5, Figure 1).

As in the case of the VAD, this rapid classification of arterial catheters cannot be exhaustive. A complete definition of the type of IAC must include other attributions:

- the caliber of the VAD, using either the external diameter in French (3 Fr = 1 mm) or the internal area of the lumen (Gauge);
- the actual length of the catheter and/or the position of the tip;
- the material of the catheter: most IACs are made of polyurethane (PUR), polyethylene (PE), or polyether-bloc-amide (PEBA).

Conclusions

Standardizing nomenclature is crucial for accurately interpreting clinical studies and providing clear, unambiguous recommendations in clinical practice. Recognizing the complexities and variations inherent in different terminologies and abbreviations across diverse medical fields, including but not limited to vascular access, GloVANet/WoCoVA felt a collective responsibility to release this position statement. These efforts aim to unify procedures and practices across different countries, enhancing global collaboration and patient care.

To align with the overarching vision of GloVANet/WoCoVA, which seeks to promote collaboration and standardization in vascular access across diverse global healthcare environments, the optimization of nomenclature and abbreviations is crucial. The NAVIGATE Statement, by advocating for a universally accepted terminology, addresses the pressing issue of inconsistent language within the field. This effort not only mitigates the challenges posed by varying terminologies but also establishes a foundation for harmonized practices that emphasize clarity, consistency, and inclusivity in vascular access management worldwide.

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References

1. Glazner J, Steinfort K, Hu YJ, et al. Short midline catheters: high success rates for antibiotic therapy in children with cystic fibrosis. *J Vasc Access* 2023; 24(3): 385–390.
2. Kelly L. The varying terminology surrounding Midline Catheters, https://campusvygon.com/the-varying-terminology-surrounding-midline-catheters (posted in 2022 – accessed 29 February 2024).
3. Meyer BM. Making the most of midlines: a retrospective review of outcomes. *J Infus Nurs* 2020; 43(6): 344–350.
4. Nickel B. Does the midline peripheral intravenous catheter have a place in critical care? *Crit Care Nurse* 2021; 41(6): e1–e21.
5. Pittiruti M, Van Boxtel T, Scoppettuolo G, et al. European recommendations on the proper indication and use of peripheral venous access devices (the ERPIUP consensus): a WoCoVA project. *J Vasc Access* 2023; 24(1): 165–182.
6. Qin KR, Ensor N, Barnes R, et al. Long peripheral catheters for intravenous access in adults and children: a systematic review of the literature. *J Vasc Access* 2021; 22(5): 767–777.
7. Qin KR, Nataraja RM and Pacilli M. Long peripheral catheters: is it time to address the confusion? *J Vasc Access* 2019; 20(5): 457–460.

