

CATETERI VENOSI OMBELICALI: GLI SVILUPPI FUTURI



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X Congresso GAVeCeLT
XI PICC Day
4-6 Dicembre Firenze

CATETERI VENOSI OMBELICALI: GLI SVILUPPI FUTURI

I have no actual or potential conflict of interest in relation to this presentation



AGENDA

Indicazioni ai cateteri venosi ombelicali

La scelta del catetere

“Can we do it better?”

Durata del CVO

Take Home Messages



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Indicazioni ai CVO

Practice Criteria

A. Establish organizational guidelines for appropriate use of UACs and UVCs based on gestational age, birth weight, and severity of illness in an effort to decrease their unnecessary use and associated complications.¹⁻³ (IV)

30.2 The clinical need for the umbilical catheter is assessed on a daily basis and promptly removed when no longer indicated.

One + all | we care

Royal Cornwall Hospitals 
NHS Trust

INSERTION OF UMBILICAL LINES – ARTERIAL (UAC) and VENOUS (UVC) - NEONATAL CLINICAL GUIDELINE

Umbilical Venous Catheterisation (UVC)

- Emergency venous access
- Central venous access for maintenance intravenous fluids, hypertonic fluids/drugs, TPN, blood products
- Exchange transfusion



Assessment

Indications: (2, 3, 4, 5)

Central venous access in neonates in the first 14 days of life

- Administration of medication, parenteral nutrition and IV fluids
- Exchange or partial exchange transfusion
- Central venous pressure monitoring
- Frequent blood sampling in unstable patients without arterial access



Norfolk and Norwich University Hospitals 
NHS Foundation Trust

Trust Guideline for the Management of: Insertion of Umbilical Venous Catheter (UVC)

Indications¹

- Venous access for low birth weight infants to avoid multiple peripheral cannulation
- Emergency vascular access for resuscitation of infants at birth
- Exchange transfusion

NTS Clinical Guideline



Indications for Umbilical Venous Catheter

- During resuscitation for administration of emergency drugs/fluids
- Difficult peripheral IV access
- Extreme prematurity
- Infusion of hypertonic solutions (eg >12.5% dextrose)
- Administration of vaso-active drugs
- Can be used for measurement of central venous pressure

VIDEOS IN CLINICAL MEDICINE

Umbilical Vascular Catheterization

JoDee Anderson, M.D., Douglas Leonard, M.D., Dana A.V. Braner, M.D.,
Susanna Lai, M.P.H., and Ken Tegtmeyer, M.D.

INDICATIONS

Umbilical-vessel catheters are indicated for use in neonates in unstable condition, including those who require frequent monitoring of blood gas, more than 40% oxygen, continuous monitoring of blood pressure, administration of high-osmolality fluids such as parenteral nutrition, or emergency vascular access. Umbilical-vessel catheterization may be indicated when attempts to obtain peripheral access are unsuccessful.



Standardizing Umbilical Catheter Usage in Preterm Infants

abstract

BACKGROUND AND OBJECTIVE: Absence of guidelines on umbilical arterial catheter (UAC) and umbilical venous catheter (UVC) use and inability to predict the hospital course may sway the frontline staff to overuse umbilical catheters in preterm infants. Our objective was to evaluate the feasibility of implementing guidelines standardizing the use of umbilical catheters and its impact on the incidence of sepsis and resource use.

TABLE 1 Guidelines for Vascular Access in Preterm Infants <33 Weeks' Gestation

Gestation	UVC	UAC	PIV
≤26 wk	Recommended	Recommended	
27–28 wk	Recommended	Recommended for selected cases ^a	
≥29 wk	Avoid except in selected cases ^{a,b}	Recommended for selected cases ^a	Recommended

Nurses were to inform the staff neonatologist if PIV could not be established after 4 attempts.

^a Use only if the patient is intubated and ventilated, or $\text{FiO}_2 > 40\%$ on continuous positive airway pressure, or the patient is hemodynamically unstable, needing fluid bolus or inotropes.

^b Difficulty establishing PIV access.

