AVA 2017

Association for Vascular Access
ANNUAL SCIENTIFIC MEETING
September 16-19 • Phoenix Convention Center • Phoenix, AZ

Secure My Intravenous Line Effectively – (The SMILE Trial).

Innovative Peripheral Intravenous (PIV) Dressing Techniques to Reduce PIV Failure

INSERT SESSION NAME HERE

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Financial Disclosures

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1. Disclosure of Relevant Financial Relationships

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2. Disclosure of Off-Label and/or investigative Uses

I will not discuss off label use and/or investigational use in my presentation.

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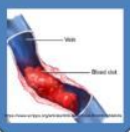
Clinical Problem: PVC failure hospitalised patients

Mechanical complications

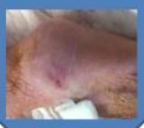
Occlusion

Inability to infuse through a previously function PVC



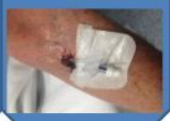
Infiltration and extravasation

Leakage of a infusate into surrounding tissues



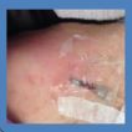
Dislodgement

Partial or complete dislodgement of the PVC out of the vein



Phlebitis

Irritation or inflammation of a vein wall



Infection

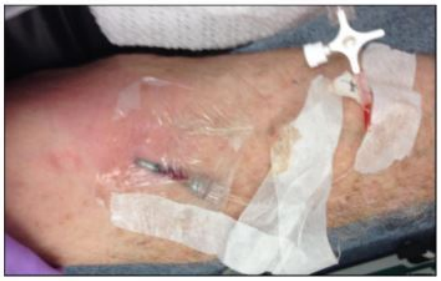
Local infection at the insertion site. Catheter related blood stream infection

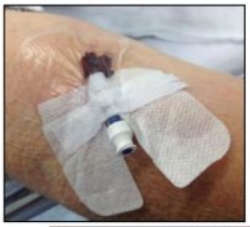
Infective complications

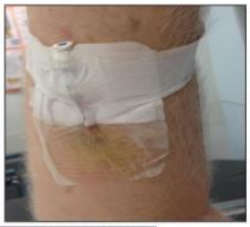
PVC failure is reported to range from **33-69%**

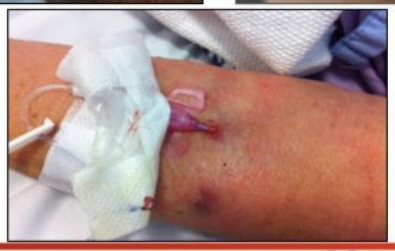
(Biausone-Gazda et al., 2010; Dillon et al., 2008; Rickard et al., 2012; Webster et al., 2008)

Where are we going wrong?









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Journal of Hospital Infection 86S1 (2014) S1-S70

Available online at www.sciencedirect.com

Journal of Hospital Infection

journal homepage: www.elsevierhealth.com/journals/jhin

ELSEVIER

epic3: National Evidence-Based Guidelines for Preventing Healthcare-Associated Infections in NHS Hospitals in England

H.P. Loveday[a]*, J.A. Wilson[a], R.J. Pratt
J. Browne[a], J. Prieto[b], M. Wilcox[c]

IVAD17 Use a sterile, transparent, Semipermeable polyurethane dressing to cover the intravascular insertion site. Class D/GPP

IVAD19 Use a sterile gauze dressing if a patient has profuse perspiration or if the insertion site is bleeding or leaking, and change when inspection of the insertion site is necessary or when the dressing becomes damp, loosened or soiled. Replace with a transparent semi-permeable dressing as soon as possible. *Class D/GPP*

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Supplement to
January/February 2016
Volume 39, Number 1S
ISSN 1533-1458
www.journalofinfusionnursing.com

Journal of Infusion Nursing

The Official Publication of the Infusion Nurses Society

37.1 Stabilize and secure vascular access devices (VADs) to prevent VAD complications and unintentional loss of access.

37.2 Methods used to stabilize the VAD will not interfere with assessment and monitoring of the access site and will not impede vascular circulation or delivery of the prescribed therapy.

3 RCTs combined (N=379)

Simple polyurethane may have some benefit over gauze + tape:

- **Accidental removal** 5% vs 13%, RR 0.4, p=0.03
- **Phlebitis** 7% vs 9%, RR 0.9, p=0.72
- **Infiltration** 11% vs 15%, RR 0.8, p=0.39

1 RCT Bordered polyurethane vs Sutureless securement device

- **Bordered transparent signif** ↓dislodgement but ↑phlebitis

1 RCT Bordered polyurethane vs Tape alone

- **Bordered polyurethane** ↓overall PIV failure

More, high quality research is needed

New(er) products

Sutureless securement devices

CHG Dressings

Tissue Adhesive (cyanoacrylate)

Securement Dressings

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SMILE Trial

Secure My Intravenous Line Effectively

Adults

Children

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Objective

- Test the feasibility of an randomized trial
- Identify clinical and cost-effective methods to prevent failure
- To compare usual care dressings with novel methods
- Evaluate the acceptability of these devices to patients and health professionals
- Study adverse effect profiles

