



V Convegno Nazionale **GAVePed** **2023 RIMINI** 15-16 Maggio



Il protocollo ISCaVO per il catetere venoso ombelicale

Giovanni Barone
Ospedale Infermi di Rimini



ISCaVO

l'Impianto Sicuro del Catetere Venoso
Ombelicale nel neonato

SHEA/IDSA/APIC Practice Recommendation

Strategies to prevent central line-associated bloodstream infections in acute-care hospitals: 2022 Update

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1. **Provide easy access to an evidence-based list of indications for CVC use to minimize unnecessary CVC placement** (Quality of Evidence: LOW)
2. **Require education and competency assessment of healthcare personnel (HCP) involved in insertion, care, and maintenance of CVCs about CLABSI prevention** (Quality of Evidence: MODERATE)^{74–78}
 - a. Include the indications for catheter use, appropriate insertion and maintenance, the risk of CLABSI, and general infection prevention strategies.
 - b. Ensure that all HCP involved in catheter insertion and maintenance complete an educational program on essential practices to prevent CLABSI before performing these duties.^{79,80} Periodic retraining with a competency assessment may be of benefit.⁸¹
 - c. Periodically assess HCP knowledge of and adherence to preventive measures.
 - d. Require all HCP who insert a CVC to undergo a credentialing process (as established by the individual healthcare institution) to ensure their competency before independently inserting a CVC and aseptic technique for accessing and maintaining the CVC thereafter.
 - e. Re-educate when an institution changes components of the infusion system that requires a change in practice (eg, when an institution's change of the needleless connector requires a change in nursing practice).
 - f. **Use simulation training** for proper catheter insertion and maintenance if available.^{82–85}

Impianto Sicuro del Catetere Venoso Ombelicale nel neonato



1. Valutazione ecografica pre-procedurale.
2. Utilizzo di un pack procedurale pre-assemblato.
3. Tecnica asettica appropriata: igiene delle mani, massime protezioni di barriera e antisepsi cutanea con clorexidina 2% in IPA 70%.
4. Incannulamento della vena ombelicale usando il catetere più piccolo sulla base delle necessità infusionali del paziente (mono/bilume)
5. Utilizzo dell'ecografo per la tip navigation e la tip location intra-pocedurale (secondo il protocollo NeoECHOTip).
6. Stabilizzazione del catetere e protezione del sito di emergenza (colla in cianoacrilato, membrana semipermeabile trasparente e “sutureless device?”)
7. Controlli seriati della posizione della punta usando l'ecografia (24-48 ore)
8. Rimozione precoce (entro 4-5 giorni)

Impianto Sicuro del Catetere Venoso Ombelicale nel neonato



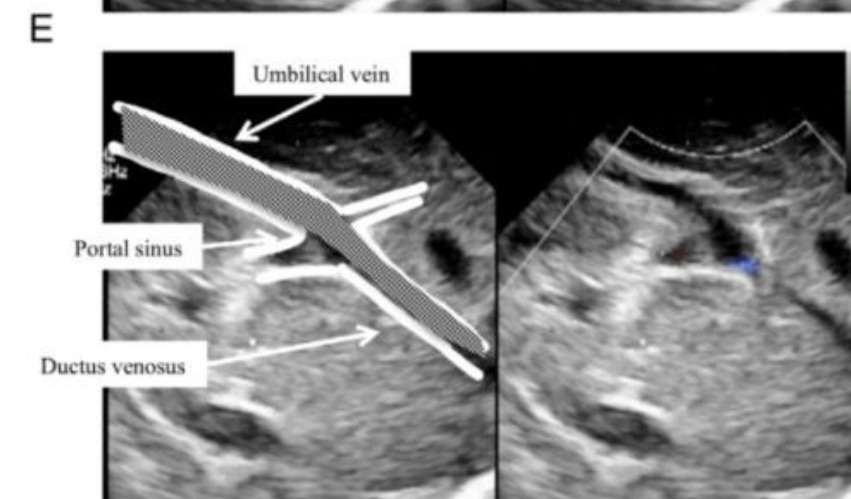
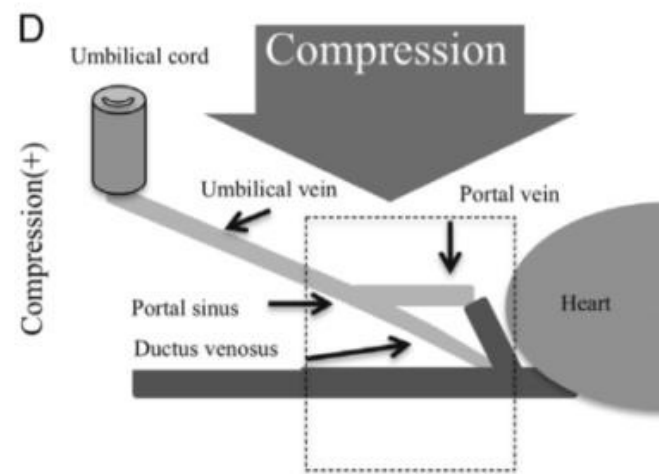
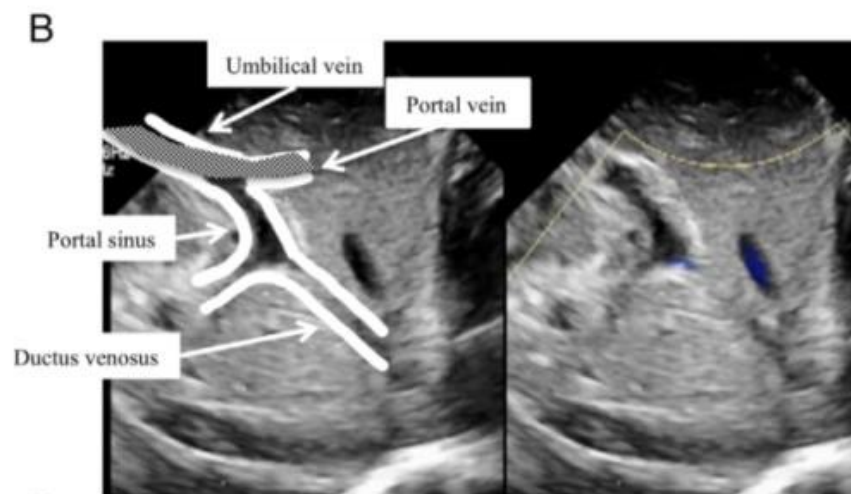
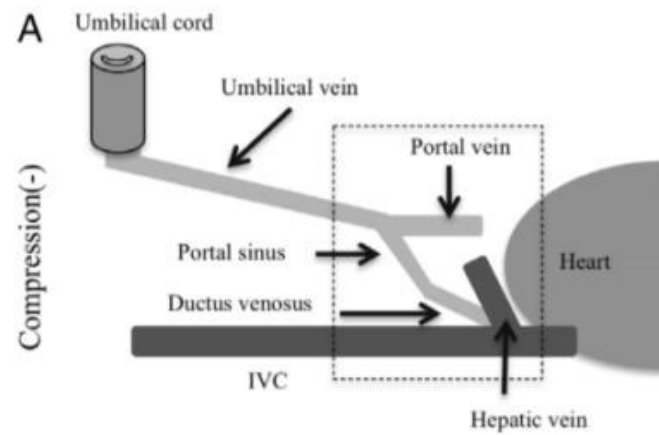
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Ecografia preprocedurale

- ✓ Identificare varianti anatomiche (azygos continuation (0,2-3%), vena ombelicale destra, etc.
- ✓ Valutazione dell'angolo tra recesso ombelicale e DVA
- ✓ Valutazione della pervietà del DVA
- ✓ Valutazione del diametro del DVA (?)