Standardizing Umbilical Catheter Usage in Preterm Infants

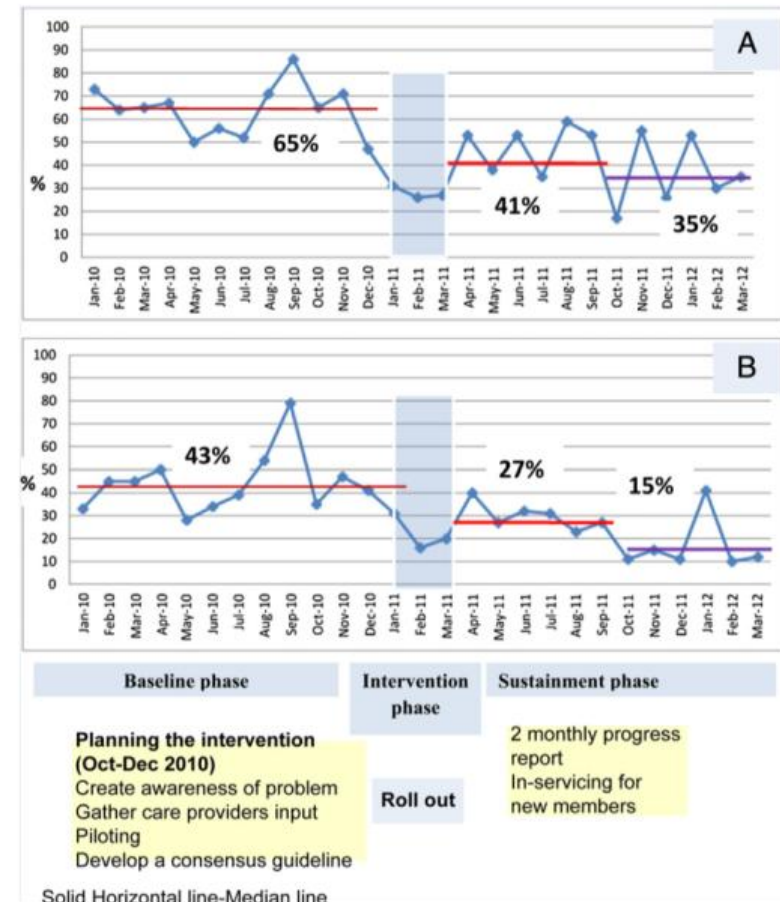


FIGURE 2
Percentage of infants receiving UVC (A) and UAC (B) per month over time during the 2 time periods.

Indicazioni TIN UCSC

EG (sett)	Vena Omb.	Arteria Omb.	Vena Perif.
<26	SI	SI, se A o B	NO
27 - 28	SI	SI, se B	NO
29 - 31 + A o B o C o D o E o G	SI	NO	NO
29 - 31	NO	NO	SI
32 - 33 + A o B o C o D o E	SI	NO	NO
32 - 33 + F	NO	NO	SI
32 - 33	NO	NO	NO
≥ 34 + A o B o C o D o E	SI	NO	NO
≥ 34 + F	NO	NO	SI
≥ 34	NO	NO	NO

- A. Ventilazione assistita con tubo OT
- B. Instabilità emodinamica
- C. CPAP con Fio₂ >30%
- D. Difficoltà reperire accesso periferico
- E. SGA + centralizzazione del circolo/AED/ARED
- F. PN < 1500 g
- G. PN ≤ 1000 g



AGENDA

Indicazioni ai cateteri venosi ombelicali

La scelta del catetere

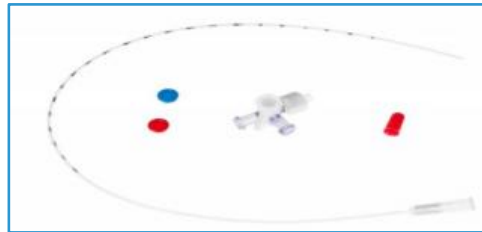
“Can we do it better?”

Durata del CVO

Take Home Messages

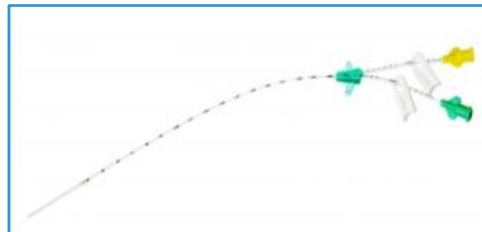
La scelta del CVO

Monolume in
PUR



Ø Est. Fr.	2.5	3.5	4	5	8
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Bilume in
PUR

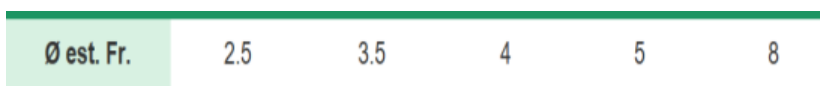
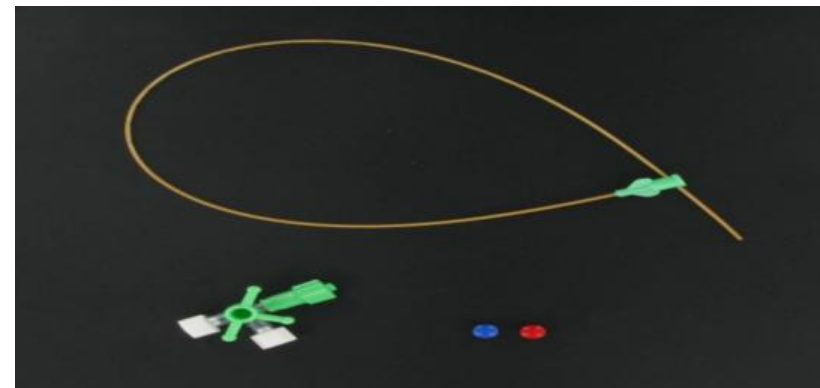