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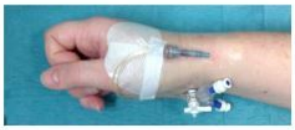
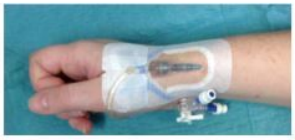
Adults - PIVs

Standard Care



Integrated Securement Dressing



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Inclusion Criteria

- >/16 yrs
- PVC expected >24 hours
- Will remain in hospital for at least 24 hours
- Written informed consent

Exclusion Criteria

- Known, current bloodstream infection (within 48 hours)
- Non English speaking with no interpreter
- PIV inserted through burned or scarred skin
- Current skin tear/high risk of skin tears
- Previous allergy to study products
- Previous enrolment in the study

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Sample size

- As a Pilot RCT sample size of 150 per group was chosen to primarily test feasibility
- Not designed to prove statistical differences

Sample recruitment

- Research Nurses visited medical/surgical wards
- Explanation of study and request for consent

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Data collection

At time of PVC insertion
- Patient & PVC information

Daily PVC check
- Protocol adherence
- Dressing appearance
- Infusates
- Pain and tenderness (0=no pain; 10= worst possible)
- Redness and swelling (in cms from insertion site)
- Palpable cord (in cms from insertion site)
- Number of dressings used
- Leakage (yes/no)

PVC removal
- Time insitu
- Inspect for phlebitis/skin complications
- Document reason for removal
- Patient satisfaction (0=completely dissatisfied; 10 = completely satisfied)

48 hours post removal
- Infection endpoints (BSI or positive tip/swab)
- Serious adverse event (including mortality)

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Patient factors

Characteristics	Control N (%)	Integrated dressing N (%)
Average age (mean)	60 years	62 years
Males	88 (59)	98 (65)
Surgical patients	108 (72)	107 (72)
Co-morbidities ≥2	106 (71)	124 (82)
Obese (BMI>30)	69 (46)	71 (49)
Poor skin integrity	14 (9)	13 (9)
Infection at baseline	37 (25)	43 (29)
Wound at baseline	72 (48)	80 (53)

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PIV factors

PIV Characteristics	Control N (%)	Intervention N (%)
Device Size 20 g	86 (57)	80 (53)
Placement in forearm	95 (76)	106 (71)
Multiple insertion attempts	19 (13)	25 (17)
Difficult insertion	56 (37)	56 (37)
Site clipped	82 (55)	79 (53)

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Dressing factors

Dressing Characteristics	Control N (%)	Integrated dressing N (%)
Number of dressings used	156	152
Dressing clean, dry and intact	99 (66)	124 (83)
Additional tubular elasticised bandage or bandage	26 (17)	27 (18)
Additional non-sterile tape	11 (7)	15 (10)

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Results

	Control N	Integrated dressing N
Device failure	46 (31%)	44 (29%)
Dwell time in hours	57.9	68.8

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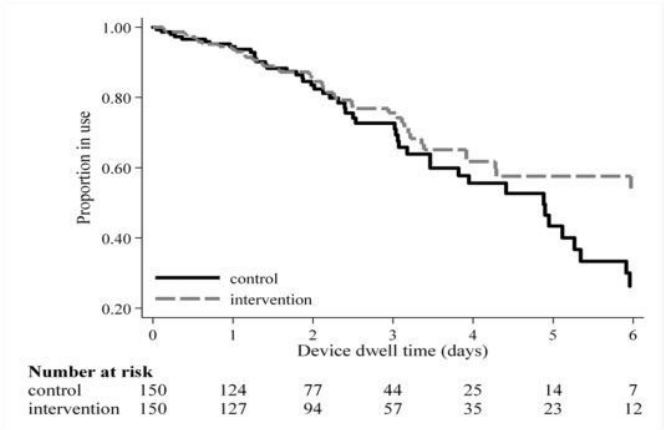
PVC Dwell

-

Kaplan-Meier curve of Device failure



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Complications at removal

Complication	Control N (%)	Integrated dressing N (%)
Occlusion	7 (5)	3 (2)
Infiltration/extravasation	17 (11)	17 (12)
To painful to tolerate	8 (5)	7 (5)
Leaking	9 (6)	12 (8)
Phlebitis (clinical definition)	3 (2)	1 (1)
Partial/complete dislodgement	8 (5)	7 (5)
Unknown	5 (3%)	6 (4%)

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Cox regression: risk factors for failure

- Significant predictors (<0.05) in bivariate model
  - Fair/poor skin quality
  - 22/24g device
  - Accessory cephalic/medial antebrachial vein
  - Lack of elasticised bandage
- Significant predictors in final multivariate model
  - 22/24g device
  - lack of elasticised bandage
- Integrated dressing adjusted hazard ratio 0.77 (95% CI 0.51-1.17)

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Skin reactions

There were 12 skin reactions to study products observed in this study (4%)

	Control	Integrated dressing
Mild itching	3	4
Severe itching	2	0
Rash	1	0
Blister	0	1
Skin tear	0	1

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Feasibility outcomes

- 91% of screened patients were eligible for participation
- 5 (1.5%) patients refused participation
- 2 protocol violations
- 0 withdrew from study
- 0 missing primary outcome