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Alto rischio trombotico

Original article

Thrombosis after umbilical venous catheterisation: prospective study with serial ultrasound

Table 1 Patient characteristics of infants with UVC (study group) and infants without UVC (control group)

Variable	Study group (n=40)	Control group (n=20)	P value
Gestational age at birth (weeks)	27 (24–41)	29 (27–41)	0.06
Birth weight (grams)	1052 (600–3925)	1464 (1020–3300)	0.07
SGA, n (%)	6 (15)	0 (0)	0.07
Duration of hospital admission (days)	18 (3–102)	13 (3–44)	0.04
PICC received after UVC, n (%)	12 (30)	3 (15)	0.21
NEC, n (%)	5 (12.5)	1 (5)	0.36
Culture-proven sepsis, n (%)	11 (27.5)	2 (10)	0.12
Mortality, n (%)	4 (10)	1 (5)	0.51

In this study, thrombosis in the UVC route was detected with screening by ultrasonography in 75% of infants after umbilical catheterisation, whereas no thrombi were demonstrated in the investigated location in infants without UVCs. This result

UVCs is not advised. However, given the high risk of thrombus formation in UVCs, these catheters should be used with caution and removed promptly if the clinical indication is no longer present.

Thrombosis after umbilical venous catheterisation: prospective study with serial ultrasound

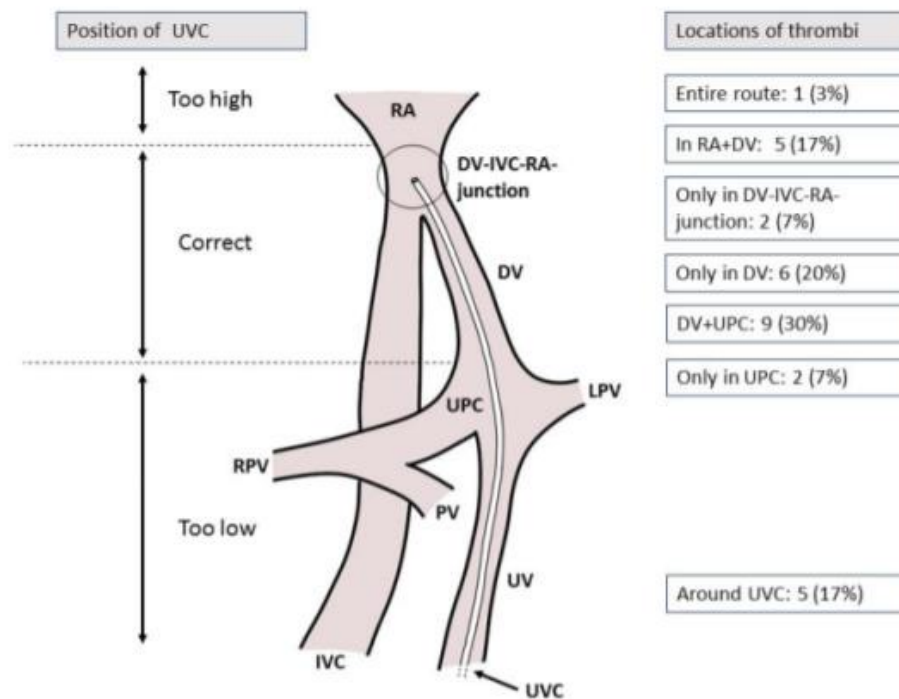


Figure 1 Locations of the 30 detected thrombi, n (%). DV, ductus venosus; IVC, inferior vena cava; LPV, left portal vein; PV, portal vein; RA, right atrium; RPV, right portal vein; UPC, umbilico-portal confluence; UV, umbilical vein; UVC, umbilical venous catheter.

Impianto Sicuro del Catetere Venoso Ombelicale nel neonato



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33. VASCULAR ACCESS SITE PREPARATION AND DEVICE PLACEMENT

hand hygiene; skin antisepsis using >0.5% chlorhexidine in alcohol solution; maximal sterile barrier precautions; and avoidance of the femoral vein in obese adult patients during placement under planned and controlled conditions.^{3,15,16,33} (I)

Ensure adherence to proper technique through use of and completion of a standardized checklist completed by an educated health care clinician and empower the clinician to stop the procedure for any breaches in aseptic technique. Completion of a checklist should be done by someone other than the CVAD inserter.^{15,34}

Use a standardized supply cart or kit that contains all necessary components for the insertion of a CVAD.¹⁵ (IV)

III. Central Vascular Access Device (CVAD)

- A. Implement the central line bundle when placing CVADs, which includes the following interventions:

-
4. **Use an all-inclusive catheter cart or kit** (Quality of Evidence: MODERATE)¹¹⁸
- a. A catheter cart or kit that contains all necessary components for aseptic catheter insertion should be available and easily accessible in all units where CVCs are inserted.



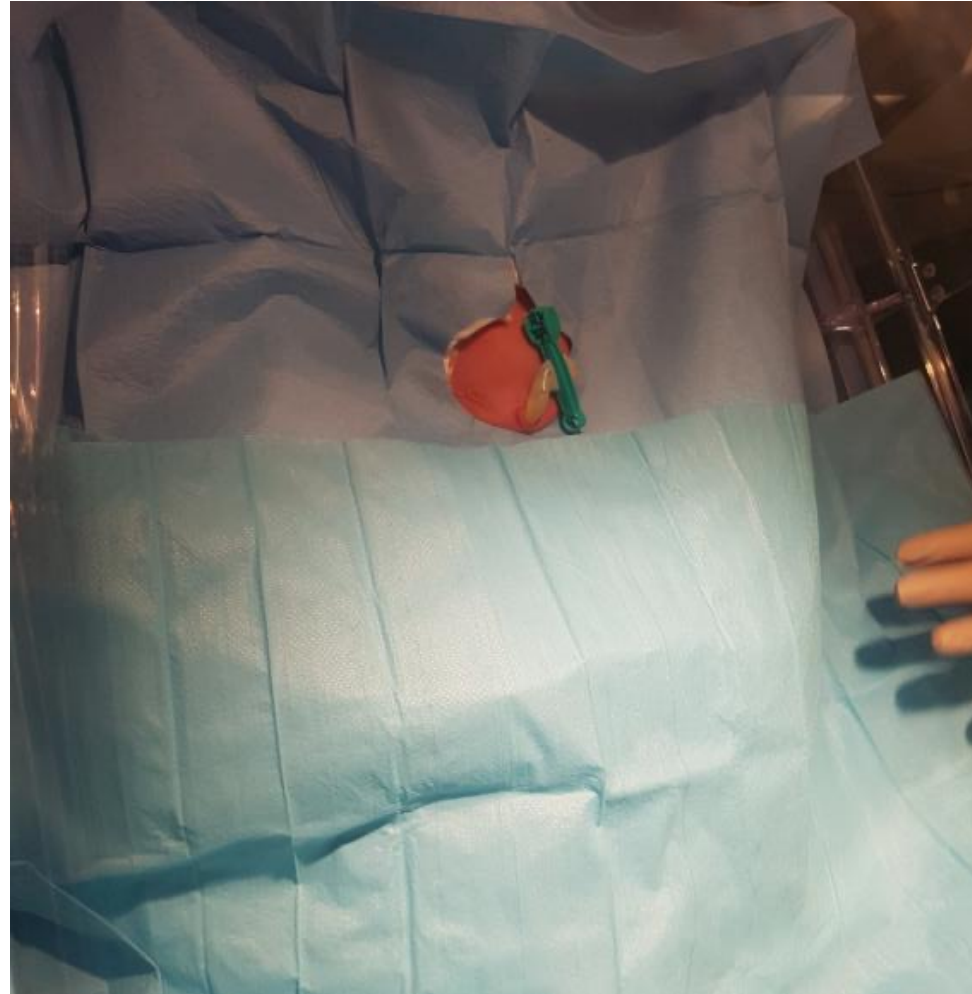
"Instruction for use.."



“Instruction for use..”



“Instruction for use..”



“Instruction for use..”



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6. **Use maximum sterile barrier precautions during CVC insertion** (Quality of Evidence: MODERATE)¹²³⁻¹²⁸
 - a. Use maximum sterile barrier precautions:
 - i. A mask, cap, sterile gown, and sterile gloves are to be worn by all HCP involved in the catheter insertion procedure.
 - ii. The patient is to be covered with a large (“full-body”) sterile drape during catheter insertion.
 - b. These measures should also be followed when exchanging a catheter over a guidewire.