CATETERE (PUR) O.R.X.				FLUSSO ml/min		CAPACITÀ ml	
Ø Est. mm	Ø Fr	Lungh. cm	Lumi	Distale	Prossimale	Distale	Prossimale
1.4	4	20	2 x 20 G	15	15	0.26	0.26
1.4	4	40	2 x 20 G	6	6	0.28	0.28
1.7	5	40	2 x 19 G	9	9	0.30	0.30

I cateteri in PUR sono da preferire rispetto a quelli in polietilene e polivinile in quanto riducono la colonizzazione

La scelta del CVO

Catetere
Ag ION



Da preferire in neonati con età gestazionale < 30 W

La scelta del CVO

- 13-20% dei neonati con catetere sviluppano CRBSI (1)
- Colonizzazione intraluminale o extraluminale (20%) dei cateteri
- L'impiego di “lock solutions” a base di eparina e/o antibiotici è di grande interesse

Gli ioni d'argento hanno una funzione batteriostatica attraverso 3 meccanismi:

1. Danneggiano la parete cellulare del batterio
2. Danneggiano i mitocondri batterici
3. Inibiscono la riproduzione batterica

La scelta del CVO

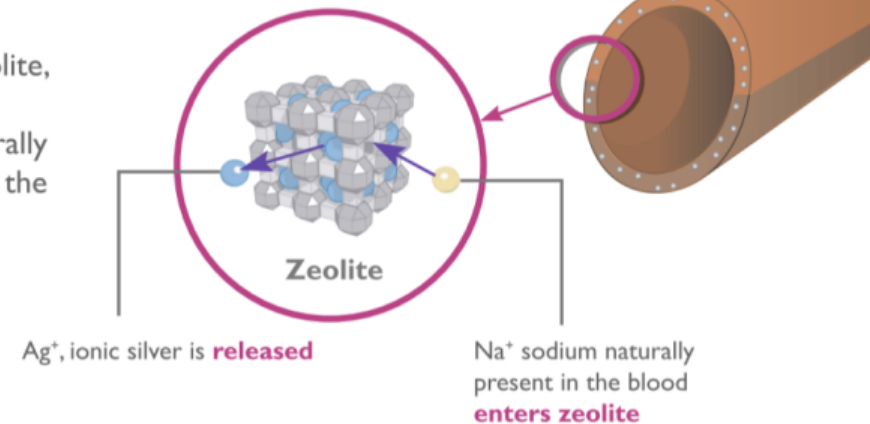
The **expert** umbilical catheter is the only umbilical catheter with an integrated antimicrobial technology, the AgION™ technology, to fight against CRBSI in NICUs.

The AgION™ technology is made of ionic silver bound into zeolite, a bio-inert ceramic integrated in the catheter material⁽¹¹⁾. When the catheter comes in contact with blood the zeolite naturally releases the Ag⁺ ions and replace them by Na⁺ ions present in the blood. It is a pure ionic exchange.

Ionic silver is a highly efficient antimicrobial technology with^(11,12):

- a broad spectrum of action on gram⁺, gram⁻ and fungi
- a low toxicity
- a tri-modal action

The AgION™ technology



Al contrario delle convenzionali strategia di «lock solutions» avrebbe le potenzialità di agire sulla colonizzazione intra ed extraluminal.

La scelta del CVO

- RCT
- Non-cieco
- Catetere impregnato vs Catetere in poliuretano
- **EG ≤ 30**
- **Definite CRBSI: EMO + da v. periferica e catetere + punta del catetere positiva+ segni clinici+ catetere in sede o entro 48 h dalla rimozione**
- Probable CRBSI: EMO negativa; punta del catetere positiva; segni clinici; catetere in sede o entro 48 h dalla rimozione
- BSI without source: EMO positiva; punta del catetere negativa; segni clinici; catetere in sede o entro 24 h dalla rimozione

Table 1

Characteristics of study groups. Mean $\pm$ (SD) or rate (%).

	Polyurethane catheter group (n = 41)	AgION catheter group (n = 45)	p
Gestational age (weeks)	26.2 $\pm$ 1.5	26.2 $\pm$ 2.0	0.99
Birth weight (g)	796 $\pm$ 203	840 $\pm$ 190	0.40
Stay in hospital (days)	85 $\pm$ 35	70 $\pm$ 33	0.04
Case fatality rate for CRBSI	4 (7)	0	0.04
Mortality	5 (10)	4 (9)	0.73
Duration of UVC (days)	8.5 $\pm$ 4.4	10.8 $\pm$ 4.7	0.02

Table 2

Occurrence of catheter colonization and catheter-related bloodstream infection (CRBSI), and blood-stream infection (BSI) in study groups. Rate (%).