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Adults – Arterial Catheters

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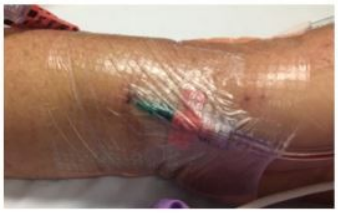
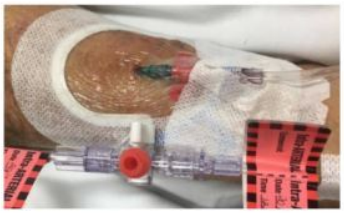
The Princess Alexandra Hospital

- Standard Care



- Integrated securement device



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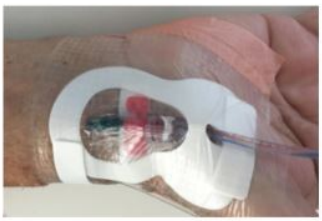
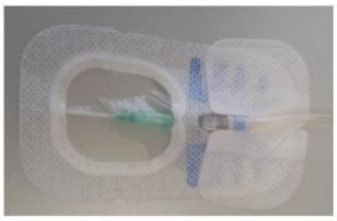
The Prince Charles Hospital

- Standard Care
- Integrated securement device





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PIVC in Pediatrics

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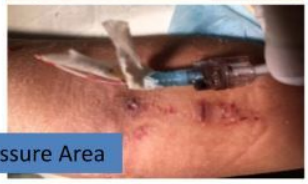
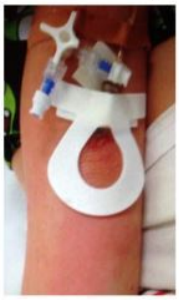
Pediatric complications

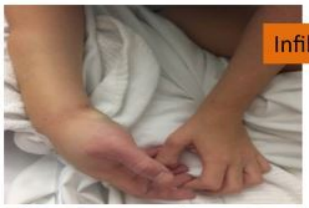
Infection



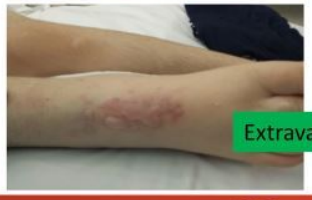
Pressure Area



Phlebitis



Infiltration



Extravasation

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MY NOSE ITCHES


data
clinical
audit
Pre-Implementation
Post-Implementation
Implementation
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Effectiveness of insertion and maintenance bundles to prevent central-line-associated bloodstream infections in critically ill patients of all ages: a systematic review and meta-analysis

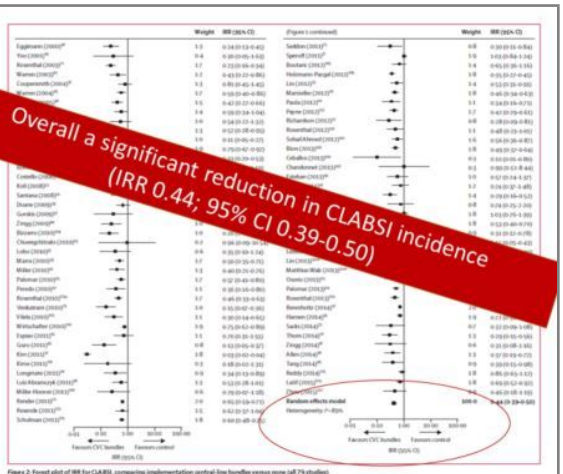
Erwin Ista, Ben van der Hoven, René F Kornelisse, Cynthia van der Starre, Margreet C Vos, Eric Boersma, Onno K Helder

Summary

Background Central-line-associated bloodstream infections (CLABSIs) are a major problem in intensive care units (ICUs) worldwide. We aimed to quantify the effectiveness of central-line bundles (insertion or maintenance or both) to prevent these infections.

Methods We searched Embase, MEDLINE OvidSP, Web-of-Science, and Cochrane Library to identify studies reporting the implementation of central-line bundles in adult ICU, paediatric ICU (PICU), or neonatal ICU (NICU) patients. We searched for studies published between Jan 1, 1990, and June 30, 2015. For the meta-analysis, crude estimates of infections were pooled by use of a DerSimonian and Laird random effect model. The primary outcome was the number of CLABSIs per 1000 catheter-days before and after implementation. Incidence risk ratios (IRRs) were obtained by use of random-effects models.

Findings We initially identified 4337 records, and after excluding duplicates and those ineligible, 96 studies met the eligibility criteria, 79 of which contained sufficient information for a meta-analysis. Median CLABSIs incidence were 5·7 per 1000 catheter-days (range 1·2–46·3; IQR 3·1–9·5) on adult ICUs, 5·9 per 1000 catheter-days (range 2·6–31·1; 4·8–9·4) on PICUs; and 8·4 per 1000 catheter-days (range 2·6–24·1; 3·7–16·0) on NICUs. After implementation of central-line bundles the CLABSI incidence ranged from 0 to 19·5 per 1000 catheter-days (median 2·4, IQR 1·2–4·4) in all types of ICUs. In our meta-analysis the incidence of infections decreased significantly from median 6·4 per 1000 catheter-days (IQR 3·8–10·9) to 2·5 per 1000 catheter-days (1·4–4·8) after implementation of bundles (IRR 0·44, 95% CI 0·39–0·50, p<0·0001; I^2=89%).