1. **In ICU and non-ICU settings, a facility should have a process in place, such as a checklist, to ensure adherence to infection prevention practices at the time of CVC insertion** (Quality of Evidence: MODERATE)¹⁰¹
 - a. Ensure and document adherence to aseptic technique
 - i. Checklists have been suggested to ensure optimal insertion practices. If used, the documentation should be done by someone other than the inserter.
 - ii. Observation of CVC insertion should be done by a nurse, physician, or other HCP who has received appropriate education (see above) to ensure that aseptic technique is maintained.
 - iii. HCP should be empowered to stop the procedure if breaches in aseptic technique are observed.
2. **Perform hand hygiene prior to catheter insertion or manipulation** (Quality of Evidence: MODERATE)¹⁰²⁻¹⁰⁷
 - a. Use an alcohol-based waterless product or soap and water.
 - i. Use of gloves does not obviate hand hygiene.

7. **Use an alcoholic chlorhexidine antiseptic for skin preparation** (Quality of Evidence: HIGH)^{42,129-134}
- a. Before catheter insertion, apply an alcoholic chlorhexidine solution containing at least 2% chlorhexidine gluconate to the insertion site.
 - i. The antiseptic solution must be allowed to dry before making the skin puncture.
 - ii. Alcoholic chlorhexidine for skin antisepsis to prevent CLABSI in NICU patients should be used when the benefits are judged to outweigh potential risk.
-

La disinfezione cutanea

What is already known on this topic?

- ▶ The 2011 guidelines for prevention of intravascular catheter-related infections recommend the use of at least 0.5% chlorhexidine solution with alcohol for skin disinfection.
- ▶ No recommendations can be made for the safety or efficacy of chlorhexidine in infants aged <2 months.
- ▶ Chlorhexidine skin disinfectants are widely used in neonates, but this solution may cause skin lesions in extremely preterm infants (gestational age <26 weeks).

What this study adds?

- ▶ Adverse skin reactions to both 2% chlorhexidine–70% isopropyl alcohol and aqueous 10% povidone–iodine are uncommon.
- ▶ Infants whose skin is cleaned with povidone–iodine are at significant risk of thyroid dysfunction.

0.2% chlorhexidine acetate as skin disinfectant prevents skin lesions in extremely preterm infants: a preliminary report. ADC 2017
2% chlorhexidine–70% isopropyl alcohol versus 10% povidone–iodine for insertion site cleaning before central line insertion in preterm infants: a randomised trial. ADC 2017
Healthcare Infection Control Practices Advisory Committee. Guidelines for the prevention of intravascular catheter-related infections. Am J Infect Control 2011;39:S1–S34.

La disinfezione cutanea

Table 1 Patient demographics

	CHX-IA (n=148)	PI (n=156)	p Value
Gestational age (weeks)*	27 (2)	27 (2)	0.558
Birth weight (g)*	1017 (289)	1014 (326)	0.92
Skin damage from IMP*	3 (2)	2 (1.3)	0.677
Raised TSH on screening*	0 (0)	12 (7.7)	<0.001
Raised TSH in serum*	0 (0)	10 (6.4)	0.002
Treatment with thyroxine*	0 (0)	8 (5.1)	0.003

0.2% chlorhexidine acetate as skin disinfectant prevents skin lesions in extremely preterm infants: a preliminary report. ADC 2017
 2% chlorhexidine–70% isopropyl alcohol versus 10% povidone–iodine for insertion site cleaning before central line insertion in preterm infants: a randomised trial. ADC 2017
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La disinfezione cutanea

Aree di disinfezione per applicatore monodose:

- 0.67 ml: 5 cm x 8 cm
- 1 ml: 8 cm x 10 cm
- 1.5 ml: 10 cm x 13 cm
- 3 ml: 15 cm x 15 cm



Instructions for using Chloraprep® applicators.

La disinfezione cutanea

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Instructions for using Chloraprep® applicators.

Uso della Clorexidina in TIN...

Allo scopo di minimizzare il rischio delle reazioni senza perdere i vantaggi legati all'uso della clorexidina

- Usare le quantità idonee
- Usare applicatori monodose
- Rimuovere la clorexidina in eccesso (no pooling)
- Usare la soluzione fisiologica e l'asciugatura dopo l'applicazione della clorexidina
- Evitare lo scrubbing della cute

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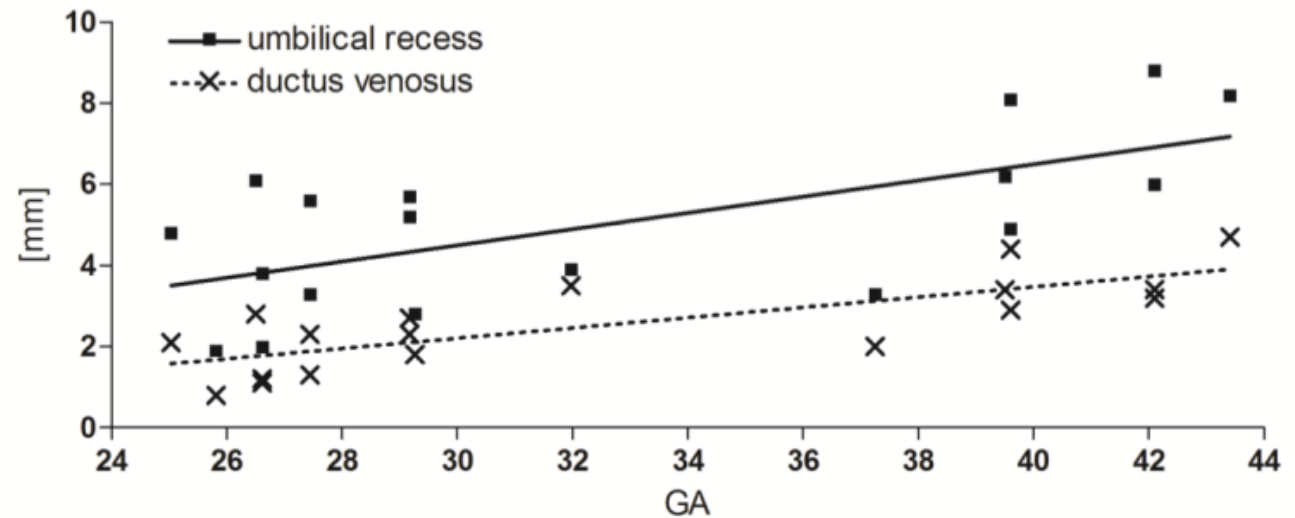
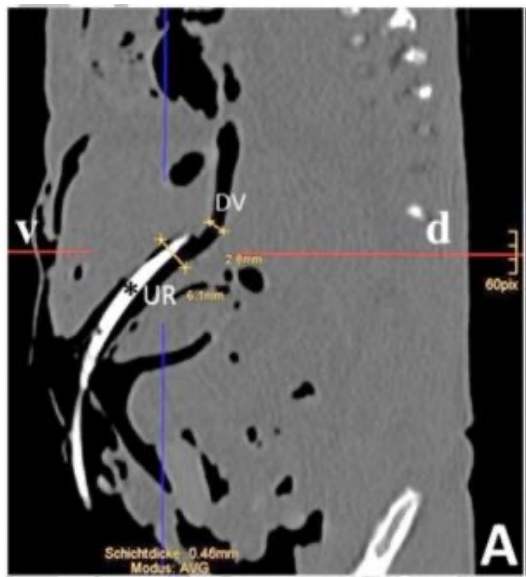
Monolume o Bilume?

Indicazioni al CVO bilume

- a) Neonati che necessitano prelievi ripetuti
- b) Neonati con infusioni continue multiple (ridurre il rischio di *inadvertent boluses*)
- c) Neonati che necessitano di nutrizione parenterale e farmaci ev non compatibili con la parenterale

DIMENSIONE DV???

18 neonati sottoposti a TAC 29 W EG



Investigation of umbilical venous vessels anatomy and diameters as a guideline for catheter placement in newborn. Eifinger. Clin Anat 2018

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Neo-ECHOTIP: A structured protocol for ultrasound-based tip navigation and tip location during placement of central venous access devices in neonates

Giovanni Barone¹ , Mauro Pittiruti² , Daniele G Biasucci³,
Daniele Elisei⁴, Emanuele Iacobone⁴ , Antonio La Greca²,
Geremia Zito Marinosci⁵ and Vito D'Andrea⁶ 

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Table 1. Summary of Neo-ECHO tip.