	Polyurethane catheter group (n = 41)	AgION catheter group (n = 45)	p
Colonization, n (%)	2 (5)	2 (2)	0.66
CRBSI	9 (22)	1 (2)	0.005
• Definite, n (%)	8 (20)	1 (2)	0.01
• Probable, n (%)	1 (2)	0 (0)	NA
BSI without a source	1 (2)	1 (2)	0.48

Reduction of catheter-related bloodstream infections in preterm infants by the use of catheters with the AgION antimicrobial system. EHD 2013

La scelta del CVO

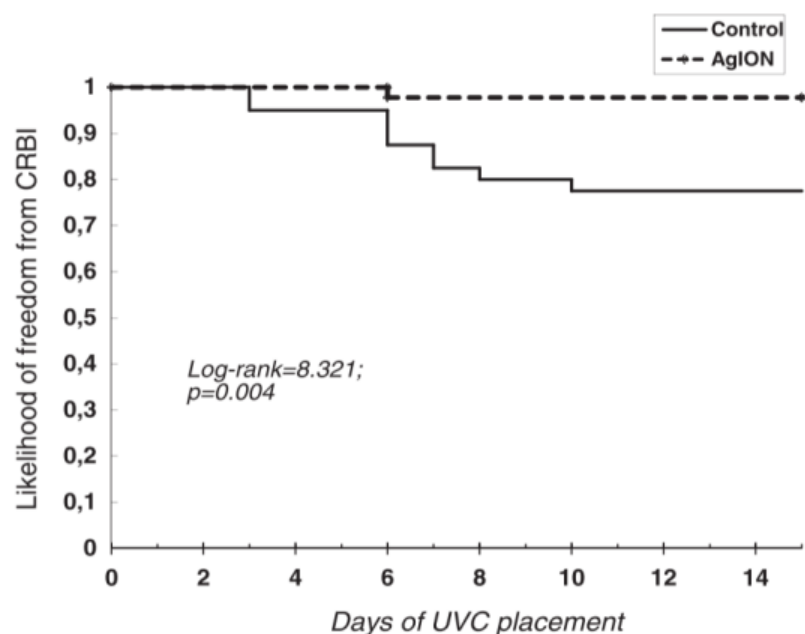


Fig. 2. Kaplan-Meier estimates of the cumulative likelihood of freedom from CRBSI in the 2 study groups.

CRBSIs were caused by *Enterobacter aerogenes* in the patient in the AgION group and CoNS in the control group patients (n=9); BSI without a source was caused by *P. aeruginosa* in the AgION group (n=1) and by CoNS in the control group (n=1).

Multivariate analysis demonstrated that non-impregnated catheter use (OR 12.5, 95% CL 2.06–75.9) and catheter placement for more than 7 days (OR 5.1, 95% CL 1.13–23.6) increased the risk of developing a CRBSI in our population.

There was no case of intolerance to the AgION catheters and none of these catheters had to be removed due to a local skin infection.

La scelta del CVO

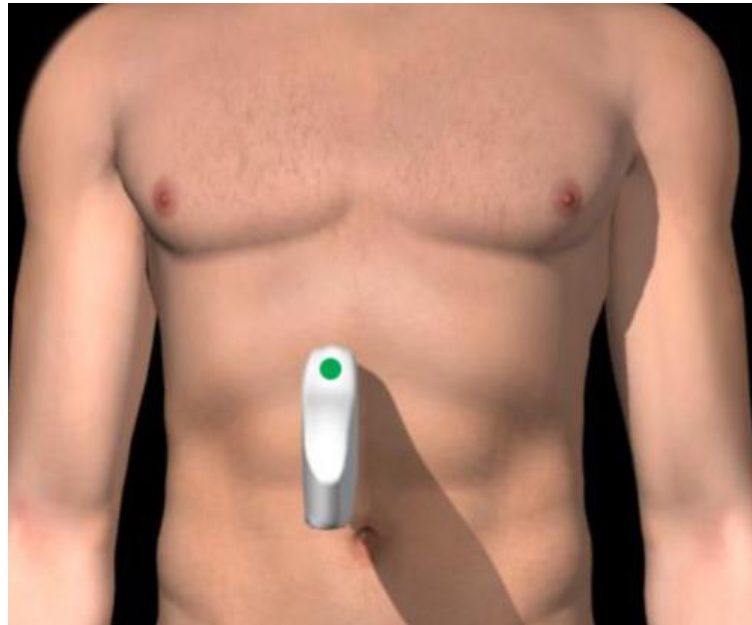
Peso	> 3.5 kg	3.5 -1.5 kg	< 1.5 kg
Dimensioni	8 Fr	5 Fr	4 Fr o 3.5 Fr

Scegliere catetere monolume in neonati che necessitino solo di una terapia infusionale. Preferire cateteri bilume in neonati con:

- Necessità di PN associate ad altre terapia endovenosa.
- Necessità di prelievi ripetuti.
- Necessità di un monitoraggio continuo della PVC.

La scelta del CVO

Misurazione ecografica della VCI per stabilire il catetere più idoneo



Umbilical vascular catheterization. NEJM 2008



AGENDA

Indicazioni ai cateteri venosi ombelicali

La scelta del catetere

“Can we do it better?”