Overall a significant reduction in CLABSI incidence (IRR 0.44; 95% CI 0.39-0.50)

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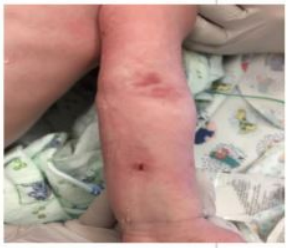
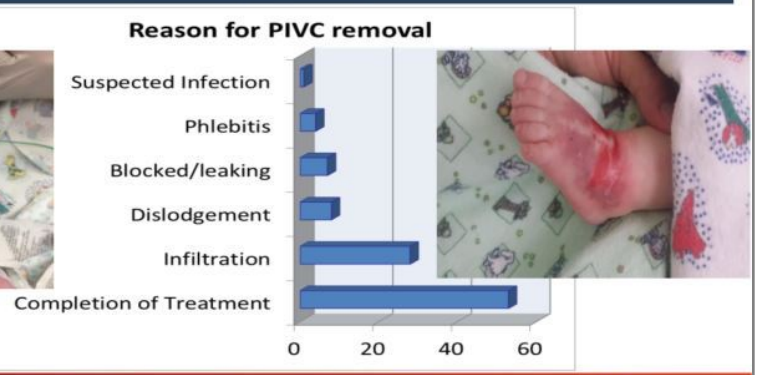
Recent audit of PIVC inserted in paediatric general wards (n=102)





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Pre-implementation demographics

		N (%)
Gender	Male	68 (65.4)
	Female	36 (34.6)
Number of previous PIVCs	0	12 (11.5)
	1	38 (36.5)
	2-4	27 (26.0)
	>4	27 (26.0)
Reason for IV insertion (n=137)	Antibiotics	46 (33.6)
	Other IV medication	38 (27.7)
	Intravenous fluids	28 (20.4)
	Procedure (e.g. CT)	11 (8.0)
	Blood sampling	9 (6.6)
	Difficult access	5 (3.6)

Delays to insertion (minutes) Median (IQR) (range)	90 (48.7, 195.0) (0, 1320)
Time to insert (minutes) Mean (SD) (range)	15.4 (10.4) (5, 45)
Total number of insertion attempts Median (IQR) (range)	2 (1,3) (1,9)
Age Median (IQR)	6.2 years (1.0, 12.7)

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PIVC placement and securement

		N (%)
Was the PIVC inserted successfully on first attempt? (n=104)	Yes	47 (45.2)
	No	57 (54.8)
Site (n=104)	Dorsum Hand	34 (32.7)
	Antecubital	28 (26.9)
	Forearm	26 (25.0)
	Foot	9 (8.7)
	Saphenous	6 (5.8)
	Scalp	1 (1.0)
Use of technology (n=104)	No	86 (82.7)
	Ultrasound	18 (17.3)
	Infared	0
Cannula gauge (n=104)	20 (pink)	9 (8.7)
	22 (blue)	60 (57.7)
	24 (yellow)	35 (33.7)
PIVC securement (n=104)	"Teddy bear" tegaderm	97 (93.3)
	Microfoam	79 (76.0)
	Thin brown tape	17 (16.3)
	Tegaderm with border	6 (5.8)
	Stretchy brown tape	4 (3.8)
	Other	5 (5)
PIVC immobilisation (n=104)	White elastoplast	72 (69.2)
	Tubifast	70 (67.3)
	Arm board	65 (62.5)
	Crepe bandage	17 (16.3)
	Styrofoam cup	2 (1.9)
Pain relief (n=104)	Distraction	42 (40.4)
	Topical anaesthetic	35 (33.7)
	None	24 (23.1)
	Positioning / swaddling	18 (17.3)
	Sucrose	10 (9.6)
	Oral analgesic	1 (1.0)
	Oral / intra-nasal sedation	1 (1.0)
	Entonox	0

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Themes



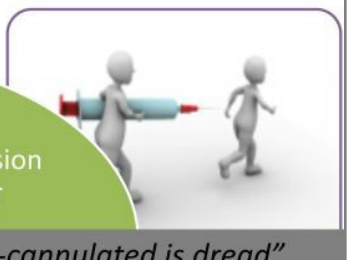

Communication

Apprehension and Fear

Recognition of the role of care giver

Appreciation of skilled technicians and technology

Themes

Communication

Apprehension and Fear

"My initial reaction when she needs to be re-cannulated is dread"
"Most stressful inpatient experiences"
"How long will this one last"