Catheter	Protocol	Probe	Windows
UVC	Tip navigation	Small sectorial probe, 7–8 MHz	Low subcostal longitudinal view
	Tip location	Small sectorial probe, 7–8 MHz	Subcostal longitudinal view
ECCs inserted via veins of the scalp or of the upper limbs	Tip navigation	Linear “hockey stick” probe, 10–14 MHz	Acoustic windows of RaCeVA and RaPeVA
	Tip location	Small sectorial probe, 7–8 MHz	Bi-caval view; four-chamber apical view; long axis view of SVC
ECCs inserted via veins of the lower limbs	Tip navigation	Linear “hockey stick” probe, 10–14 MHz	Short and long axis view of the femoral vein
	Tip location	Small sectorial probe, 7–8 MHz	Subcostal longitudinal view

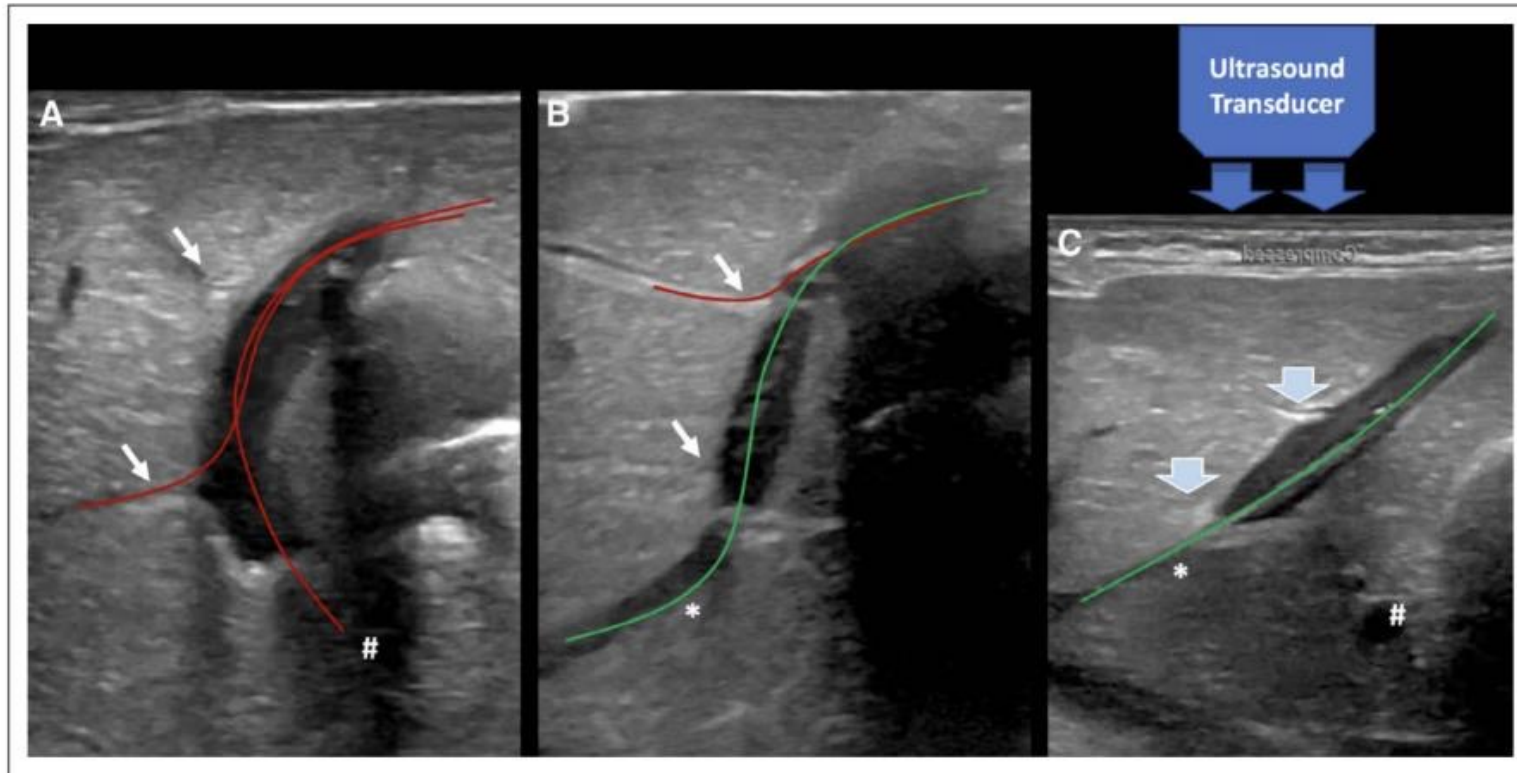
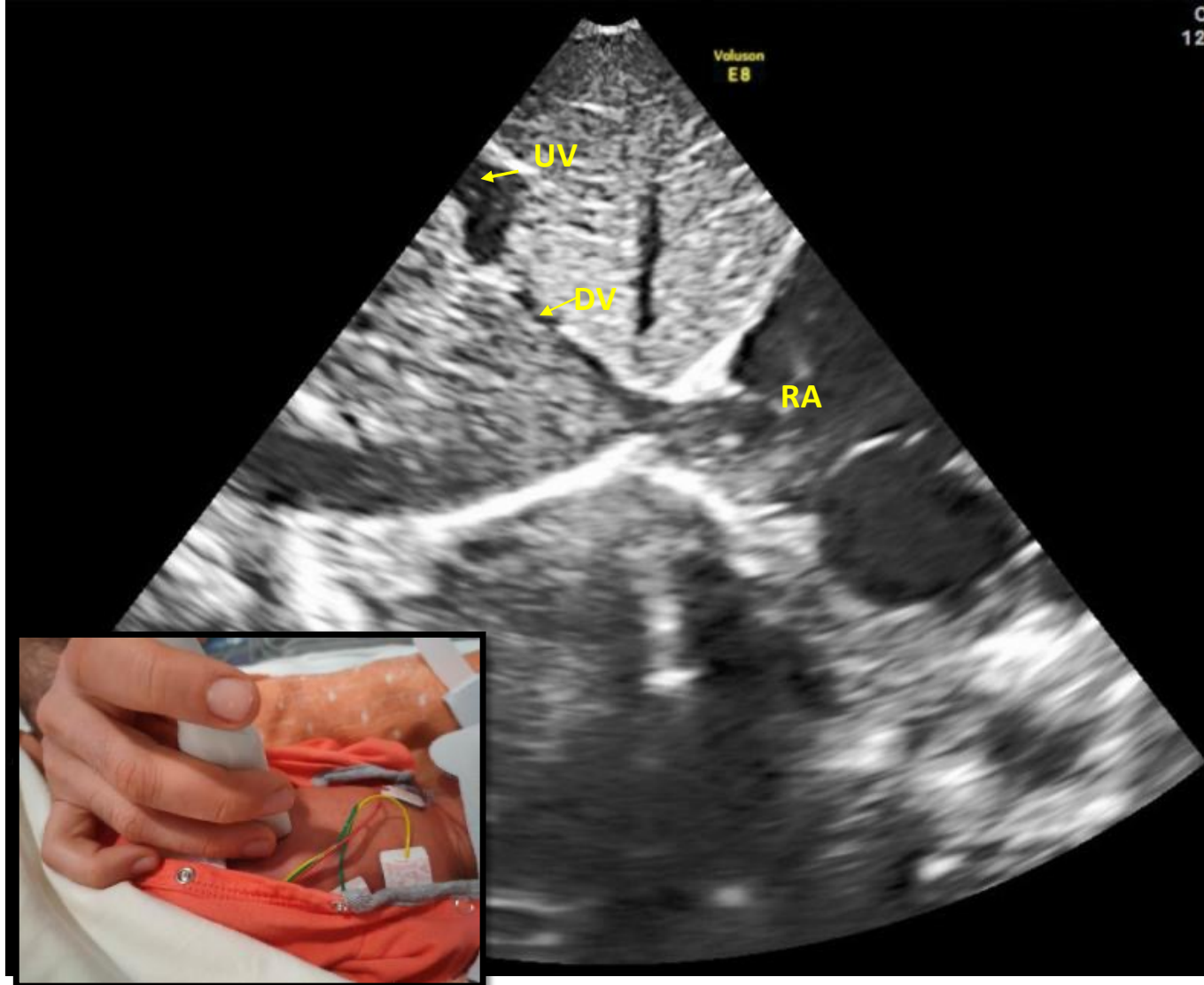


Figure 4. Effect of liver pressure. Ultrasound assists in navigating the path through the portal sinus to the ductus venosus (*), avoiding the left (*small arrows*) and right (#) portal veins that readily accept the umbilical venous catheter and result in malposition. **A** and **B**, *Red lines* accentuate the potential, incorrect courses taken by the catheter into the portal veins. The *green line* represents the optimal catheter course. **C**, With titrated liver pressure, the left portal veins are compressed (*large arrows*), the caudal turn into the right portal veins (#) becomes more acute, and the "S-turn" (seen in **B**) through the portal sinus to the ductus venosus becomes flatter and more favorable.

