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SPECIAL ARTICLE



Vascular access management plan (VAMP): neonatal European vascular access team—ESPR Recommendation 1

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IMPACT:

- Proper use of the Vascular Access Management Plan (VAMP) ensures choosing the right vascular access device from the start of therapy.
- The VAMP method offers a structured and patient-centered approach to vascular access in neonates.
- Implementation of the VAMP method ensures a more uniform practice regarding vascular access in neonates.
- Implementation of the VAMP method has the potential to greatly decrease the number of vascular access related complications in neonates.

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INTRODUCTION

This article is part of a special article series of ten recommendations for neonatal vascular access. The recommendations were developed using a structured consensus methodology, integrating systematic appraisal of the literature with iterative rounds of multidisciplinary expert deliberation, to ensure both evidence-informed content and broad international applicability.

Effective vascular access management in neonates is crucial for optimal patient outcomes¹. However, variability in vascular access decision-making, device selection strategies, insertion techniques, securement practices, and monitoring protocols persists across institutions and countries^{1–4}. Such inconsistencies have been associated with higher rates of multiple insertion attempts, device failure, catheter-related complications, and delays in therapy, potentially impacting short- and long-term outcomes in vulnerable neonates^{1,4–7}. International standards, structured decision algorithms, insertion bundles, and infection-prevention guidelines for many aspects of neonatal vascular access exist^{2–4,8–21}. However, despite this availability implementation remains inconsistent, reflecting a gap between published evidence and routine clinical practice^{1–3,6,13,14}. To address these issues, we advocate that a comprehensive Vascular Access Management Plan (VAMP) is used.

PLANNING FOR VASCULAR ACCESS

Essentially a VAMP can be defined as setting out a prospective and proactive multiprofessional team based strategy for establishing,

using, and managing vascular access within agreed parameters for a particular patient to meet current and anticipated therapy needs¹⁵. Importantly in neonatal practice settings the definition of multiprofessional team is extended to include consideration of parents' opinions, and the scope for their involvement in care⁶.

When integrated into routine neonatal care this multiprofessional strategy provides for a patient-centered and proactive approach, guiding assessment, device selection, insertion, monitoring, and timely removal. Observations and expert commentary suggest that such approaches, as used in other areas of patient care can support greater patient empowerment, support attempts to preserve blood vessels, and contribute to safer, more effective vascular access with improved clinical outcomes⁶.

USING A PATIENT RIGHTS INFORMED APPROACH TO INFORM VASCULAR ACCESS

The Neonatal European Vascular Access Team (NEVAT) and the Pediatric and Neonatal Vascular Access Special Interest Group (SIG) of the European Society for Paediatric Research (ESPR) together developed the “7-Rights Framework for Neonatal Vascular Access”⁶. This conceptual framework integrates vascular access and patient rights as fundamental components for achieving better patient outcomes. The 7-Rights framework seek to reduce errors, promote teamworking, minimize pain, promote comfort, optimize decision making and consistency in practice whilst simultaneously promoting greater parental involvement,

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Table 1. Essential components of the 7-rights framework for neonatal vascular access.

Right	Components
Right patient	Ensuring patient safety through accurate identification, ethical decision-making, informed consent, and individualized vascular access planning based on clinical need.
Right care team	Involves a multidisciplinary team of trained professionals and includes parents as active participants in vascular access decisions.
Right comfort measures	Prioritizing proactive pain prevention and management, using both pharmacological (analgesia, sedation) and non-pharmacological (skin-to-skin contact, sucrose, swaddling) strategies.
Right vascular access device for intended therapy	Selecting the most appropriate catheter type based on intended therapy duration, fluid characteristics, and patient-specific factors.
Right blood vessel for device and therapy	Utilizing advanced vessel assessment tools (e.g., ultrasound, near-infrared spectroscopy) to ensure optimal vein selection and longevity.
Right care of the infusion and device	Emphasizing infection prevention, securement techniques, site monitoring, and complication management to reduce failure rates and adverse events.
Right therapy duration and device removal	Regular assessment of catheter necessity, ensuring timely removal to minimize risks of thrombosis, infection, and vascular damage.

