

Evidence Profile

Recommendation Question 5: Should the daily review of peripheral IVs by nurses and the inter-professional team be recommended?

Recommendation 5.1: The guideline panel recommends that acute care health service organizations implement a multi-component PVAD care protocol. This protocol includes a minimum of a daily review by health providers in collaboration with persons and their families.

Population: Pediatrics and Adults (from birth and older)

Intervention: Daily review of PVAD

Comparison: No daily review of PVAD/standard care

Outcomes: Complications (e.g., phlebitis, infiltration, extravasation, infection, bleeding, embolism)

Setting: All health care settings where a VAD may be used.

Bibliography: Hand searched 1 (Sriupayo et al. (2014)), 2452, 925, 1617, 2339, 2922, 10366, Handsearched 2 (Steere, Ficara, Davis & Moureau (2019)), 583, 648, 739, 1266, 1335

Quality assessment							Study details		No. of participants		Reported effects/outcomes	Certainty	Reference
No of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Publication Bias	Country	Intervention	Intervention	Control			
<p>Complications: Assessed with: Infiltration scale, phlebitis scale, chart reviews for rate of infiltrations and staphylococcus bacteremia Follow-up: 2, 4, 8 and 12 months post-intervention</p>													
13	Non-RCT	Very serious ^a	Not serious	Not serious	Not serious ^b	Not detected	<p><u>Hand Search 1:</u> Thailand</p> <p><u>2452:</u> USA</p>	<p><u>Hand Search 1:</u> <i>Peripheral Vascular Care Bundle:</i> - Checklist included: a) PVAD in situ – is it still required? b) PVAD removal where there is extravasation or inflammation; c) PVAD checks that dressings are intact; d) Hand hygiene performed before and after all PVAD procedures - Training, weekly meetings to obtain feedback from nurses regarding the bundle, booklets distributed regarding bundle</p> <p><u>2452:</u> <i>Pediatric IV Infiltration Prevention Bundle (STICK):</i> a) Securement → Standardized step by step approach to securing PVAD focusing on type of tape used and how the tape is to be applied b) Touch, look, compare → Does the site look ok? Is it painful? Is it swollen?</p>	<p><u>Hand Search 1:</u> N (post intervention / 4 mths) = 2456 events</p> <p>Infiltration (per 100 PVAD insertions): 20/2456 (0.8)</p> <p>Phlebitis (per 100 PVAD insertions): 5/2456 (0.2)</p> <p><u>2452:</u> <i>2 mths post -</i> Infiltration: 11.8 / 1000 PVAD device days <i>8 mths post -</i> infiltration: 3.34 / 1000</p>	<p><u>Hand Search 1:</u> N (baseline / 4 mths) = 2252 events</p> <p>Infiltration (per 100 PVAD insertions): 125/2252 (5.6)</p> <p>Phlebitis (per 100 PVAD insertions): 14/2252 (0.6)</p> <p><u>2452:</u> <i>4 mths pre -</i> Infiltration: 17.4 / 1000 PVAD device days</p>	<p><u>Hand Search 1:</u> There was a decrease in both infiltration and phlebitis after care bundle implementation (RR 0.15 [0.09-0.23] and RR 0.33 [0.12-0.91]).</p> <p>For every 100 people who received the intervention, 5 fewer cases of PVAD infiltrations would occur (ranges from 6 to 5 fewer), and 1 less case of phlebitis would occur (ranges from 1 fewer to 0 more (no difference)).</p> <p><u>2452:</u> Two months after implementation of the IV infiltration prevention bundle, there was a slight decrease in PVAD infiltrations, followed by a plateau, followed by a greater decrease give b six months after implementation.</p>	⊕⊕○○ Low	<p><u>Hand Search 1:</u> Sriupayo et al. (2014)</p> <p><u>2452:</u> Watterson et al. (2018)</p>