This is a B-mode ultrasound image of the Aranzio duct. The image is presented in a triangular sector. A prominent, bright, echogenic structure is visible in the lower central portion of the field, which is identified by the text as a CVO (Cerebral Venous Occlusion). The surrounding tissue shows a typical speckled echotexture. In the upper left corner, there is a small, faint label that reads "Rapid".

CVO nel dotto di Aranzio





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La stabilizzazione del CVO: the unsolved issue

- F. Choose a method for securing the UVC and UAC based on promotion of security, skin integrity, decreasing complications, and ease of utilization and management. There is currently a lack of evidence demonstrating the superiority of one method over others. These catheters are at risk for significant complications resulting from migration and dislodgement, such as extravasation, thrombosis, and necrotizing enterocolitis. Powered RCTs are needed to establish the superiority of one securement method over another.^{18,23,26,33,34} (IV)
1. Organizational protocols should be developed also recognizing that neonates are at high risk for catheter-associated skin injuries (see Standard 55, *Catheter-Associated Skin Injury*).¹⁰ (IV)



***Infusion Therapy
Standards of Practice***

The logo features the text "Infusion Therapy Standards of Practice" in a bold, italicized, white serif font. It is set against a dark red background with horizontal lines and a small white dot on the left side.

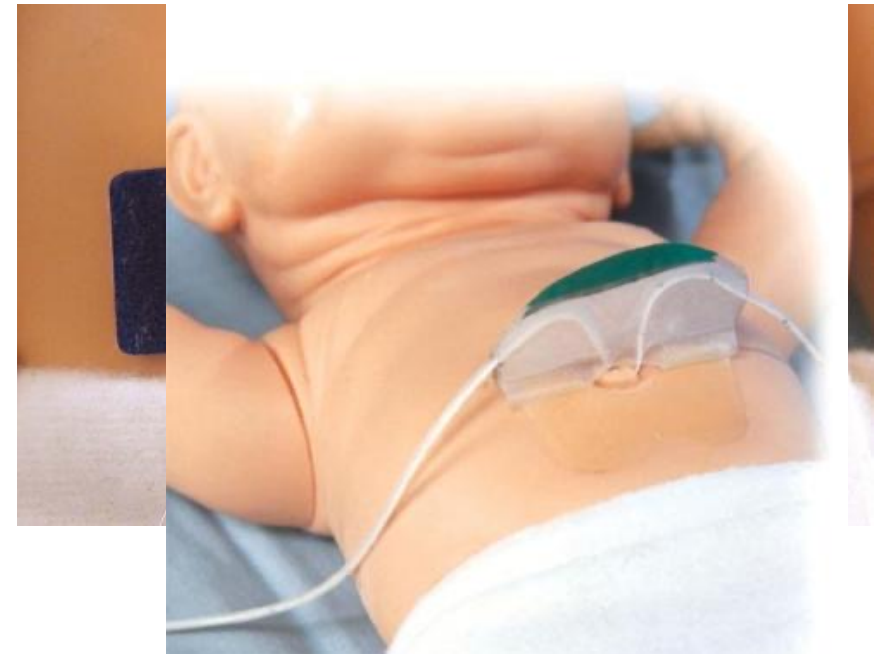
The unsolved issue

Jacqueline McGrath, PhD, RN, FNAP, FAAN ○ Section Editor

Evidence-Based Practice Briefs

TABLE. Comparison of Umbilical Cord–Securing Techniques Based on Discussion of Advantages Versus Disadvantages

Technique	Advantages	Disadvantages	Price
1. Anchoring (with or without stitching)	No adhesives on skin.	Pain at umbilical site.	Negligible
2. Goal post or bridging	Potentially anchored more securely.	Skin irritation and infection. Catheter adjustments may require new goal post.	Negligible
3. DuoDERM method	Quick securing of umbilical cord lines.	Skin irritation and infection. Not ideal for infants requiring ultrasound of abdomen or heart.	~\$5 DuoDERM and < \$1 for Tegaderm
4. NeoBridge by Neotech Products	Hydrocolloid gel secured to abdomen. Adjustable flaps allow easy catheter adjustments.	Expensive. Skin irritation and infection.	\$8 to \$10/NeoBridge





Umbilical Venous Catheter Update: A Narrative Review Including Ultrasound and Training

Vito D'Andrea^{1*}, Giorgia Prontera¹, Serena Antonia Rubortone¹, Lucilla Pezza¹, Giovanni Pinna¹, Giovanni Barone², Mauro Pittiruti³ and Giovanni Vento¹

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Atlas of Procedures in Neonatology (14). In conclusion, in the current literature there are no data that support one method over another, so the choice is made according to local guidelines, medical skills, and to the infant's conditions. A randomized controlled trial is in progress in our neonatal unit and proposes the use of cyanoacrylate glue applied to the umbilical stump to reinforce the securing suture and ensure a better stabilization (52). Probably a strategic choice could include the use of a sutureless device, the use of cyanoacrylate glue in order to provide immediate hemostasis and to prevent dislodgement, and the application of a transparent semipermeable dressing with a high level of moisture transmission rate.

The unsolved issue



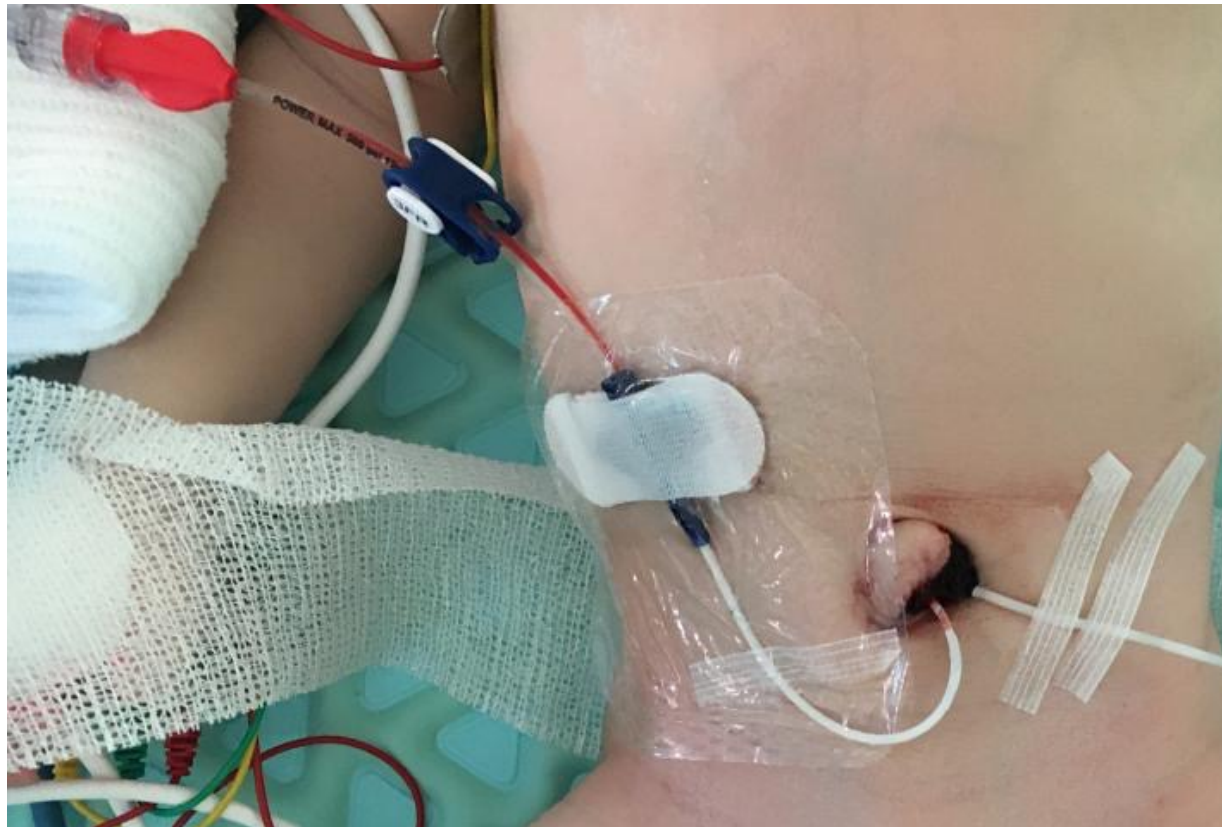
Gripplock + punti di sutura sulla
gelatina + MST