8. Qin KR, Pittiruti M, Nataraja RM, et al. Long peripheral catheters and midline catheters: insights from a survey of vascular access specialists. *J Vasc Access* 2021; 22(6): 905–910.
9. Thomsen SL, Boa R, Vinter-Jensen L, et al. Safety and efficacy of midline vs peripherally inserted central catheters among adults receiving IV therapy: a randomized clinical trial. *JAMA Netw Open* 2024; 7(2): e2355716.
10. Pittiruti M and Pinelli F. GAVeCeLT Working Group for Vascular Access in COVID-19. Recommendations for the use of vascular access in the COVID-19 patients: an Italian perspective. *Crit Care* 2020; 24(1): 269.
11. Pittiruti M. The VAD Expert app by GAVeCeLT, http://vadexpert.gavecelt.it/?q=node/104 (2018, accessed April 2024).
12. Mason MF, Wallis M, Lord B, et al. Prehospital use of peripheral intravenous catheters and intraosseous devices: an integrative literature review of current practices and issues. *Australas Emerg Care* 2020; 23(3): 196–202.
13. Santos-Costa P, Paiva-Santos F, Sousa LB, et al. Nursing practices and sensitive outcomes related to peripheral intravenous catheterization in Portugal: a scoping review. *J Infus Nurs* 2023; 46(3): 162–176.
14. Nickel B, Gorski L, Kleidon T, et al. Infusion therapy standards of practice, 9th edition. *J Infus Nurs* 2024; 47(1S Suppl 1): S1–S285.
15. Barone G, D'Andrea V, Ancora G, et al. The neonatal DAV-expert algorithm: a GAVeCeLT/GAVePed consensus for the choice of the most appropriate venous access in newborns. *Eur J Pediatr* 2023; 182(8): 3385–3395.
16. Barone G and Pittiruti M. Epicutaneo-caval catheters in neonates: new insights and new suggestions from the recent literature. *J Vasc Access* 2020; 21(6): 805–809.
17. Biasucci DG, Disma NM and Pittiruti M (eds). *Vascular access in neonates and children*. Cham: Springer International Publishing, 2022.
18. Baskin KM, Durack JC, Abu-Elmagd K, et al. Chronic central venous access: from research consensus panel to national multistakeholder initiative. *J Vasc Interv Radiol* 2018; 29(4): 461–469.
19. Baskin KM, Mermel LA, Saad TF, et al. Venous Access: National Guideline and Registry Development (VANGUARD) Initiative Affected Persons Advisory Panel. Evidence-based strategies and recommendations for preservation of central venous access in children. *JPEN J Parenter Enteral Nutr* 2019; 43(5): 591–614.
20. Johansen M, Classen V and Muchantef K. Long-term IV access in paediatrics - why, what, where, who and how. *Acta Anaesthesiol Scand* 2021; 65(3): 282–291.
21. Pittiruti M, Crocoli A, Zanaboni C, et al. The pediatric DAV-expert algorithm: a GAVeCeLT/GAVePed consensus for the choice of the most appropriate venous access device in children. *J Vasc Access*. Epub ahead of print 10 June 2024. DOI: 10.1177/11297298241256999.
22. Cellini M, Bergadano A, Crocoli A, et al. Guidelines of the Italian Association of Pediatric Hematology and Oncology for the management of the central venous access devices in pediatric patients with onco-hematological disease. *J Vasc Access* 2022; 23(1): 3–17.
23. Crocoli A, Martucci C, Persano G, et al. Vascular access in pediatric oncology and hematology: state of the art. *Children (Basel)* 2022; 9(1): 70.
24. Iacobone E, Brescia F, Capozzoli G, et al. Terminology for vascular access devices. *J Vasc Surg* 2021; 74(1): 344–345.
25. Pittiruti M and Scoppettuolo G. *The GAVeCeLT manual of PICC and midline*. 2nd ed. Milano: EDRA, 2022.
26. Nalesso F and Garzotto F. Nomenclature for renal replacement therapies in chronic patients. *Nephrol Dial Transplant* 2020; 35(6): 933–936.
27. Neri M, Villa G, Garzotto F, et al. Nomenclature Standardization Initiative (NSI) alliance. Nomenclature for renal replacement therapy in acute kidney injury: basic principles. *Crit Care* 2016; 20(1): 318.
28. Annetta MG, Elli S, Marche B, et al. Femoral venous access: state of the art and future perspectives. *J Vasc Access*. Epub ahead of print 13 November 2023. DOI: 10.1177/11297298231209253.
29. Bertoglio S, van Boxtel T, Goossens GA, et al. Improving outcomes of short peripheral vascular access in oncology and chemotherapy administration. *J Vasc Access* 2017; 18: 89–96.
30. Gallieni M, Pittiruti M and Biffi R. Vascular access in oncology patients. *CA Cancer J Clin* 2008; 58: 323–346.
31. Schiffer CA, Mangu PB, Wade JC, et al. Central venous catheter care for the patient with cancer: American Society of Clinical Oncology clinical practice guideline. *J Oncol Pract* 2013; 31: 1357–1370.
32. Sousa B, Furlanetto J, Hutka M, et al. Central venous access in oncology: ESMO clinical practice guidelines. *Ann Oncol* 2015; 26: v152–v168.
33. Annetta MG, Ostroff M, Marche B, et al. Chest-to-arm tunneling: a novel technique for medium/long term venous access devices. *J Vasc Access* 2023; 24(1): 92–98.
34. Annetta MG, Marche B, Ortiz Miluy G, et al. Totally implanted central venous access devices inserted by the femoral route: a narrative review and the proposal of a novel approach, the FICC-port. *J Vasc Access*. Epub ahead of print 6 May 2024. DOI: 10.1177/11297298241236816.
35. Romitti MG, Perez CR, Pezzotti E, et al. Long peripheral catheters in neonates: filling the gap between short peripheral catheters and epicutaneous-caval catheters? *J Vasc Access* 2023; 24(5): 920–925.
36. Breschan C and Pittiruti M. Ultrasound guided venous access in neonates. In: Biasucci DG, Disma NM and Pittiruti M (eds) *Vascular access in neonates and children*. Cham: Springer, 2022, pp.189–208.
37. British Association of Perinatal Medicine. Use of central venous catheters in neonates - a BAPM framework for practice, https://www.bapm.org/resources/10-use-of-central-venous-catheters-in-neonates-revised-2018 (2018, accessed 29 February 2024).
38. Spencer TR, Pittiruti M, Miluy GO, et al. Letter regarding: open versus ultrasound guided tunneled central venous access in children: a randomized controlled study. *J Surg Res* 2021; 267: 712–714.
39. Ostermann M, Ankawi G, Cantaluppi V, et al. Nomenclature Standardization Faculty. Nomenclature of extracorporeal blood purification therapies for acute indications: the nomenclature standardization conference. Blood Purif 2024; 53(5): 358–372.
40. Reis T, Ronco C, Soranno DE, et al. Nomenclature Standardization Faculty. Standardization of nomenclature for the mechanisms and materials utilized for extracorporeal blood purification. *Blood Purif* 2024; 53(5): 329–342.