care giver

technicians and technology

Implementation

SUCCESS PIVCS

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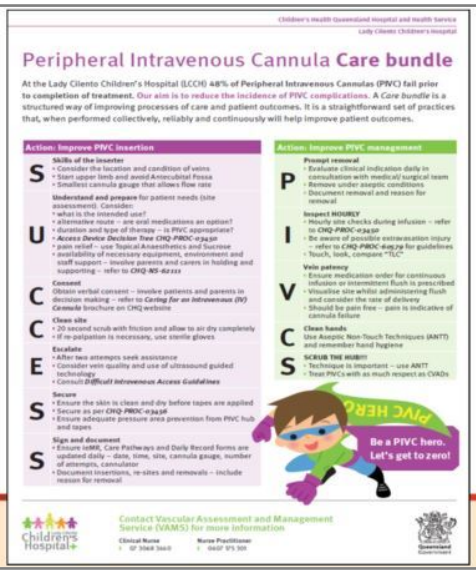
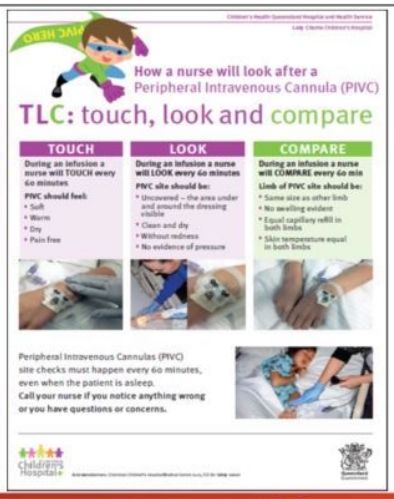


Implementation



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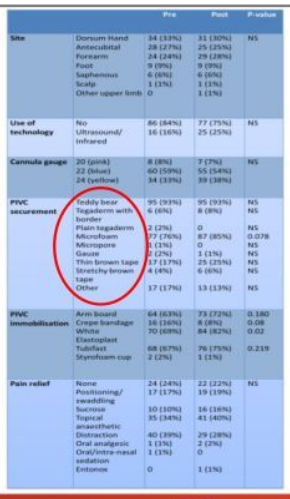
Post intervention

		Pre	Post	P-value
Duration of PIVC (hours)	Mean (SD)	44.8 (33)	61.2 (53)	0.009
Total number of insertion attempts	Mean (SD)	2.6 (2.1)	2.1 (1.8)	0.068
PIVC inserted successfully on first attempt	Yes No	46 (45%) 56 (55%)	63 (62%) 39 (38%)	0.024

Person attempting PIVC insertion		RMO	Registrar	Consultant	Nurse Practitioner	Anaesthetist	TOTAL	P value
1st	Pre	73 (72%)	25 (25%)	0	4 (4%)	1 (1%)	102	<0.0001
	Post	42 (41%)	45 (44%)	1 (1%)	11 (11%)	3 (3%)	102	
2nd	Pre	3 (9%)	21 (62%)	0	6 (17%)	4 (12%)	34	0.721
	Post	1 (4%)	16 (67%)	1 (4%)	4 (17%)	2 (8%)	24	
3rd	Pre	0	2 (25%)	2 (25%)	4 (50%)	0	8	0.216
	Post	0	2 (18%)	0	7 (64%)	2 (18%)	11	
4th	Pre	0	0	0	1 (33%)	2 (67%)	3	1.0
	Post	0	0	0	1 (33%)	2 (67%)	3	



			Pre	Post	P-value
Site		Dorsum Hand	34 (33%)	31 (30%)	NS
		Antecubital	28 (27%)	25 (25%)	
		Forearm	24 (24%)	29 (28%)	
		Foot	9 (9%)	9 (9%)	
		Saphenous	6 (6%)	6 (6%)	
		Scalp	1 (1%)	1 (1%)	
		Other upper limb	0	1 (1%)	
Use of technology		No	86 (84%)	77 (75%)	NS
		Ultrasound/ Infrared	16 (16%)	25 (25%)	
Cannula gauge		20 (pink)	8 (8%)	7 (7%)	NS
		22 (blue)	60 (59%)	55 (54%)	
		24 (yellow)	34 (33%)	39 (38%)	
PIVC securement		Teddy bear	95 (93%)	95 (93%)	NS
		Tegaderm with border	6 (6%)	8 (8%)	NS
		Plain tegaderm	2 (2%)	0	NS
		Microfoam	77 (76%)	87 (85%)	0.078
		Micropore	1 (1%)	0	NS
		Gauze	2 (2%)	1 (1%)	NS
		Thin brown tape	17 (17%)	25 (25%)	NS
		Stretchy brown tape	4 (4%)	6 (6%)	NS
		Other	17 (17%)	13 (13%)	NS
PIVC immobilisation		Arm board	64 (63%)	73 (72%)	0.180
		Crepe bandage	16 (16%)	8 (8%)	0.08
		White Elastoplast	70 (69%)	84 (82%)	0.02
		Tubifast	68 (67%)	76 (75%)	0.219
		Stynofoam cup	2 (2%)	1 (1%)	
Pain relief		None	24 (24%)	22 (22%)	NS
		Positioning/ swaddling	17 (17%)	19 (19%)	
		Sucrose	10 (10%)	16 (16%)	
		Topical anaesthetic	35 (34%)	41 (40%)	
		Distraction	40 (39%)	29 (28%)	
		Oral analgesic	1 (1%)	2 (2%)	
		Oral/intra-nasal sedation	1 (1%)	0	
		Entonox	0	1 (1%)	