Colla + statlock

The unsolved issue

Griplock + colla + MST



Statlock Neonatale

AN APPLICATION TECHNIQUE (use saline wipe as needed)

TECHNIQUE D'APPLICATION (utiliser une lingette imbibée de sérum physiologique si nécessaire)

EINE BEFESTIGUNGSTECHNIK (bei Bedarf Tupfer mit physiologischer Kochsalzlösung verwenden)

UNA TECNICA DI APPLICAZIONE (usare una salvietta di salina secondo necessità)

UNA TÉCNICA DE APLICACIÓN (use un paño impregnado en solución salina cuando sea necesario)

METHODE VAN AANBRENGEN (gebruik, indien nodig, een doekje met fysiologische zoutoplossing)

UMA TÉCNICA DE APLICAÇÃO (utilize a limpeza com soro fisiológico conforme o necessário)

ΜΙΑ ΤΕΧΝΙΚΗ ΕΦΑΡΜΟΓΗΣ (χρησιμοποιήστε φυσιολογικό ορό, όπως απαιτείται)



STATLOCK® NEONATALE

8. CARATTERISTICHE TECNICHE

- Dispositivo di fissaggio adesivo con dorso in Tyvek® flessibile
- Superficie inferiore composta da sistema adesivo in acrilico, ipoallergenico.







From: A Novel Method of Securement for Umbilical Lines To Reduce Malposition Rates

Pediatrics. 2021;147(3_MeetingAbstract):293-295. doi:10.1542/peds.147.3MA3.293

Patient Demographics	Mean ± SD (range)
LifeBubble patients, N	32
Gestational Age (Weeks+Days)	35 ± 4.5 (24+3 - 40)
Birth Weight (g)	2340 ± 945 (794 - 3870)
Birth Length (cm)	45 ± 6 (34 - 52)
Male, N	26
Female, N	6
Average day of life LifeBubble was placed (days)	1 ± 1 (0 - 4)
Line Demographics	Mean ± SD (range)
Total UVCs, N	23
5 Fr, N	17
3.5 Fr, N	6
Depth of initial insertion (cm)	9 ± 2 (7-13)
UVC removed due to malposition, N	4
Time to removal for malposition, hr:min	101:35 ± 73:13
Patients with UAC & UVC, N	14
Total UACs, N	22
5 Fr, N	11
3.5 Fr, N	11
Depth of insertion (cm)	16 ± 3 (12.5 - 21.5)
UAC removed due to malposition, N	0

Patient and Line Demographics of LifeBubble Study

Figure Legend:

Patient and Line Demographics of LifeBubble Study

Statlock vs Griplock vs Lifebubble

- ✓ Statlock e Lifebubble stabilizzano il catetere
- ✓ Il Griplock rappresenta solo un controfissaggio dell'aletta
(necessita di un altro sistema di stabilizzazione)
- ✓ Pochi dati in letteratura. Necessità di studi randomizzati

Impianto Sicuro del Catetere Venoso Ombelicale nel neonato



1. Valutazione ecografica pre-procedurale.
2. Utilizzo di un pack procedurale pre-assemblato.
3. Tecnica asettica appropriata: igiene delle mani, massime protezioni di barriera e antisepsi cutanea con clorexidina 2% in IPA 70%.
4. Incannulamento della vena ombelicale usando il catetere più piccolo sulla base delle necessità infusionali del paziente (mono/bilume)
5. Utilizzo dell'ecografo per la tip navigation e la tip location intra-pocedurale (secondo il protocollo NeoECHOTip).
6. Stabilizzazione del catetere e protezione del sito di emergenza (colla in cianoacrilato, membrana semipermeabile trasparente e "sutureless device")
7. **Controlli seriati della posizione della punta usando l'ecografia (24-48 ore)**
8. Rimozione precoce (entro 4-5 giorni)

Daily assessment

- La migrazione del catetere è descritta soprattutto nelle prime 24-48 ore
- La gelatina di Wharton si essicca e il moncone ombelicale si accorcia
- 65 Neonati con cateteri fissati con punto + NeoBridge

Table 1 Ultrasound findings of catheter tip position

	First ultrasound, n=65	Second ultrasound, n=52	Third ultrasound, n=42	Fourth ultrasound, n=24
Good position, n (%)	25 (38.5)	40 (77)	24 (57)	13 (54.2)
Malposition, n (%)	40 (61.5)	12 (23)	18 (43)	11 (45.8)
Right atrium, n (%)	17 (26.2)	6 (11.5)	9 (21)	1 (4.2)
Foramen ovale, n (%)	6 (9.2)	1 (2)	2 (5)	2 (8.3)
Left atrium, n (%)	15 (23.1)	3 (5.7)	–	1 (4.2)
Hepatic vessels, n (%)	2 (3)	2 (3.8)	7 (17)	7 (29.1)
Migration rate, n (%)	–	9 (17)	13 (31)	7 (29.1)

- 29/58 (50%) dei neonati hanno nel complesso avuto fenomeni di migrazione
- Solo il 50% dei neonate avevano un CVO normoposizionato alla fine dello studio

Can UVCs migrate from a safe position over time?

In neonates with a UVC in situ [patient] which was felt to be in a safe position following insertion [test], can we assume it will remain in a safe position [outcome]?

Franta *et al* found that 50% of UVCs in infants born <32 weeks' gestation had migrated during the first week after insertion.¹⁶ All neonates with a UVC in situ, whether or not it is initially in an optimal position, need to be monitored closely for all complications, not just those associated with a line in an ideal position. Some centres advocate regular proactive reassessment of UVC position, which, in light of Franta's data, seems prudent.¹⁴

