Evidence Profile

Recommendation question 4: **Should blood draws from a vascular access device versus blood draws using venipuncture be recommended?**

Recommendation 4.1: The expert panel suggests health providers perform venipuncture instead of drawing blood samples from a VAD to maintain specimen integrity.

Population: Nurses and the interprofessional team
Intervention: Blood draw from a vascular device [Vascular devices found in the literature= PVAD and PICC, PIVO™ device with PVAD in situ]
Comparison: Blood draw from venipuncture
Outcomes: specimen rejection, patient satisfaction, contamination rate (specific to blood cultures), dwell time

Setting: All health care settings

Bibliography: 610, 649, 1226, 2216

Quality assessment							Study details		No. of participants		Reported effects/outcomes	Certainty	Reference
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Publication bias	Country	Intervention	Intervention	Control			
Contamination *(rates of contaminated blood cultures)*													
1 [a]	One systematic review and meta-analysis of non-RCTs	Not Serious[b]	Very Serious[c]	Not Serious	Very Serious[d]	Not detected	**610:** Multiple (majority USA as well as Spain, Netherlands, UK, Singapore and Australia)	**610:** Blood draw from a PVAD (protocol and methods varied across studies) Control: Blood draw from venipuncture (protocol and methods varied across studies)	**610:** Study 1: Kelly and Kim, (2013): False positive via PVAD: N = 8/248 (3.2%) Study 2: Self et at. (2012) PVAD contaminated: 33/505 (6.5%)	**610:** Kelly and Kim, 2013: False positive via venipuncture: N = 8/224 (3.6%) Self et at 2012 Venipuncture contaminated: 18/505 (3.6%)	The systematic review demonstrated a negative direction of effect, though results are mixed. **610:** One study (Kelly & Klim, 2013) reported blood cultures could be taken accurately from a PVAD within 1 hr of PVAD insertion when compared with venipuncture. In contrast, the other study (Self et al., 2012) reported taking blood cultures from PVAD increases the risk of contamination and false positive results compared with venipuncture.	⊕○○○ VERY LOW	**610:** Coventry et al. (2019)

Quality assessment							Study details		No. of participants		Reported effects/outcomes	Certainty	Reference
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Publication bias	Country	Intervention	Intervention	Control			
Specimen Rejection *(rate of hemolysis)*													
1[e]	Systematic Review of Non-RCTs and meta-analysis	Serious[f]	Serious[g]	Not serious	Not serious	Detected[h]	**610:** Multiple (majority USA as well as Spain, Netherlands, UK, Singapore and Australia) **649:** USA **1226:** China	**610:** Blood draw from a PVAD (protocol and methods varied across studies) Control: Blood draw from venipuncture (protocol and methods varied across studies) **Additional non-RCTs identified:** **649:** Participants served as their own controls and contributed 2 blood samples, 1 collected per venipuncture and 1 collected from PVADs used for infusion of IV fluids. **1226:** One pair of samples was retrieved from each patient by the	**610:** Total number of hemolysis events= 5673 Total number of PVAD blood draws= 59032 **649:** N=95 Hemolysis rates were 15% for samples drawn from PVAD (14/95) **1226:** 101 paired	**610:** Total number of hemolysis events= 70 Total number of venipuncutre blood draws= 6091 **649:** N=95 Hemolysis rates were 4% for blood specimens drawn by Venipuncture (4/95) **1226:**	The systematic review demonstrated a negative direction of effect, favouring the control (venipuncture). Two additional non-RCTs were identified. One study results supported the findings of review 610. One study found lower rates of hemolysis in blood draws from a VAD however it was a central line (PICC). **610:** Specimen rejection (hemolysis) outcome favours venipuncture (review reports a fixed effects odd ratio of 4.58 [3.61, 5.80]). **649:** The rate of hemolysis was less in the control group than the intervention group. For every 100 people who receive intervention, 10 more people will have outcome (ranges from 1 more to 37 more).	⊕⊕◯◯ **Low**	**610:** Coventry et al. (2019) **649:** Twibell et al. (2019) **1226:** Zhang et