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engagement and empowerment, ensuring ethical and safe decision making (Table 1)⁶. In essence the 7-Rights Framework establishes the “why” and sets out the “what” guiding principles of safe neonatal vascular access practice, whereas the VAMP operationalizes these principles (the “how”) through a structured implementation strategy, ensuring consistent integration into clinical workflows.

This article is the second in an 11-part series developed by NEVAT and the Pediatric and Neonatal Vascular Access Special Interest Group (SIG) of the ESPR. The first article in the series acts as an introductory primer for the next ten articles (numbered REC 1–REC 10) setting out what we want to achieve by developing the 10 recommendations, providing an overview of the recommendations and the process of their development and defining key ideas such as preferred terminology. Each recommendation article addresses a key aspect of neonatal vascular access practice. The present paper (REC 1) aims to describe the essential elements of a VAMP that translates and operationalizes the principles of a patient-rights based approach to vascular access; an initiative that we believe is foundational for improving neonatal vascular access practice.

CLINICAL RATIONALE

Neonates are uniquely vulnerable to complications from vascular access due to their small vessel size, fragile skin, and limited tolerance for repeated procedures^{1,2,4–7,9,13}. Yet, access decisions are often made reactively, leading to suboptimal device selection, multiple failed attempts, therapy delays, and potentially avoidable harm^{1–7,14}. A structured approach can replace the event-driven practices seen in many NICUs with a proactive, anticipatory model of vascular access care^{1,2,6,14–21}.

One structured approach, the VAMP addresses the reactive-proactive imbalance by promoting early planning based on structured assessments, anticipating therapy needs, and incorporating patient characteristics. It offers a systematic, team-based approach that prioritizes first-attempt success, minimizes catheter-related complications, and integrates infection prevention, comfort care, and family engagement^{1,2,6}. The VAMP also ensures that parents are recognized as essential partners in care^{6,22–24}. By offering them involvement, communication, and participation in decision-making, this strengthens family-centered care and promotes trust and transparency. Most importantly, it shifts the paradigm from reactive troubleshooting to proactive access planning.

CLINICAL APPLICATION

The VAMP comprises four interrelated structural domains that capture the essential components requiring consideration when developing a VAMP and support coordinated and anticipatory vascular access practice. These four domains are labeled “Resource allocation,” “Patient and family engagement,” “Assessment and planning,” and “Quality monitoring and improvement.” These four domains use a dynamic continually updated process of cyclical information gathering, decision making and practice directing phases to inform pre-considerations and assessments, decisions about vascular access, its utilization and monitoring¹⁵.

Resource allocation

- Ensuring adequate resources, including trained personnel, equipment, and supplies, to support vascular access procedures in all neonatal care settings where catheter insertion is performed^{1,3,8,9,13}.
- Developing local policies and protocols for the economic and sustainable use of vascular access devices choices^{1–3,9,11,14,16–21}.

Patient and family engagement

- Promoting transparent communication with families at defined stages of the vascular access pathway—including planning, insertion, occurrence of complications, and device removal. Families should be provided with information, support, and appropriate opportunities to participate in care planning, empowering them to advocate for their child’s needs^{6,22–24}.

Assessment and planning

- Conducting a comprehensive assessment of each neonate’s vascular access needs, considering medical history, current condition, and treatment goals. This informs the development of a tailored plan for vascular device insertion, maintenance, and removal, aligning with the principles of the “7-Rights Framework”^{1,2,6}.

Quality monitoring and improvement

- Systematically evaluating predefined clinical indicators in accordance with institutional quality frameworks and the

corresponding NEVAT- ESPR Pediatric and Neonatal Vascular Access Special Interest Group (SIG) recommendations, to ensure adherence to established standards of care and patient rights, identify areas for improvement, and implement strategies to enhance safety, efficacy, and patient-centered care^{6,8,9,13,14,25,26}.

These four structural domains should be integrated into an institutionally implemented VAMP, adapted to align with local governance structures, available resources, and national regulatory frameworks, while remaining anchored in the universal principles of the 7-Rights Framework.

Within this framework, insertion, maintenance, and removal of vascular access devices should be performed by appropriately trained and credentialed nurses and/or physicians, in accordance with institutional scope-of-practice policies and national regulatory standards. Clear local policies should define limits on the number of insertion attempts and establish structured escalation pathways to more experienced operators when initial attempts are unsuccessful, thereby reinforcing patient safety, minimizing vessel trauma, and supporting first-attempt success principles.