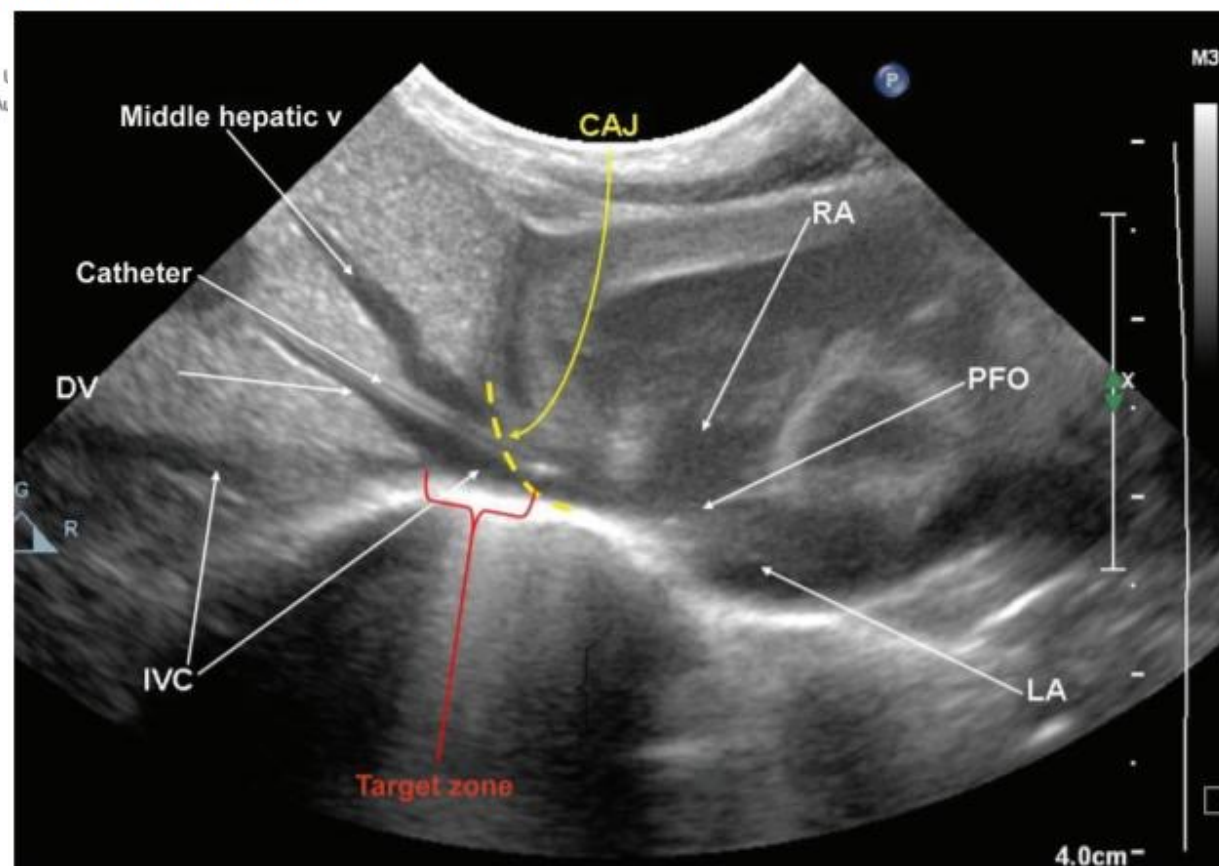
ORIGINAL ARTICLE

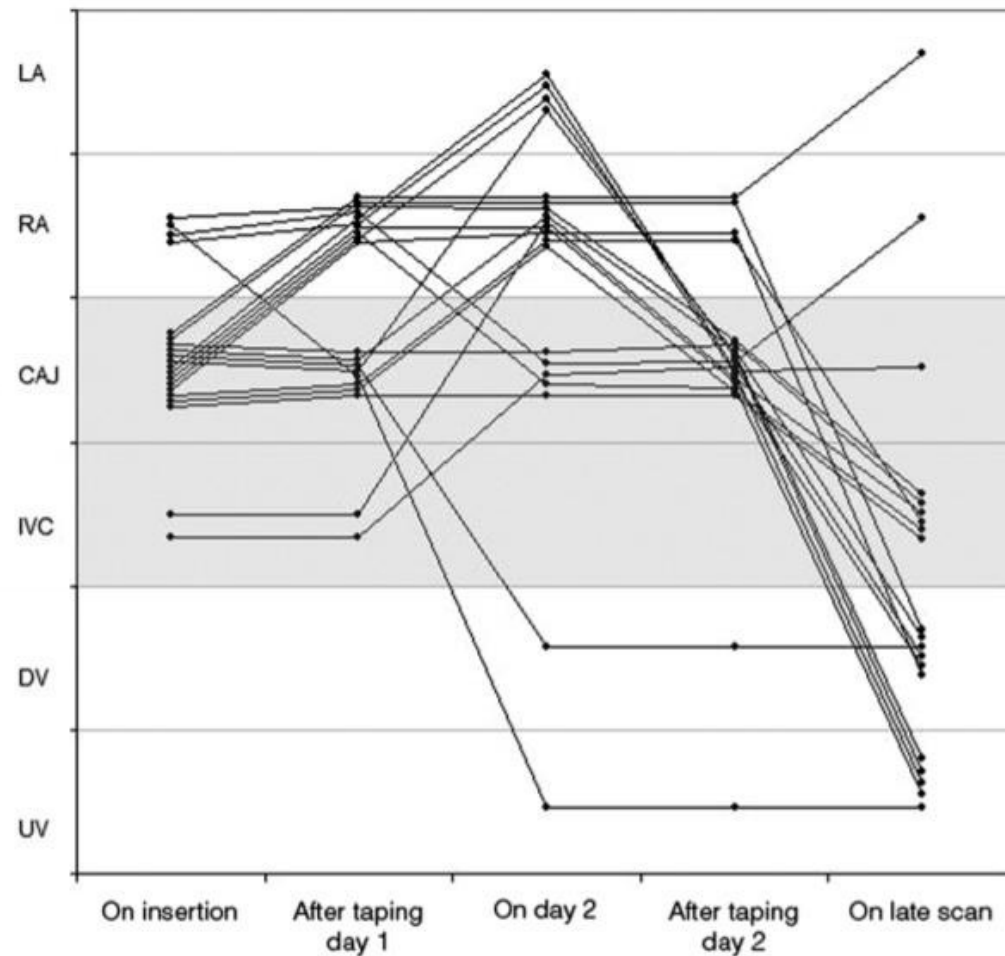
Study of movement of umbilical venous catheters over time

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an adjustment in catheter position.²⁰ Despite this, in our study, 65% of catheters were positioned outside of the target zone on the late scan. It would seem prudent, therefore, to regularly assess catheter tip position, with ultrasound if possible. We now recommend that a daily assessment of UVC tip position is made with either an X-ray or an ultrasound scan until it is removed.

Inadvertent Migration of Umbilical Venous Catheters Often Leads to Malposition

Gerdina H. Dubbink-Verheij^a Remco Visser^a Ratna N.G.B. Tan^a

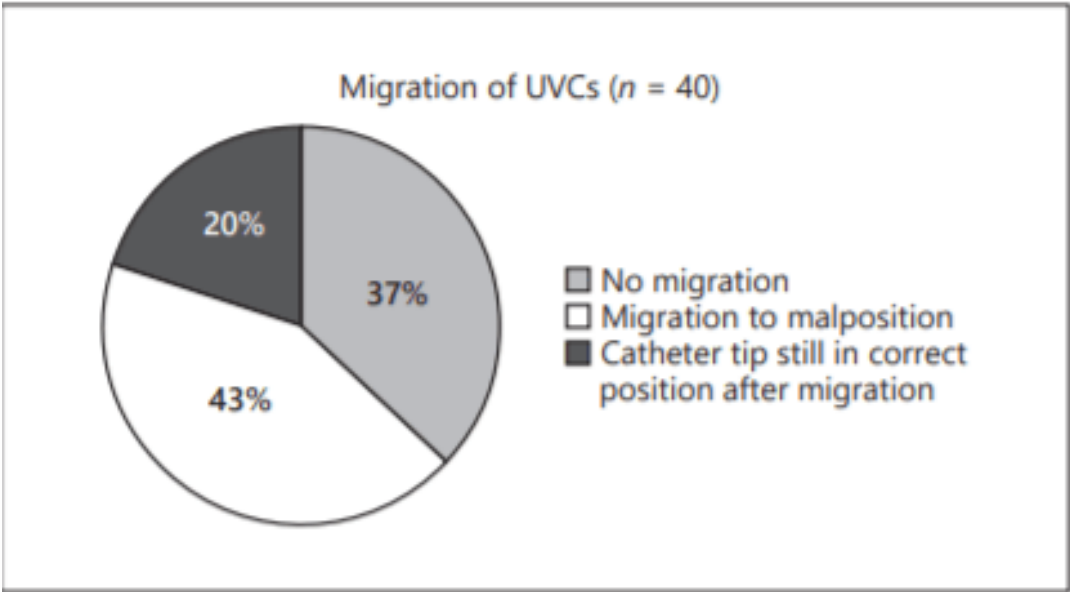


Table 1. Migration of umbilical venous catheters

	Day 3 (n = 37)	Day 7 (n = 24)	Day 8 (n = 11)
No migration	16 (43)	15 (63)	9 (82)
Migration	21 (57)	9 (38)	2 (18)
Inward, too high	11	5	1
Inward, still correct	1	–	–
Outward, too low	2	–	–
Outward, still correct	7	4	1

Data are represented as number (percentage). Time expressed in days of umbilical venous catheterization. Day 1: insertion day, Day 3 (IQR 3–3), Day 7 (IQR 6–7), Day 8 (IQR 8–10).