Durata del CVO

Take Home Messages

“Can we do it better?”...la disinfezione

What is already known on this topic?

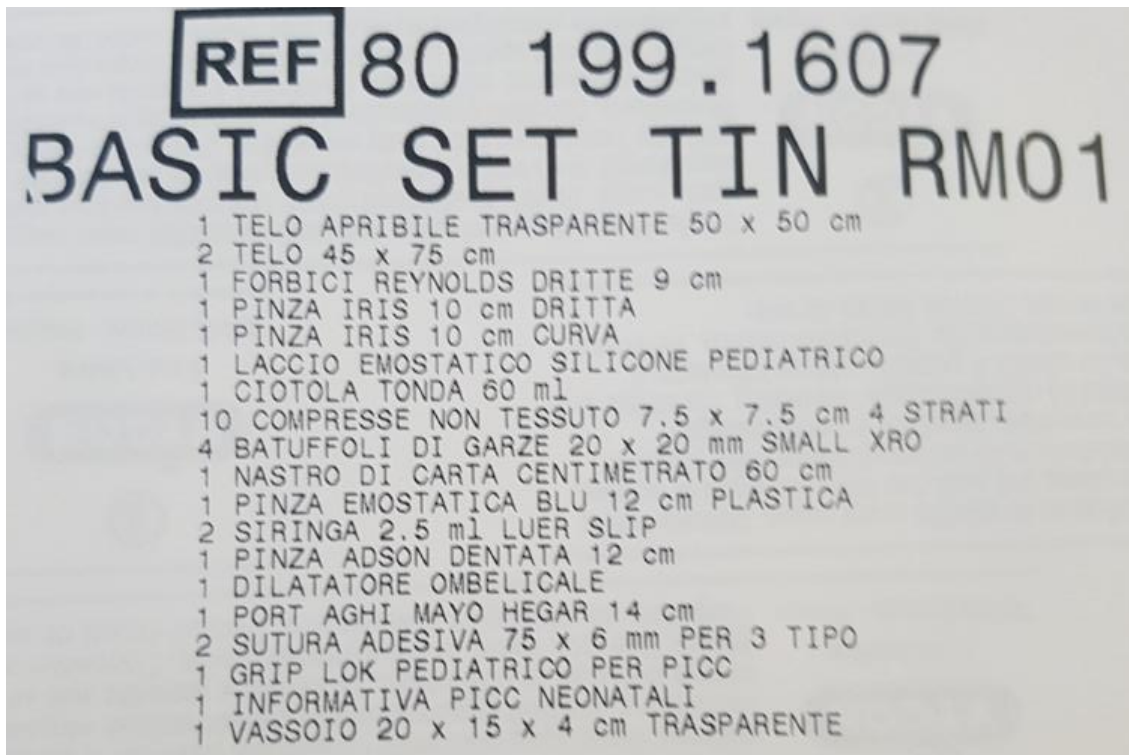
- ▶ The 2011 guidelines for prevention of intravascular catheter-related infections recommend the use of at least 0.5% chlorhexidine solution with alcohol for skin disinfection.
- ▶ No recommendations can be made for the safety or efficacy of chlorhexidine in infants aged <2 months.
- ▶ Chlorhexidine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

*0.2% chlorhexidine acetate as skin disinfectant prevents skin lesions in extremely preterm infants: a preliminary report. 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.*

“Can we do it better?”...



“Can we do it better?”...Neonatal Pack

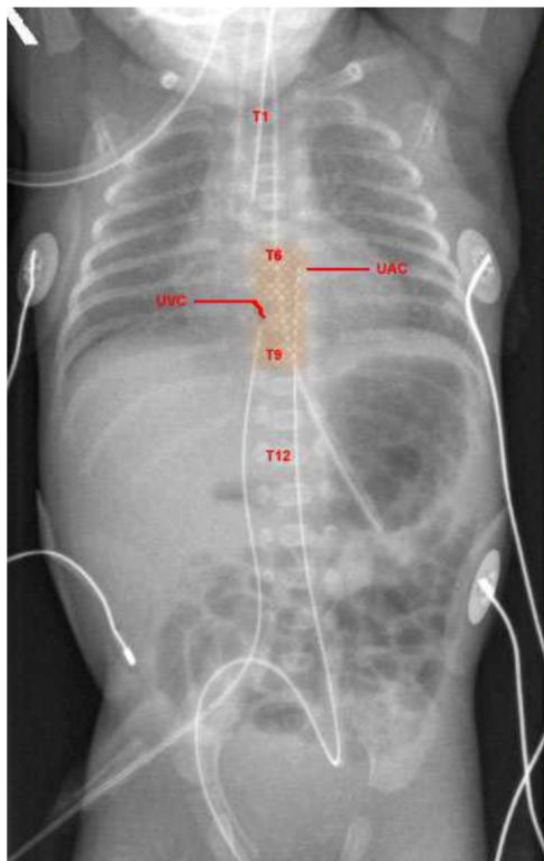


“Can we do it better?”...tip location

Molte delle complicanze da CVO sono legate alla sua malposizione:

- CVO posizionato nel cuore:
 1. Perforazione del cuore
 2. Versamento pericardico con tamponamento cardiaco
 3. Aritmie, potenzialmente fatali
 4. Trombosi endocavitarie
 5. Versamento pleurico
- CVO posizionato nel sistema portale:
 1. NEC
 2. Perforazione del colon
 3. Necrosi ed ematomi epatici
 4. Cisti epatiche
 5. Perforazione di vasi del sistema portale
 6. Ipertensione portale



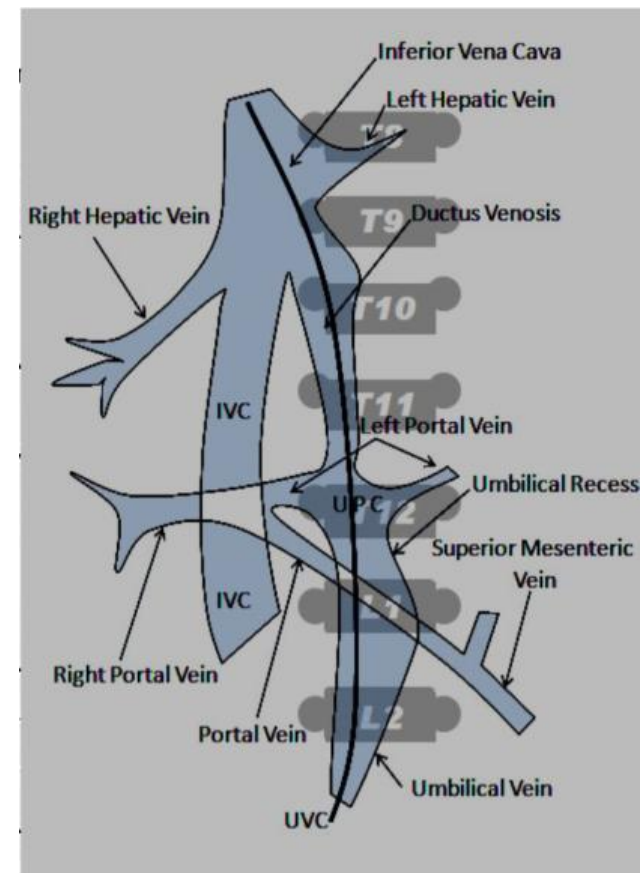


UVC
Optimal above diaphragm T8-10
Acceptable Low position in IVC
Withdraw if in heart or diverted angle into liver, re XRay

UAC
Optimal T6 – T9
Acceptable low position L3 - 4
Withdraw if at T12 -L2 as site of mesenteric and renal arteries

Insertion length:
 UAC = 3 x weight + 9cm + stump
 or diagonally umbilicus to shoulder
 length + 1cm + stump

 UVC = 1.5 x weight + 5cm+ stump
 Emergency UVC access 5cm plus
 cord length



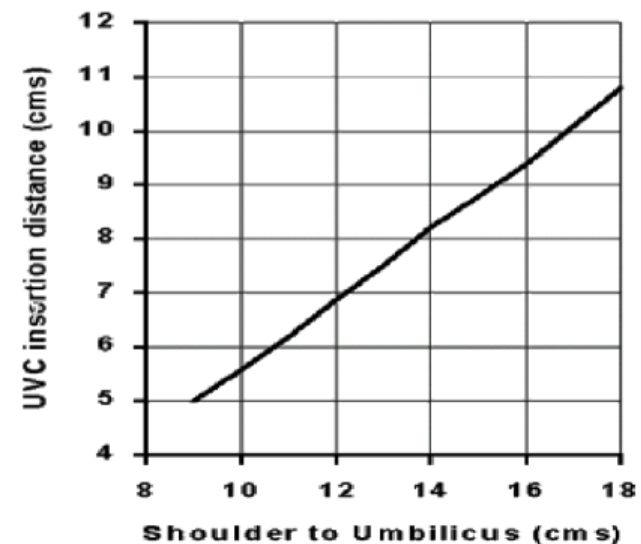
“Can we do it better?”...tip location



- C. Determine the length of catheter to be inserted by anatomical measurement of shoulder to umbilicus length, by equations based on body weight, or with other research-based protocols to achieve successful tip placement.¹²⁻¹⁶ (V)
- D. Place the catheter tip for:
1. UVCs in the inferior vena cava near the junction with the right atrium.

- Formula di Shukla = $(3 * \text{Peso (kg)} + 9) / 2 + 1$
- Lunghezza ombelico spalla
- Lunghezza ombelico-processo xifoideo et c...

La letteratura e i libri sono pieni di formule e nomogrammi!
Quale usare???