The following elements do not represent new procedural guidance and are not intended to replace existing national or international standards. Rather, within the VAMP framework, they ensure that established evidence-based practices are proactively coordinated, anticipated, and systematically integrated into a structured vascular access plan. Their inclusion reinforces

implementation consistency and clinical alignment, rather than duplicating device-specific guidelines.

Every VAMP should incorporate structured vascular access decision-making tools and consider the following core clinical elements. These decision-support tools may include structured site-selection algorithms, therapy-driven device selection frameworks, and defined escalation pathways, as detailed in the corresponding NEVAT recommendations:

Assessment

- Evaluate the neonate's medical condition, vascular access history, and anticipated needs^{1,2,6,9}.

Choice and preparation of the insertion site

- Select appropriate sites based on the patient's condition and duration of access required^{1-3,10-14,17,20,21}.

Choice of device

- Select the appropriate vascular access device based on therapy duration and type of infusion^{1-3,6,13,14}.

Insertion technique

- Follow institutional protocols and use aseptic techniques^{1,8,9,25}.

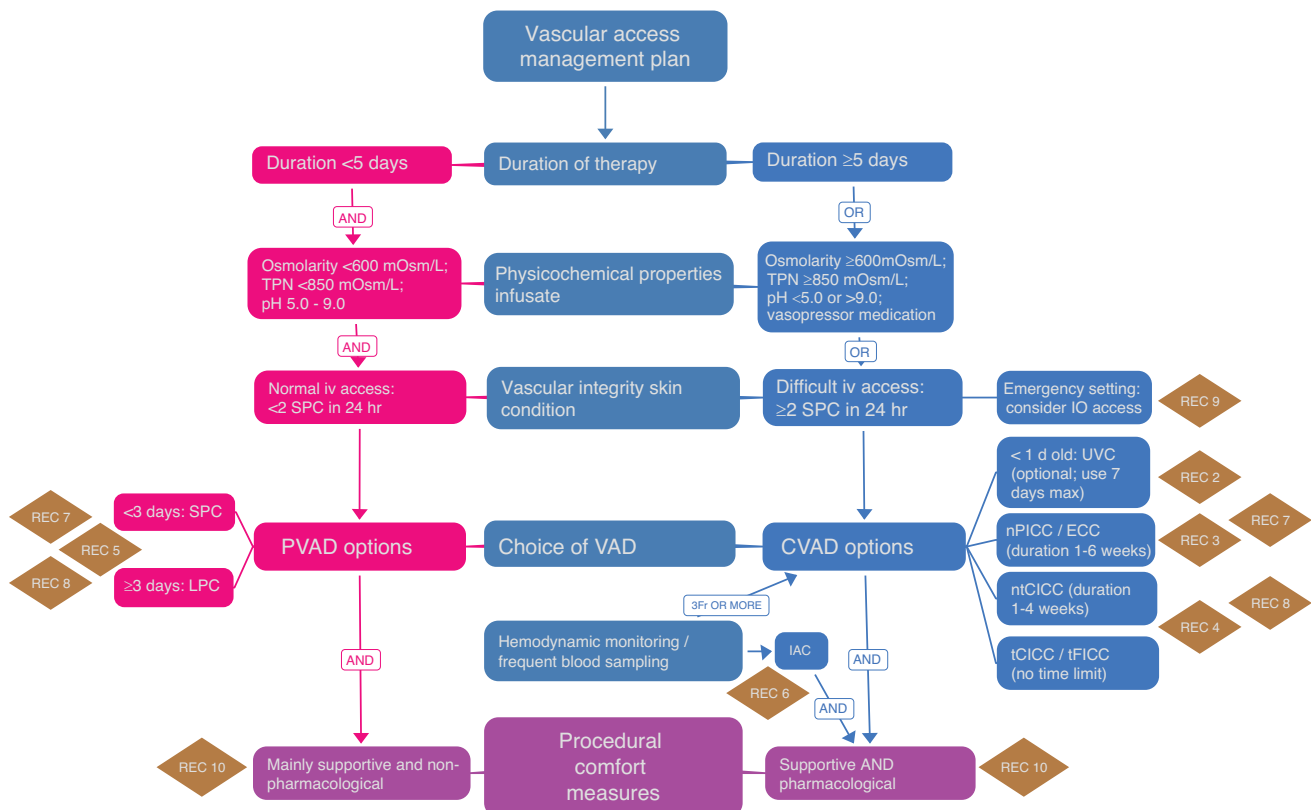


Fig. 1 Vascular access management plan flow diagram. Note that for the decision to use a PVAD all conditions must be met; when one of these conditions is not met and consequently a condition for a CVAD is applicable, then CVAD insertion is recommended. The diamonds in brown refer to the applicable recommendations of this series. Figure abbreviations: CVAD, central vascular access device, IAC intra-arterial catheter, IO intraosseous access, LPC long peripheral catheter, nPICC/ECC neonatal peripherally inserted central catheter/epicutaneo-caval catheter, ntCICC non-tunneled centrally inserted central catheter, PVAD peripheral vascular access device, REC recommendation 1–10 cross referenced with the nevat special article series, SPC short peripheral catheter, tCICC/tFICC tunneled centrally inserted central catheter/tunneled femoral inserted central catheter, TPN total parenteral nutrition, UVC umbilical venous catheter, VAD vascular access device.

Follow procedural steps carefully to ensure successful and safe insertion

- Implement aseptic technique^{1,8,9,25}.
- Ensure adequate and safe positioning of the patient^{6,23,24,26}.
- Ensure effective comfort, pain relief, or sedation is provided, using an appropriate judicious balance of pharmacological and non-pharmacological measures intended to relieve pain and promote comfort in accord with established neonatal standards^{2,6,9,10,22,26}.
- Prepare the insertion site^{1,8,9,25}.
- Insert the device as per protocol^{2,3,8–10,16–21}.
- Confirm placement through imaging or other verification methods^{3,10,13,16–21,27–30}.