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7. Controlli seriati della posizione della punta usando l'ecografia (24-48 ore)
8. **Rimozione precoce (entro 4-5 giorni)**

DWELL TIME UVC

Clinical Bottom Lines

- 1 Dedicated teams should be used to maintain central lines within the neonatal intensive care unit as part of an overall CLABSI prevention strategy (Level 4 evidence).
- 2 If longer term **>5–7 days** central venous access is required, replacement of a UVC with a PICC may be beneficial, if combined with a PICC maintenance team (Level 4 evidence).
- 3 A large multi-centre randomised trial is needed to clearly answer the question of whether routine replacement of UVCs and PICCs at days 5–7 or earlier will result in lower rates of CLABSIs in neonates that require longer term central access.
- 4 The most effective way to minimise CLABSIs in neonates is not to have a central line in situ. Need for central lines should be assessed on a daily basis and removed as soon as no longer required.

Remove umbilical catheters promptly when no longer needed or if a complication occurs.

1. Consider limiting UVC dwell time to 7 to 14 days; risks of infection are increased with longer dwell times. UVC removal at **7 days** followed by insertion of a peripherally inserted central catheter (PICC) for continued infusion therapy is one strategy to reduce central line-associated bloodstream infection.^{4,30,32,33} (III)

*Infusion therapy standard of practice.
Journal of infusion nursing 2016*

2. Consider UVC removal at **4 days** followed by insertion of a PICC for continued infusion as one infection prevention strategy.⁴² (V)

*Infusion therapy standard of practice.
Journal of infusion nursing 2021*



Recommendations for Prevention and Control of Infections in Neonatal Intensive Care Unit Patients: Central Line-associated Blood Stream Infections

Centers for Disease Control and Prevention
National Center for Emerging and Zoonotic Infectious Diseases
Division of Healthcare Quality Promotion

Date: February 2022

Recommendation 9.C. Consider removal of umbilical venous catheters at or before 7 days of dwell time in neonatal intensive care unit (NICU) patients. **Conditional Recommendation**

- **Supporting Evidence:** Four observational studies.^{6, 11, 27, 40}
- **Level of Confidence in the Evidence:** The level of confidence in this evidence is very low due to imprecision and inconsistency across studies. Only one study was conducted in the current standard of care.⁴⁰
- **Benefits:** Increasing risk of infection was reported in association with increasing UVC dwell time, suggesting a benefit to removing UVCs at the earliest opportunity. One study suggested the risk of CLABSI was significantly different at 4 days;¹¹ however, this study used data collected before the

ARTICLE



Adverse events associated with umbilical catheters: a systematic review and meta-analysis

Kim Gibson¹✉, Rebecca Sharp¹, Amanda Ullman^{2,3}, Scott Morris^{4,5}, Tricia Kleidon⁶ and Adrian Esterman⁷

14226 CVO

4228 CAO

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Table 2. Pooled incidence proportion and IR for specific AEs associated with UVCs.

Proportion of AEs

Incidence rates of AE per 1000 catheter days

87], which reported a UVC failure of 11%. Our previous work [88] identified a broad range of risk factors for umbilical catheter-associated AEs such as increased dwell time, prematurity, low birth weight, catheter material, malposition, and maternal characteristics. As there has been no improvement in umbilical catheter outcomes over the last 5 years, there is a need for research to determine strategies to reduce the risk of AEs for this vulnerable population.

Local injury	1	366	68	18.58	n/a	0				
Hepatic	2	1457	5	1.51 ^d	0.45–9.55	1	8315	1	0.12	n/a
Cardiac	2	1397	3	0.26 ^a	0.06–0.60	1	8315	3	0.36	n/a
Breakage	1	2017	8	0.40	n/a	1	15,289	8	0.52	n/a

ARTICLE

Umbilical catheter-associated complications in a level IV neonatal intensive care unit

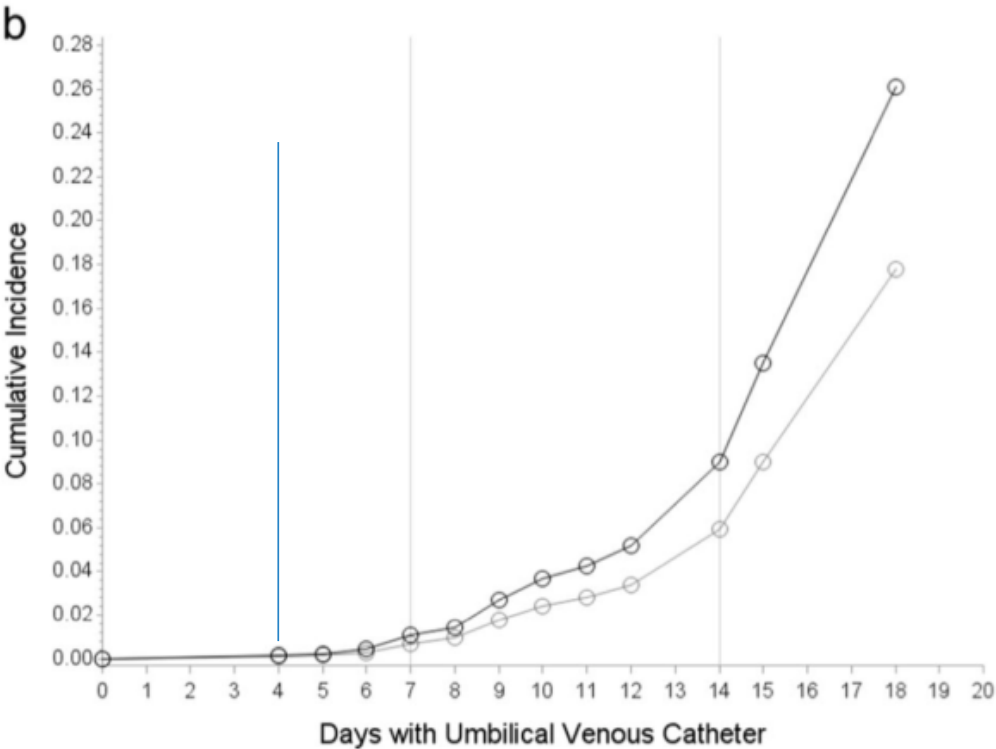


Table 1 Data related to umbilical arterial and venous catheter utilization.

Variable	Umbilical arterial catheters (N = 2035)	Umbilical venous catheters (N = 2017)
Lumens ^a		
Single	1982 (97.4)	1391 (69)
Double	53 (2.6)	626 (31)
Total dwell time (days) ^b	5.5 (1–22)	7.6 (1–21)
Complication ^a	51 (2.5)	269 (13.3)
Break/rupture	20 (1)	8 (0.4)
Occlusion	10 (0.5)	5 (0.25)
Catheter tip malposition	10 (0.5)	232 (11.5)
Poor perfusion to lower extremity	6 (0.3)	0
CLABSI	2 (0.1)	19 (0.9)
Thrombus	2 (0.1)	3 (0.15)
Effusion	0	2 (0.1)
Break/rupture and CLABSI	1 (0.05)	0
Dwell time to the onset of any complication (days) ^b	4.4 (1–20)	6 (1–20)
Dwell time to the onset of a complication, excluding catheter tip malposition (days) ^b	4.6 (1–16)	9 (7–11)

Il protocollo ISCaVO: Rimini e Gemelli

Gennaio 2021-Aprile 2023: 427 CVO

EG	27,2 $\pm$ 2 (22-41)
PN	824 $\pm$ 154 (340-4270)
Posizione centrale (si/no)	389/427 (91%)
Permanenza del catetere	3 $\pm$ 1 (1-5)
Rimozione elettiva (si/no)	372/427 (87%)
Migrazione	12 (2,8%)
Trombosi in VCI	2 (0,5%)
Infezione	1 (0,2%)
Altro	2 (0,5%)



Conclusioni

Il protocollo ISCaVO

1. Si fonda su un uso globale dell'ecografo (pre impianto - all'impianto – post impianto).
2. Incrementa la percentuale di bambini con una posizione idonea del CVO al termine della procedura.
3. Incrementa il tasso di rimozione elettiva del CVO.
4. Minimizza le complicanze (infettive e non).

A newborn baby is lying in a clear, oval-shaped medical incubator. The baby is wrapped in a white cloth and has several medical tubes connected to their chest. The incubator is resting on a surface with a patterned cloth. The image is tilted at an angle.