“Can we do it better?”...tip location

ORIGINAL ARTICLE

Simple measurements to place umbilical catheters using surface anatomy

AO Gupta¹, MR Peesay² and J Ramasethu²

Table 2. Expected position of umbilical venous catheter with different morphometric measurements and Shukla formula

		Over-insertion					Under-insertion				
Neonates	UIM										
Total	35 (2)										
N= 170											
> 1500 g	24 (2)										
n= 109											
≤ 1500 g	11 (18%)	0	55 (91%)	2 (3%)	30 (49%)	2 (3%)	61 (100%)	0	2 (3%)	3 (5%)	
n= 61											

Abbreviations: UIM, umbilicus to midpoint of inter-mammary distance; UN, umbilicus to nipple distance; UXp, umbilicus to xiphoid process distance.

There is no universal formula, measurement or nomogram available for placement of umbilical catheters, which is satisfactory for infants of all BWs and gestational ages.^{6–9} In our

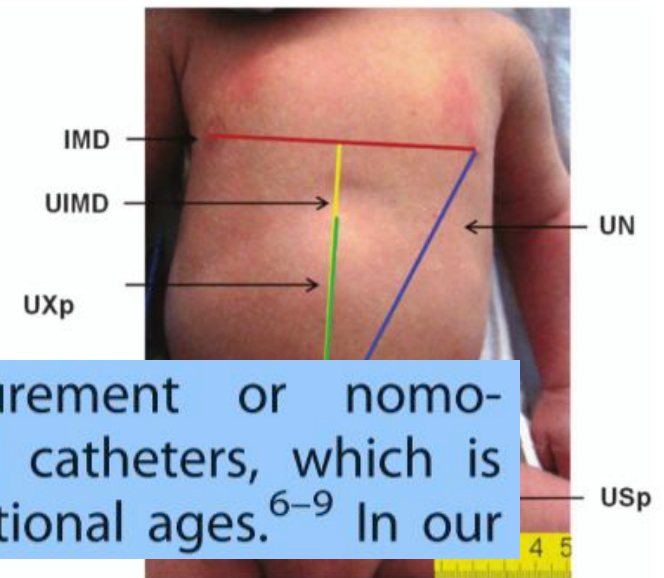
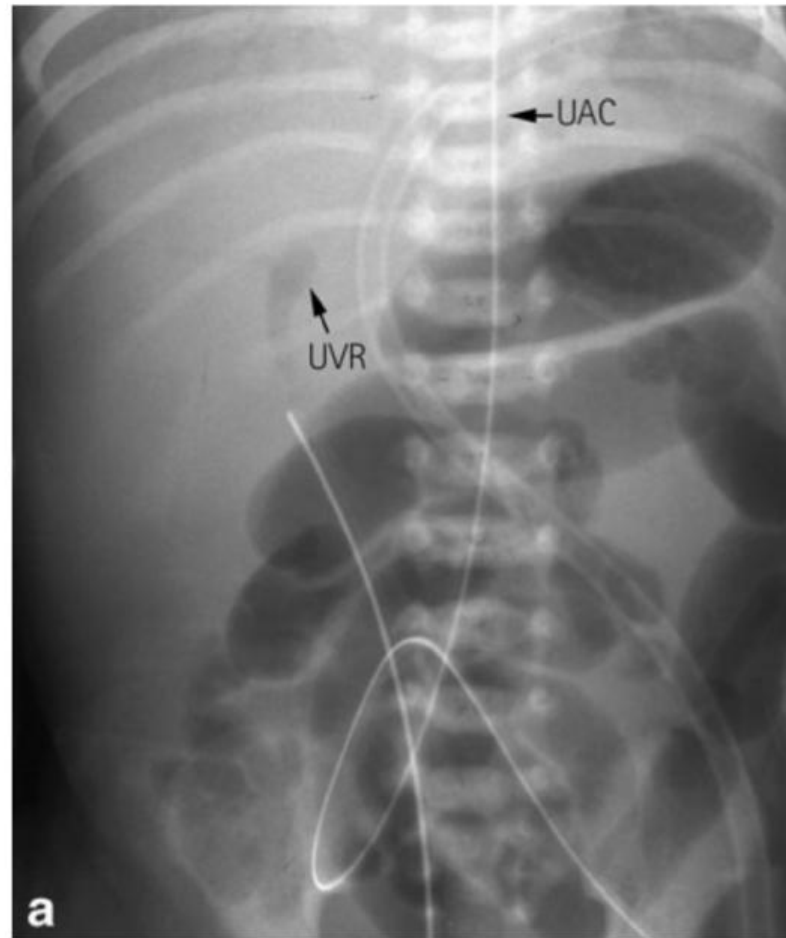