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							<p>925: Australia</p> <p>c) Irritants → focused on the list from pharmacy d) Catheter selection → Algorithm for determining the need for midline IV access e) Keep → Daily review of necessity - RNs educated on bundle and evidence-based practice of each item. Parent and family education also provided. Visual aids placed in each patient's room.</p> <p>925: <i>Multimodal Intervention:</i> 1) Post campaign to promote newly developed observation chart and revised phlebitis scoring system and updated 2) PVAD training program reviewed and updated 3) PVAD observation chart – assessment and phlebitis scoring – four tiered Phlebitis score 4) Alerts – Flagging alert sticker to tag PVADs requiring removal within 24 hrs 5) Standardized equipment (e.g., PVAD insertion trolleys across organization)</p> <p>1617: <i>Standardized PVAD assessment model:</i> ACT = Assess, Compare, Touch → had to be completed hourly, at every change of shift and documented in the hand-off portion of the EMR - Staff education to identify normal versus abnormal site appearances; pictures taken to use as visual aids for staff - Multidisciplinary rounds: bedside nurse asked: 1) are there any indwelling catheters that can be removed; 2) how long has the IV been in; 3) Are there any medications that</p>	<p>PVAD device days</p> <p>12 mths post-Infiltration: 9 / 1000 PVAD device days</p> <p>925: N = 279 patients audited</p> <p><i>PVAD-associated staphylococcus bacteremia:</i> 12/83 = 14.4%, 0.14 per 10 000 occupied bed days</p> <p><i>Phlebitis scores:</i> 0: 257/279 = 92.1% 1: 20/277 = 7.2% 2: 2/279 = 0.24% 3: 0/279 = 0.15%</p> <p>1617: N = 1320 total NICU catheter days</p> <p><i>Total infiltration rate:</i> 5.68/100 PVAD days</p> <p><i>Total Grade 4 infiltration rate:</i> 0.83 / 100 PVAD days</p> <p><i>Total tissue</i></p>	<p>925: N = 272 patients audited</p> <p><i>PVAD-associated staphylococcus bacteremia:</i> 24/68 = 35%, 0.39 per 10 000 occupied bed days</p> <p><i>Phlebitis scores:</i> 0: 211/272 = 77.6% 1: 54/272 = 19.9% 2: 5/272 = 1.8% 3: 2/272 = 0.74%</p> <p>1617: N = 740 total NICU catheter days</p> <p><i>Total infiltration rate:</i> 5.4/100 PVAD days</p> <p><i>Total Grade 4 infiltration rate:</i> 2.8 / 100 PVAD days</p> <p><i>Total tissue damage rate:</i></p>	<p>925: There was a decrease in PVAD-associated bacteremia after bundle implementation (RR 0.41 [0.22-0.76]). For every 100 people who receive intervention, 21 less people will have bacteremia (ranges from 27 less to 8 less).</p> <p>There was an increase in the percentage of PVAD sites scored 0 on the phlebitis scale (P < 0.05), and a decrease in those scored 1, 2 or 3 were post-intervention.</p> <p>1617: There was no difference between the overall rate of infiltrations at baseline compared to the rate after implementation of the Standardized PVAD assessment model . However, the rate of Grade 4 infiltrations decreased.</p> <p>The rate of tissue damage observed was lower in the intervention group than the control group.</p>		<p>925: Rhodes et al. (2016)</p> <p>1617: Wilder et al. (2014)</p>	