- Seal the exit site, secure the device and dress the site^{4,8–10,14,16–21,25,31–33}.

Detailed guidance on insertion preparation, securement strategies, and dressing selection is provided in the corresponding NEVAT-ESPR Pediatric and Neonatal Vascular Access Special Interest Group (SIG) recommendation articles dedicated to vascular access device stabilization and site care.

Vascular access device removal

- Follow local protocols for vascular access maintenance and the timely removal of devices and catheters based on therapy completion/changes, or the emergence of complications^{1,3,6,9,10,14–16,18}.
- In the event of device-related complications, the vascular access plan should be promptly reassessed and modified as appropriate, including consideration of device removal, site change, or escalation to alternative access strategies in alignment with patient safety principles^{6,13–15}.

These decision-support tools may include structured site-selection algorithms, therapy-driven device selection frameworks, and defined escalation pathways, as detailed in the corresponding NEVAT recommendations^{REC3–10}.

A model integrated decision pathway linking the VAMP to the broader NEVAT recommendation series is presented in Fig. 1.

SUMMARY

A well-coordinated VAMP provides a practical framework for implementing the principles outlined in the “7-Rights Framework for Neonatal Vascular Access” in NICU settings. Such plans require healthcare providers to take, with parental involvement a well-considered, anticipatory, and systematic approach to the way they plan for and carry out vascular access procedures. The VAMP aims to optimize patient outcomes and enhance the quality of care. Continued research to advance the evidence base for practice, education, and quality improvement efforts are essential to further refine and implement the VAMP, ensuring its effectiveness in meeting the evolving needs of neonatal care.

Healthcare providers involved in neonatal vascular access have a professional responsibility to act lawfully, work within their scope of practice and level of competence, and follow established hospital and national policies, protocols and guidelines. Providers must also respect patients’ rights and ensure that parents, carers, or legal guardians are informed and involved in their child’s care decisions.

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AUTHOR CONTRIBUTIONS

All authors contributed to the conceptualization of the ten recommendations project and orchestrated their development. M.F.P.T.v.R. and K.H. drafted the initial version of

this manuscript, and F.P., B.S., Y.S., T.O., A.v.d.H., S.v.E. and R.v.d.L. reviewed the manuscript for important intellectual content. All authors approved the final version of the manuscript as submitted.

COMPETING INTERESTS

The authors declare no competing interests.

ADDITIONAL INFORMATION

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