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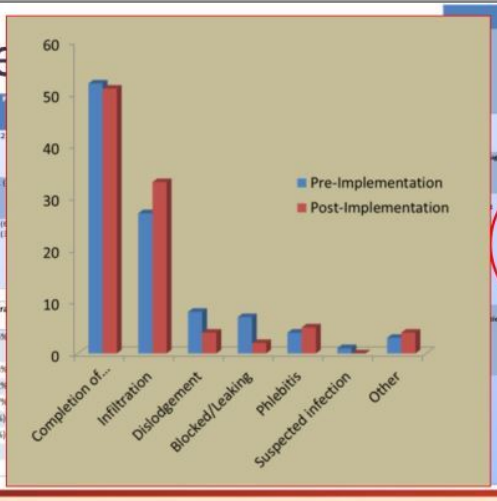
Post inte



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SMILE – Pediatrics

- Feasibility study
- Randomised controlled trial
- Lady Cilento Children's Hospital
  - Large tertiary pediatric hospital
- 330 patients
  - 100 patients to 3 trial arms
  - 10% attrition
- Medical and surgical inpatient wards

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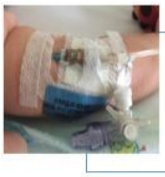
SMILE



Standard Care

Integrated Securement Dressing

Tissue Adhesive

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Inclusion Criteria	Exclusion Criteria
0-18 years	Previous participation on current study
PIVC expected dwell >24 hours	Non-English speakers without an interpreter
Inpatient > 24 hours	Known/current bloodstream infection (previous 48 hours)
Written informed consent	Other types of vascular access devices insitu
	Previous allergy to any study product
	Current skin tears/ burnt/scarred skin

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Patient factors

Characteristics	Standard Care N (%)	Integrated Dressing N (%)	Tissue Adhesive N (%)
Age (average)	4.8 (4.3)	5.8 (4.3)	5.6 (4.5)
Female	17 (49)	16 (44)	22 (58)
Medical	18 (51)	15 (42)	17 (45)
Poor skin integrity	1 (3)	0 (0)	3 (8)
Co-morbidities >2	8 (23)	4 (11)	7 (18)
Infection at baseline	17 (49)	16 (44)	20 (53)
Wound at baseline	14 (40)	13 (36)	15 (39)
Wt. appearance (Excessive)	23 (66)	21 (58)	15 (39)

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PIVC factors

PIVC Characteristics	Standard Care N (%)	Integrated Securement Dressing N (%)	Tissue Adhesive N (%)
Difficult insertion	14 (41)	15 (43)	22 (58)
Multiple insertion attempts	13 (38)	15 (43)	18 (47)
Size/ 22 gauge	28 (85)	28 (80)	25 (66)
Placement in forearm	21 (60)	24 (63)	27 (71)
Placement by VA team	20 (61)	26 (74)	75 (71)
Continuous IV infusion	47%	35%	38%
No obvious use	4 (15%)	8 (29%)	4 (13%)

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Dressing factors

Dressing Characteristics	Control N (%)	Integrated securement dressing N (%)	Tissue Adhesive N (%)
Number of dressings used	36 (1.09)	37 (1.06)	40 (1.05)
Life of first dressing (hours)	49.0 (25.2-97.5)	47.7 (26.5-71.1)	66.5 (34.8-95.9)
Reason for dressing change:			
- dressing lifting	3	1	1
- sweating	1	0	0
- other	1	1	1
Protocol deviations	0 (0%)	1 (4%)	3 (10%)

Dressing factors

Dressing Characteristics	Control N (%)	Integrated securement dressing N (%)	Tissue Adhesive N (%)
Additional tubular elasticised bandage or bandage	53%	55%	61%
Armboard	19%	16%	10%

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Dressing factors

Additional dressing devices:	Standard Care	Integrated Securement Dressing	TA + IV Tegaderm
- none	65%	89%	84%
- sterile tape at hub	0%	1%	0%
- microfoam	13%	0%	4%
- non-sterile tape	24%	6%	5%
- Hyperfix	2%	3%	1%

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Results

	Standard Care N=	Integrated Securement Dressing N=	Tissue Adhesive N=
Device failure	19 (54%)	10 (28%)	13 (34%)
Dwell time (hours)	74.0 (53.7)	55.3 (37.8)	78.1 (48.8)

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Complications at removal

Complication at removal	Standard Care N (%)	Integrated securement dressing N (%)	Tissue Adhesive N (%)
occlusion	9 (26)	3 (8)	7 (18)
infiltration or extravasation	5 (14)	6 (17)	4 (11)
too painful to tolerate	3 (9)	1 (3)	3 (8)
device leaking	4 (11)	2 (6)	1 (3)
phlebitis (clinical definition)	1 (3)	1 (3)	2 (5)
accidental removal	3 (9)	0 (0)	1 (3)