Quality assessment							Study details		No. of participants		Reported effects/outcomes	Certainty	Reference
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Publication bias	Country	Intervention	Intervention	Control			
								same nurse- the nurse would initially collect the blood sample via venipuncture of median cubital vein of the upper limb without PICC using BD Vacutainer®. The second step was the blood sample via PICC. Infusion through PICC was halted prior to blood sample collection.	samples drawn from 22 patients. Hemolysis events from PICC blood draw = 1/101	Hemolysis events from venipuncture= 11/101	**1226:** Hemolysis rate in blood samples from PICC was much lower than that with venipuncture. For every 100 people who receive blood draw from a PICC, 10 less people will have hemolysis (ranges from 11 less to 3 less).		al. (2020)
Patient satisfaction (Patient/parent completed the VAS for satisfaction after venipuncture and blood draw from a PVAD on a scale from 1 to 10.)													
1	Non-RCT	Very Serious[i]	Not Serious	Not serious	Very Serious[j]	None	**649:** USA	**649:** Participants served as their own controls and contributed 2 blood samples, 1 collected per venipuncture and 1 collected from PVADs used for infusion of IV fluids.	**649:** N=84 PVAD mean 9.452 SD=1.4006	**649:** N=84 Venipuncture mean 8.179 SD=2.7426	**649:** Patient satisfaction was higher in the PVAD blood draw group compared to the venipuncture group (mean difference= -1.2738, SD 2.5429).	⊕○○○ **Very Low**	**649:** Twibell et al. (2019)
Dwell time (mean survival time)													
1	RCT	Serious[k]	Not Serious	Not Serious	Serious[l]	None	**2216:** USA	**2216:** Blood draws from PIVO™ device used with PVAD in situ. Control: blood draws from venipuncture.	**2216:** n=73 PVAD mean survival time 2.77 days (SD 0.08)	**2216:** n=79 mean survival time 2.75 (SD 0.08)	**2216:** Dwell time slightly favours blood draws from PIVO™ with PVAD in situ based on mean survival time (mean difference of 0.02 days).	⊕⊕○○ **Low**	**2216:** Mulloy et al. (2018)

Acronyms:

BC= Blood Culture

NA= Not Applicable

PICC= Peripherally inserted central catheter

PVAD= peripheral vascular access device

Explanations:

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[a] One systematic review of 16 non-RCT studies, 2 of which examined the outcome of contamination.

[b] Review was assessed as low risk of bias using the ROBIS tool. Review authors assessed the included articles to be high quality based on the Joanna Briggs checklist. We did not downgrade.

[c] There was variation in the comparison group (newly placed PVAD versus not). Additionally, one study favoured venipuncture while one study showed no difference. We downgraded by 2 for both these issues.

[d] There were less than 100 total events for the contamination outcome as well as a wide confidence interval. We downgraded by 2.

[e] One systematic review of 16 non-RCT studies, 12 of which examined the outcome of specimen rejection. Two additional non-RCTs were identified. One study's results supported the findings of review 610. One study found lower rates of hemolysis in blood draws from a VAD however it was a central line (PICC). The additional studies were not GRADED separately.

[f] Review was assessed as low risk of bias using the ROBIS tool. Review authors assessed the included articles quality to vary from high to low quality due to lack of control of confounding based on the Joanna Briggs checklist. We downgraded by 1.

[g] There was variation in the comparison group (newly placed PVAD versus not). We downgraded by 1.

[h] The review reports that publication bias was strongly suspected based on funnel plot analysis for the outcome of specimen rejection.

[i] The study was assessed using the ROBINS-I tool. It was rated as serious risk of bias due to confounding and unblinded outcome measurement. We downgraded by 1.5.

[j] There were less than 100 events. We downgraded by 2.

[k] Study was assessed as moderate risk of bias using the Cochrane risk of bias 2.0 tool due to no information about allocation concealment. We downgraded by 0.5.

[l] There were 160 events. We downgraded by 1.