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							<p>2339: Spain</p> <p>can be changed from IV to oral? 4) Should an alternative vascular access device be considered? - IV discontinued if PVAD exhibited signs of infiltration</p> <p>2339: <i>Bundle for appropriate maintenance of PVAD:</i> a) Daily monitoring of phlebitis – done at least once a day and when solutions changed / drugs added. Removal of PVAD and if phlebitis occurred recorded b) Withdrawal of idle catheter not in use for > 24 hours c) Re-siting of PVAD every 96 hours (2005-2008) and then every 120 hours (2008-2011) - Education and training – both theoretical and practical</p> <p>2922: Implementation of bundle measures, including: daily meetings with microbiology team, review of peripheral vascular access device (PVAD) related blood stream infections, introduction of sterile gloves, reinforcement of aseptic care technique, scheduled replacement of PVAD, regular meetings and training sessions for healthcare workers, pocket care guidelines for hospital staff, wall charts of guidelines for insertion of PVADs, notifications to ward staff and discussion with ward nursing team after each case of PVAD related blood stream infections.</p> <p>10366: <i>PVAD Infiltration Management Program:</i> <i>Routine usual care:</i> a) posters to prevent PVAD infiltration in all patient</p>	<p>2339: N = 5333 catheter days</p> <p><i>Peripheral Vein Phlebitis (PVP):</i> 12.1 per 100 catheters</p> <p>2922: Incidence rate of PVAD related blood stream infection (2016): 8 episodes = 0.34 episodes per 10,000 patient days</p> <p>Incidence of PVAD related blood stream infection caused by staph aureus (2016): 3 episodes = 0.14 episodes per 10,000 patient days</p> <p>10366: N = 3651 PVADs inserted</p> <p>Incidence rate of</p>	<p>0.68 / 100 PVAD days</p> <p>2339: N = 896 catheter days</p> <p><i>Peripheral Vein Phlebitis (PVP):</i> 23.3 per 100 catheters</p> <p>2922: Incidence rate of PVAD related blood stream infection (2003): 30 episodes = 1.17 episodes per 10,000 patient days</p> <p>Incidence of PVAD related blood stream infection caused by staph aureus (2003): 18 episodes = 0.70 episodes per 10,000 patient days</p> <p>10366: N = 2894 PVADs inserted</p> <p>Incidence rate</p>	<p>2339: After implementation of the bundle for appropriate PVAD maintenance, the incidence of peripheral vascular phlebitis was 12.1 cases per 100 catheters (95%CI: 10.7-13.2), compared to 23.3 cases per 100 catheters (95%CI: 16.4-30.1) prior to implementation.</p> <p>2922: There was a reduction in the incidence of PVAD related blood stream infections per year after the implementation of the intervention of 8% (RR= 0.92 per year, 95% CI: 0.90 – 0.96). Specifically, a rate reduction of 9% was observed for PVAD related blood stream infections caused by staphylococcus aureus (RR= 0.91 per year, 95% CI: 0.86 – 0.96).</p> <p>10366: The rate of infiltration decreased significantly after bundle implementation. RR 0.21 [0.15- 0.31]. For every 100 people who receive intervention, 3 less people will have infiltration (ranges from 3 less to 3</p>	<p>2339: Mestre et al. (2013)</p> <p>2922: Saliba et al. (2018)</p> <p>10366: Park et al. (2016)</p>		

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							<p>Hand search 2: USA</p> <p>583: Australia</p>	<p>rooms; b) Recording of date/time/size and name of practitioner after PVAD insertion; c) caregivers educated by nurses on how to prevent PVAD infiltration and alert nurse of any abnormalities; d) if infiltration occurs, immediately stop infusion, assess site and document; e) assess blood vessels of patients before insertion to select best vein for peripheral administration; f) decide if nurse can do PVAD insertion, or if it should be referred to PVAD insertion team; g) if insertion fails twice, refer to IV team; h) assess patient's movements or thumb sucking habits prior to insertion; i) monitor PVAD site at minimum every shift and document general characteristics of the person, the date of insertion, the site, the size, the type of infusion</p> <p>Hand search 2: Intervention arm: catheters placed by VAST using the PIV5Rights: P= proficiency catheters placed by infusion team nurses I= insertion insertion using ultrasound when necessary V= vein and catheter points of flexion avoided, vein selected in the forearm 5= supplies and technology 1. IV kit 2. chlorhexidine gluconate/alcohol prep 3. 22 g 1.75" catheter 4. anti-reflux needleless connector 5. CHX antimicrobial bordered securement dressing and tape changed q7 days R= review and assessment Insertion documentation Photo documentation completed 1-2 times daily with functional review including flushing</p> <p>Control arm: current state of care with catheters placed by generalist nurses</p> <p>583: An insertion and maintenance bundle</p>	<p>PVAD infiltration 34 / 3651 = 0.9%</p> <p>Stage 1: 11.8% Stage 2: 76.4% Stage 3: 5.9%</p> <p>Hand search 2: N=113 Complication rate: 11%, p<0.001</p> <p>Total catheter failure: 12 (11%) p<0.001</p> <p>Complications resulting in catheter removal Phlebitis 5 (5) p=0.017 Infiltration: 4 (4%) p=0.212 pain: 2 (2%) p=0.013 catheter occlusion: 0 p=0.002 accidental dislodgement: 1 (1%) p=NA</p> <p>583: Post bundle implementation</p>	<p>of PVAD infiltration: 127 / 2894 = 4.4%</p> <p>Stage 1: 3.1% Stage 2: 74% Stage 3: 20.5%</p> <p>Hand search 2: N=94 Complication rate: 40%,</p> <p>Total catheter failure: 80 (85%)</p> <p>Complications resulting in catheter removal Phlebitis 13 (14) Infiltration: 7 (8%) pain: 9 (10%) catheter occlusion: 8 (9%) accidental dislodgement: 1 (1%)</p> <p>583: Pre bundle implementation</p>	<p>less).</p> <p>Hand search 2: Total complication rate and catheter failure rate were decreased in the intervention arm RR 0.26 [0.15-0.47] and RR 0.12 [0.07-0.21].</p> <p>For every 100 people who receive the intervention there would be 30 less complications (ranges from 34 less to 21 less) and 75 less catheter failures (ranges from 67 less to 79 less).</p> <p>583: There was no difference between groups.</p> <p>PVAD failure or complication rates</p>		<p>Hand search 2: Steere, Ficara, Davis & Moureau (2019)</p> <p>583: Kleidon et al (2019)</p>

