



A 3-step protocol to support VAD selection for difficult venous access patients based on current literature

Cheryl Campos, DNP, RN-BC, CPHQ¹; Francie Moehring, PhD²; Halit O. Yapici, MD, MBA, MPH²

¹ Salinas Valley Memorial Hospital, California USA; ² Boston Strategic Partners, Boston USA

Introduction

- Peripheral intravenous (PIV) lines are simple and inexpensive vascular access devices (VAD)¹ used for the delivery of non-irritating fluids, medications, and blood products or blood draws² in majority of patients admitted to the hospital
- Challenges regarding traditional PIVs include low successful first-time insertion rates (~47%) and short dwell times (~1.5 days)³ causing frequent IV restarts, which may lead to progressive depletion of peripheral veins⁵ as well as increased costs/length of stay⁴⁻⁶
- Patients who require PIV catheters may present with difficult venous access (DVA) due to a variety of reasons including age, vein size, and pre-existing conditions^{4, 6-9}
- Advanced technologies in vascular access include guidewire-assisted peripheral IVs (GAPIV) which utilize ultrasound visualization during placement to improve the first-time insertion success rates⁴
- There is a lack of standardized processes to identify DVA patients and place the most appropriate VAD to meet patients' therapeutic needs

The goal of this project was to develop a step-by-step workflow based on a literature review to identify and treat DVA patients and ultimately improve patient experience.

Methods

Setting: Salinas Valley Memorial Hospital, which is a 263-bed acute care hospital in California

Key issues identified by the project team consisting of clinicians at Salinas Valley Memorial Hospital:

1. Ultrasound-guided catheter insertion was primarily used for the peripherally inserted central catheters (PICCs) and midlines, instead of PIVs
2. Vascular access nurses, who are trained in ultrasound-guided catheter insertion and experts in VAD placement⁷, were underutilized due to a lack of clear guidelines regarding calling for assistance by inpatient nurses
3. There was limited availability of vascular access nurses, especially after-hours (i.e., night shifts and weekends)⁷

Literature Review Methods:

- Time frame: 2012-2017
- Sources: ProQuest Central, Ovid, CINAHL, PubMed, Center for Disease Control, Association of Vascular Access, Emergency Nurses Association and the Infusion Nurses Society (INS)

Literature Review Results:

- 29 relevant articles were identified following a screening of 11,700 peer-reviewed articles
- Recurring themes from the articles based on the recommendations from INS Standards of Practice were synthesized to draft the final workflow^{10, 11}

Recommendations in the literature included:

- o Limiting the number of total PIV placement attempts
- o Utilizing vascular visualization technologies for the DVA patients

Results

Based on the findings from the literature, a three-step workflow was used to streamline the process for identifying patients who could benefit from the GAPIV:

1

Identify Difficult Venous Access Patients

- Peripheral vein neither palpable nor visible⁴
- History of DVA, obesity, IV drug abuse, dialysis, hypertension, sickle cell disease, chemotherapy, or other chronic medical conditions
- No more than 2 PIV insertion attempts per nurse or 4 attempts in total
- INS, 2021 Update – After 2 attempts, escalate to a clinician with a higher skill level and/or consider alternate routes for medication administration^{2,12}

Step 1:

DVA patients were identified based on:

- Visual inspection/palpation of the peripheral veins
- Assessment of medical and vascular access history for chronic illnesses that can affect peripheral vasculature^{4, 7-9}
- Number of PIV insertion attempts: limited to no more than 2 per nurse or 4 attempts in total¹⁰

Rule for advancing to step 2: A patient may be classified as DVA based on any of these

2

Call for Assistance From the Specially Trained Vascular Access Nurses

DI Nurses and Other Specialty Vascular Access Nurses:

- Trained to insert PIVs on DVA patients with ultrasound and transillumination devices

- Skilled at inserting standard PIVs, GAPIVs, midlines, and PICCs

- Currently 66 nurses trained (in ED, DI, Med/Surg, Peds, ICU, and Float Pool)

Contact Administrative Supervisor after hours (when DI not available) for a specialty nurse

Step 2:

Once a patient is classified as DVA the nurse is instructed to:

- Call a vascular access nurse to evaluate the case, and place the GAPIV using ultrasound guidance when necessary
- Contact administrative supervisor to check for additional advanced-skilled nurses if a vascular access nurse is unreachable (i.e., after-hours)¹⁰

Rule for advancing to step 3: Insertion by vascular access nurse fails, no advanced-skill nurses are available (confirmed by administrative supervisors), or patient becomes unstable

3

Advance to Central Venous Catheter (CVC) Insertion by MD

- Contact MD if more invasive line such as CVC is needed (e.g., patient requires invasive monitoring and a PICC cannot be placed, or the patient is becoming unstable and the vascular access nurse is unable to start a PIV)

Step 3:

Once it is determined that a vascular access nurse is unable to insert the GAPIV or patient becomes unstable

- Escalate the case to a MD who would consider other access options such as CVC

Following the implementation of the workflow, the nurses reported:

- Decrease in the total number of PIV attempts, especially in DVA patients¹⁰
- Reduction in the number of catheters needed to be replaced due to longer dwell times of GAPIVs versus standard PIV catheters¹⁰
- Reduction in the number of central line placements¹⁰

At the end of 2017, the IV Therapy Policy at Salinas Valley Memorial Hospital was updated to include recommendations initiated by the workflow.

Conclusion

- Patients' unique therapeutic needs may differ based on a variety of medical factors, and it is essential to provide the most appropriate care to all patient populations
- Recommendations in the literature can be utilized to develop evidence-based protocols to utilize the most appropriate technologies/techniques based on patients' needs
- Further research is required to evaluate the impact of these protocols/workflows on health outcomes and patient experience

Take home message:

Published literature may serve as a resource for hospitals to develop clear guidelines and protocols to identify patients that would benefit the most from the advanced vascular access technologies.

References

- ¹Cheung E, Baerlocher MO, Asch M, Myers A. Venous access: A practical review for 2009. Paper presented at: Canadian Family Physician • Le Médecin de famille canadien2009.
- ²Moureaux NL, Alexandrou E. Device Selection. In: Springer International Publishing; 2019:23-41.
- ³Hadaway L, Dalton L, Mercanti-Erieg L. Infusion Teams in Acute Care Hospitals: Call for a Business Approach An Infusion Nurses Society White Paper. Journal of Infusion Nursing. 2013;36(5):356-360.
- ⁴Idemoto BK, Rowbottom JR, Reynolds JD, Hickman RL. The accucath intravenous catheter system with retractable coiled tip guidewire and conventional peripheral intravenous catheters: A prospective, randomized, controlled comparison. JAVNA – Journal of the Association for Vascular Access. 2014;19:94-102.
- ⁵Chiricolo G, Balk A, Raio C, Wen W, Mihailos A, Ayala S. Higher success rates and satisfaction in difficult venous access patients with a guide wire-associated peripheral venous catheter. 2015.
- ⁶Sebbane M, Claret PG, Lefebvre S, et al. Predicting peripheral venous access difficulty in the Emergency Department using body mass index and a clinical evaluation of venous accessibility. Journal of Emergency Medicine. 2013;44:299-305.
- ⁷Campos CL. Enhancements in the identification of difficult venous access and the use of AccuCath. In: Yapici H,ed2020.
- ⁸Armenteros-Yeguas V, Garate-Echenique L, Tomas-Lopez MA, et al. Prevalence of difficult venous access and associated risk factors in highly complex hospitalised patients. J Clin Nurs. 2017;26(23-24):4267-4275.
- ⁹Lamperti M, Pittiruti M, II. Difficult peripheral veins: turn on the lights. British Journal of Anaesthesia.2013;110(6):888-891.
- ¹⁰Campos CL. Improving Patient Outcomes in Nurse-Placed Vascular Access Devices. https://sigma.nursingrepository.org/handle/10755/17236. Published 2019. Accessed January 27th, 2020.
- ¹¹Infusion Nurse Society. Infusion Therapy Standards of Practice. In:2016.
- ¹²Infusion Nurse Society. Infusion Therapy Standards of Practice. In:2021.