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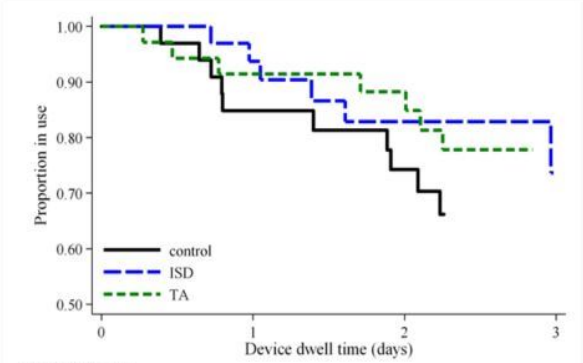
PIVC Dwell-

Kaplan-Meier curve of Device failure



Number at risk

control	33	27	19	15
ISD	33	28	16	7
TA	36	31	26	18

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Optimal site for ultrasound-guided venous catheterisation in paediatric patients: an observational study to investigate predictors for catheterisation success and a randomised controlled study to determine the most successful site

Jun Takeshita[1], Yoshinobu Nakayama[2], Yasufumi Nakajima[2*], Daniel I Sessler[3], Satoru Ogawa[2], Teiji Sawa[2] and Toshiki Mizobe[2]

Abstract

Introduction: Venous catheterisation in paediatric patients can be technically challenging. We examined factors affecting catheterisation of invisible and impalpable peripheral veins in children and evaluated the best site for ultrasound-guided catheterisation.

Methods: Systolic pressure, age, sex, and American Society of Anaesthesiologists (ASA) physical status were determined in 96 children weighing less than 20 kg. Vein diameter and subcutaneous depth were measured with ultrasound. Logistic regression was used to evaluate the contribution of these factors to cannulation success with (n = 65) or without (n = 31) ultrasound guidance. Thereafter, we randomly assigned 196 patients for venous catheter insertion in the dorsal veins of the hand, the cephalic vein in the forearm, or the great saphenous vein. Success rates and vein diameters were evaluated by using Dunn tests; insertion time was evaluated by using Kaplan-Meier cumulative incidence analysis.

Results: Independent predictors of catheterisation were ultrasound guidance (odds ratio (OR) = 7.3, 95% confidence interval (CI) 3.0 to 36.0, $P = 0.002$), vein diameter (OR = 1.5 per 0.1 mm increase in diameter, 95% CI 1.1 to 2.0, $P = 0.007$), and ASA physical status (OR = 0.4 per status 1 increase, 95% CI 0.2 to 0.9, $P = 0.03$). Cephalic veins were significantly larger (cephalic diameter 1.8 mm, $P = 0.001$ versus saphenous 1.5 mm, $P < 0.001$ versus dorsal 1.5 mm). Catheterisation success rates were significantly better at the cephalic vein than either the dorsal hand or saphenous vein (cephalic 95%, 95% CI 89% to 100%, $P < 0.001$ versus dorsal 69%, 95% CI 56% to 82%, $P = 0.03$ versus saphenous 76%, 95% CI 63% to 89%).

Conclusions: The cephalic vein in the proximal forearm appears to be the most appropriate initial site for ultrasound-guided catheterisation in invisible and impalpable veins of paediatric patients.

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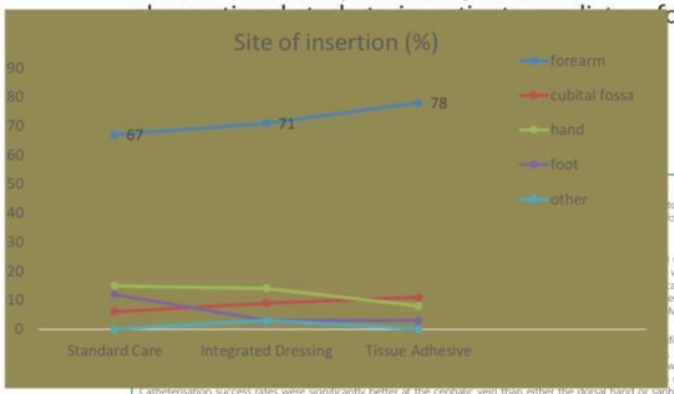
Optimal site for ultrasound-guided venous catheterisation in paediatric patients: an



Catheterisation success rates were significantly better at the cephalic vein than either the dorsal hand or saphenous vein (cephalic 95%, 95% CI 89% to 100%, $P < 0.001$ versus dorsal 69%, 95% CI 56% to 82%, $P = 0.03$ versus saphenous 76%, 95% CI 63% to 89%).

Conclusions: The cephalic vein in the proximal forearm appears to be the most appropriate initial site for ultrasound-guided catheterisation in invisible and impalpable veins of paediatric patients.

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Ultrasound

Ultrasound guidance allows faster peripheral IV cannulation in children under 3 years of age with difficult venous access: a prospective randomized study

Mehdi Benkhadra[1], Mathieu Collignon[1], Isabelle Fournel[2], Christian Oeuvrard[1], Patricia Rollin[1], Murielle Perrin[1], François Volot[1] & Claude Girard[1]

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2 Department of Epidemiology and Infection Control, University Hospital Bocage, Dijon, France

Keywords
i.v. cannulation; pediatric anesthesia; ultrasound guidance

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Summary

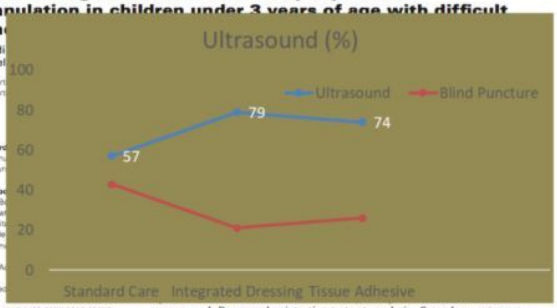
Objectives: Ultrasound-guided peripheral venous access (USG-PIVA) presents many advantages over the reference 'blind' technique in both adults and children in emergency situations.