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							<p>648: Spain</p> <p>was implemented. The acronym SUCCESS formed the insertion bundle: Skill of the inserter, Understand and prepare for patient needs, Consent, Clean site 2% chlorhexidine gluconate and 70% alcohol swab stick, Escalate, Secure with bordered polyurethane dressing, Sign and document. PIVCS formed the maintenance bundle: Prompt removal, Inspect hourly, Vein patency by intermittent flush of 0.9% sodium chloride flush, Clean hands, Scrub the hub with 2% chlorhexidine gluconate and 70% alcohol swab.</p> <p>Control: PVADs were not routinely replaced; rather, removal and replacement occurs at the completion of treatment or as clinically indicated</p> <p>648: PVAD-Infection Prevention Bundle consisting of: (1) promoting hand hygiene ; (2) replacing the previously used 0.5% chlorhexidine preparation with an alcohol-based 2% chlorhexidine preparation for skin antisepsis (Bohmclorh Chlorhexidine 2%); (3) selecting the appropriate catheter; (4) scrubbing the access port with an antiseptic and accessing the port only with sterile devices; (5) inspecting at every shift the catheter insertion site through the transparent dressing (6) removing 'idle' catheters and assessing daily the need for intravenous treatment.</p> <p>Control: PVAD care prior to implementation of the bundle not well described.</p> <p>739: The study units' staff RNs evaluated PVAD sites every 8 hours for signs of phlebitis using the Visual Infusion Phlebitis (VIP) scale. Within the intervention group, if a catheter remained patent at 96 hours (4 days) with a VIP score less than 2, the RN requested from the provider team an</p>	<p>Complications, n (%)</p> <p>Accidental dislodgement 4 (8)</p> <p>Suspected infection 0 (0)</p> <p>Phlebitis 5 (10)</p> <p>Blocked/Leak 3 (6)</p> <p>Extravasation 3 (6)</p> <p>Central access required 4 (8)</p> <p>Other 0 (0)</p> <p>Infiltrated 33 (65)</p> <p>PVAD failure n (%)</p> <p>51 (50)</p> <p>RR 1.02 (CI 0.77–1.35)</p> <p>648: Monthly PVAD-BSI rate was 4.00 episodes/month during the observational period, from August to December 2015, 2.75 in 2016, 2.50 in 2017, and 1.4 episodes/month in 2018.</p> <p>739: n=66 participants</p> <p>Reason for removal: Catheter damage 4 (6.1%)</p> <p>Drainage/leaking</p>	<p>n</p> <p>Complications, n (%)</p> <p>Accidental dislodgement 8 (16)</p> <p>Suspected infection 1 (2)</p> <p>Phlebitis 7 (14)</p> <p>Blocked/Leak 7 (14)</p> <p>Extravasation 0 (0)</p> <p>Central access required 0 (0)</p> <p>Other 4 (8)</p> <p>Infiltrated 27 (54)</p> <p>PVAD failure n (%) = 50 (49)</p> <p>648: N/A</p> <p>739: n=67 participants</p> <p>Reason for removal: Catheter damage 4 (6%)</p>	<p>remained at similar levels, no bloodstream infections occurred, and the majority of PVADs failed due to infiltration.</p> <p>648: There was a decreasing trend of PVAD-related blood stream infection over the study period.</p> <p>739: There were fewer infiltrations (n = 6 [9.1%]) and no complications of phlebitis among the intervention group. For every 100 people who receive intervention, 9 less people will have outcome (ranges from 14 less to 5 more).</p> <p>There were more incidences of</p>		<p>648: Garcia-Gasalla et al (2019)</p> <p>739: Maier (2019)</p>	

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							<p>1266: Turkey</p> <p>extension of the dwell time to be removed based on the VIP scale.</p> <p>Control: PVAD were removed after 96-hours as per hospital policy (VIP scale not used).</p> <p>1266: The Intravenous Infiltration Management Program, a care bundle developed by Kleidon et al in 2019 to improve pediatric PVAD catheter care, was used in the study. The program consists of 2 sections: Peripheral Intravenous Catheterization Process and Peripheral Intravenous Catheter Follow-up Process. See 583 for bundle details.</p> <p>Control: These nurses were trained on how to use the Pediatric Peripheral Intravenous Infiltration Assessment Tool. There were no guidelines for nurses to use for the PVAD catheterization process in the pretest group.</p>	<p>4(6.1%) Infiltration 6 (9.1%) Occlusion 6 (9.1%) Phlebitis 0</p> <p>1266: n=234 Incidence of Infiltration Observed 159 (67.9%) Stage 0: 32.1% Stage 1: 60.7% Stage 2 and over: 7.3%</p>	<p>Drainage/leak ing 1 (1.5%) Infiltration 12 (17.9%) Occlusion 4 (6%) Phlebitis 1 (1.5%)</p> <p>1266: n=169 Incidence of Infiltration Observed 116 (68.6%) Stage 0: 31.4% Stage 1: 42.6% Stage 2 and over: 26%</p>	<p>drainage/leakage and occlusion in the intervention group, and there were no differences between the groups in catheter damage incidences.</p> <p>1266: There was a minimal difference between groups in overall incidence of infiltration. For every 100 people who receive intervention, 1 less person will have outcome (ranges from 9 less to 9 more). There was a decrease in the rate of stage 2 and above infiltration in the posttest group (7.3%) compared with the pretest group (26.0%).</p>		<p>1266: Tasdelen & Caglar (2020)</p>	
							<p>1335: Singapore</p> <p>1335: Peripheral venous catheter care bundle initiative: (1) LINE acronym: Location of cannula, Insertion date, Needle gauge and Expiry date. (2) Simplified diagram of PVAD sites showing various commonly used superficial veins for PVAD insertion (3) Visual representation of Phlebitis Scoring Scale and its respective interventions for management (4) Routine patency checks of PVADs have to be performed once every shift (approximately every 8 h). (5) Routine PVAD site check for dressing integrity and proper anchoring technique to be performed once every shift. (6) Provide Patient and Family Education Pamphlets on signs and symptoms of phlebitis. (7) Routine assessment of indication of PVAD once per shift and to remove PVAD when its clinical use is no longer justified. (8) Minimize usage of bandages post-PVAD removal and to apply firm</p>	<p>1335: Incidence rate of Phlebitis post implementation (July-December 2017): Total n=41 Month 1: 13 Month 2: 4 Month 3: 8 Month 4: 7 Month 5: 7 Month 6: 2</p>	<p>1335: Incidence rate of Phlebitis (Jan-June 2017) Total n=24 Month 1: 5 Month 2: 5 Month 3: 4 Month 4: 2 Month 5: 5 Month 6: 3</p>	<p>1335: There was no difference between pre intervention and post-intervention implementation.</p> <p>The trend demonstrates a sharp increase of 13 occurrences of phlebitis at 1 month post implementation of the PVAD care bundle in July, followed by a general decreasing trend in phlebitis occurrences across a span of 6 months from July to December 2017.</p>		<p>1335: Gunasundram et al. (2020)</p>	

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								pressure on site upon removal of PVAD. Control: No PVAD care bundle [no additional details given in the study].					

Acronyms:

PVAD= Peripheral Vascular Access Device

VAD= Vascular Access Device

VAST: Vascular Access Specialty Team

IV= intravenous

BSI = blood stream infection

Explanations

^a Based on the ROBINS-I quality appraisal tool for quasi-experimental studies, all of the included studies had critical concerns related to risk of bias. Studies were rated as critical due to lack of control of confounding variables, lack of measurement of fidelity and/or compliance in completing the intervention, and the assessors not being blinded to the intervention received by participants. Therefore, we downgraded by 2.

^b The total number of events was > 300 (we did not downgrade).