Aim: To compare USG-PIVA with the blind technique in children < 3 years undergoing general anesthesia.

Methods: After obtaining the approval of the ethics committee and informed consent from the parents, we included all children < 3 years scheduled to undergo general anesthesia [surgery, magnetic resonance imaging (MRI)], who presented difficult venous access. The children were randomized into two groups: the US group (USG-PIVA) and the B group (blind). The primary endpoint was time to cannulation (from tourniquet placement to successful IV cannulation), compared between USG-PIVA group and B group by intention-to-treat analysis. Secondary outcomes were success rate at the first puncture, number of punctures, and diameter of the catheters. Cannulations requiring > 15 min were considered as failures. In case of failure in group B, USG-PIVA was attempted for a further 15 min.

Ultrasound

Ultrasound guidance allows faster peripheral IV cannulation in children under 3 years of age with difficult ven



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	Number of attempts	Number of successes	Success rate
Vascular Access Specialist	80	75	94%
Consultant Doctor	6	2	33%
Resident Medical Officer	91	15	16%
Anaesthetist Doctor	36	5	14%
Registrar Doctor	98	9	9%
Other	4	0	0%

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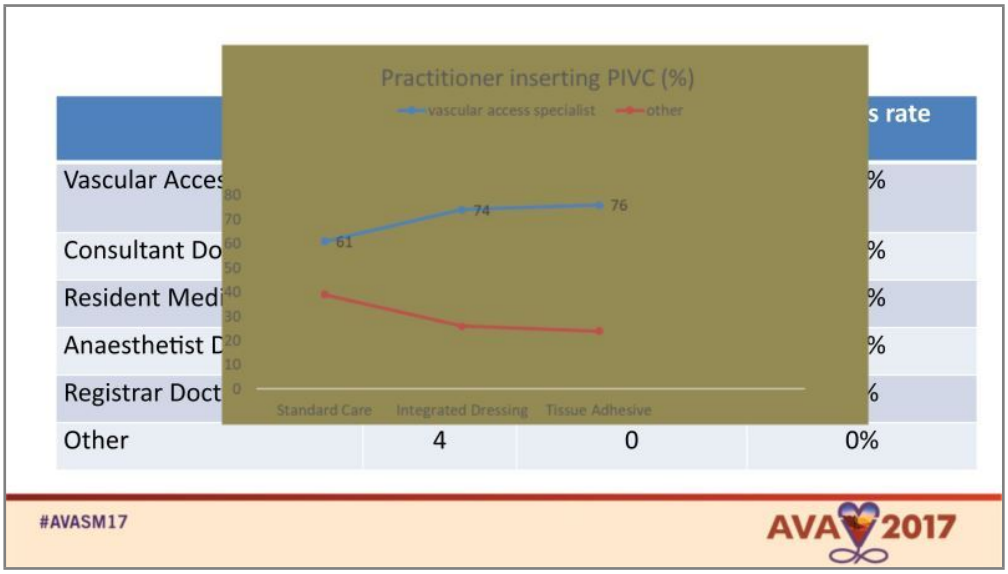

			s rate
Vascular Acces			%
Consultant Do			%
Resident Medi			%
Anaesthetist D			%
Registrar Doct			%
Other	4	0	0%

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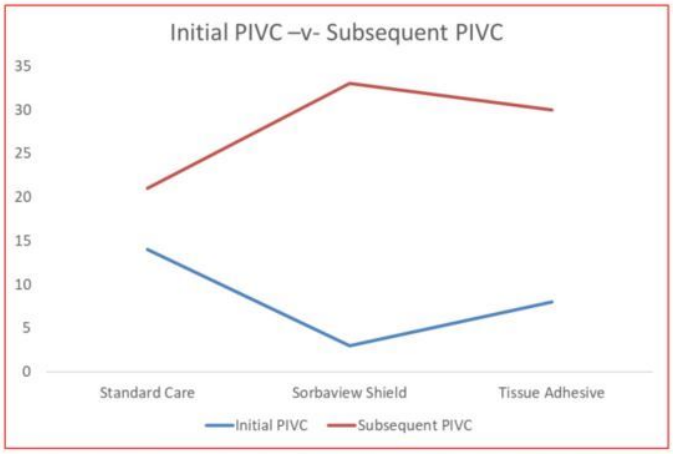

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"Meaningful change will require that the concept of the peripheral IV catheter as an expendable and replaceable tool be discarded."

(Helm RE et al. Accepted but unacceptable: peripheral IV catheter failure. Journal of Infusion Nursing. 2015;38(3):189-203

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