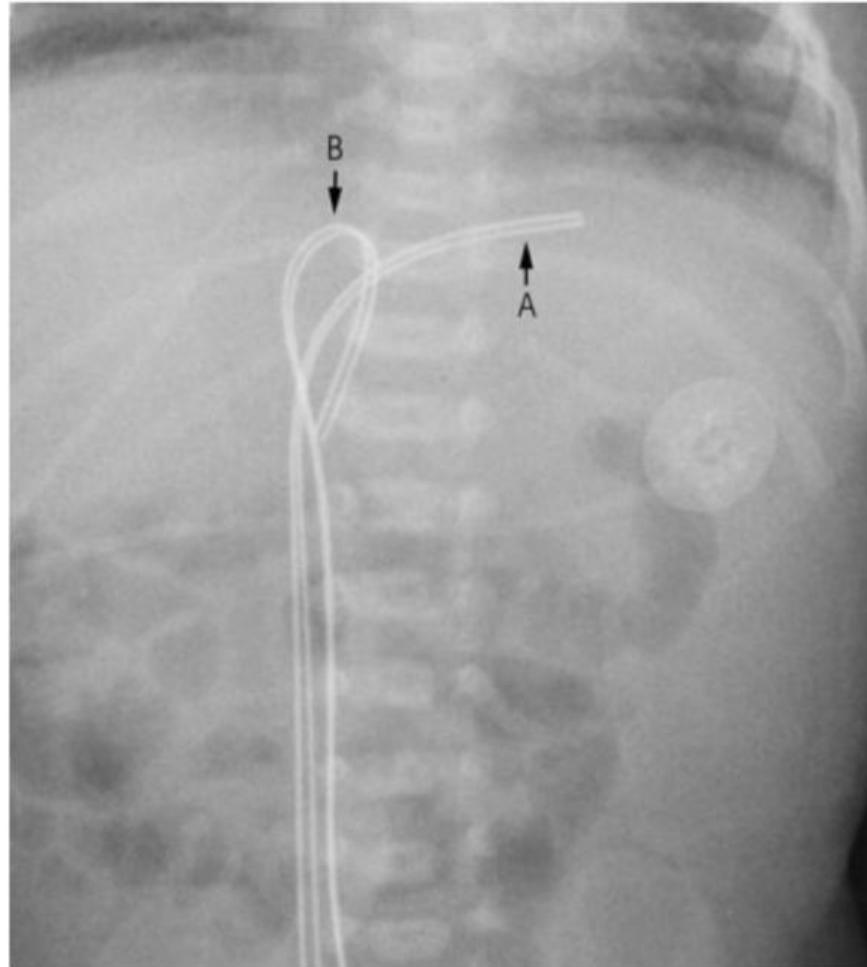
Figure 1. Morphometric measurements. IMD, inter-mammary distance; UIM, umbilicus to midpoint of IMD; UN, umbilicus to nipple; USp, umbilicus to symphysis pubis; UXp, umbilicus to xiphoid process.

“Can we do it better?”...tip location..quanti Rx



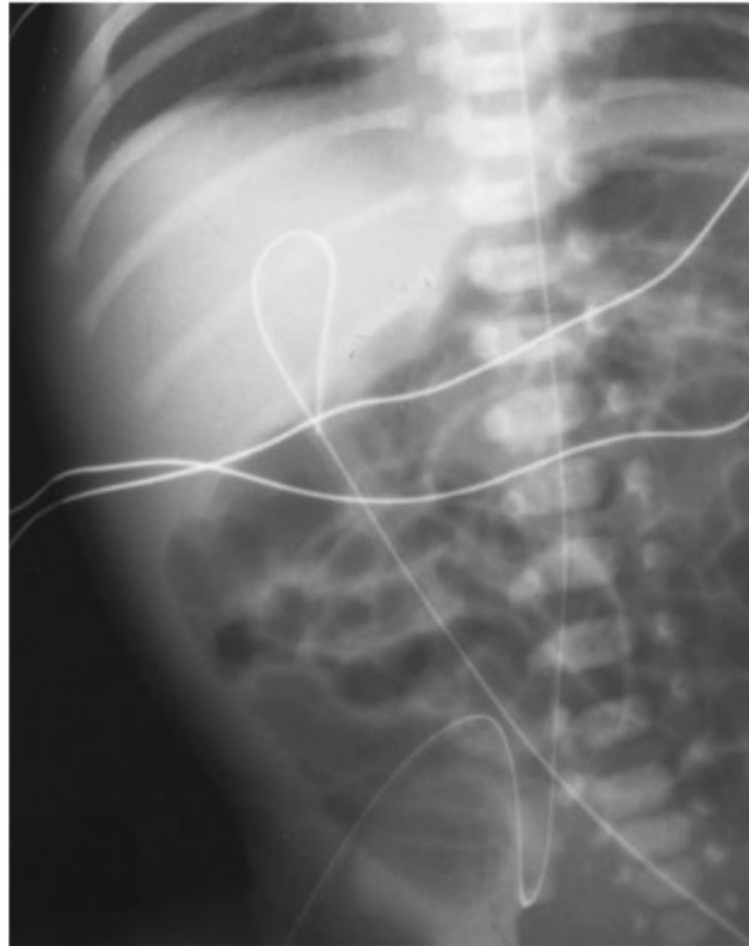
Umbilical vein catheterization—appropriate and inappropriate placement. Pediatric Radiology 2010

“Can we do it better?”...tip location..quanti Rx



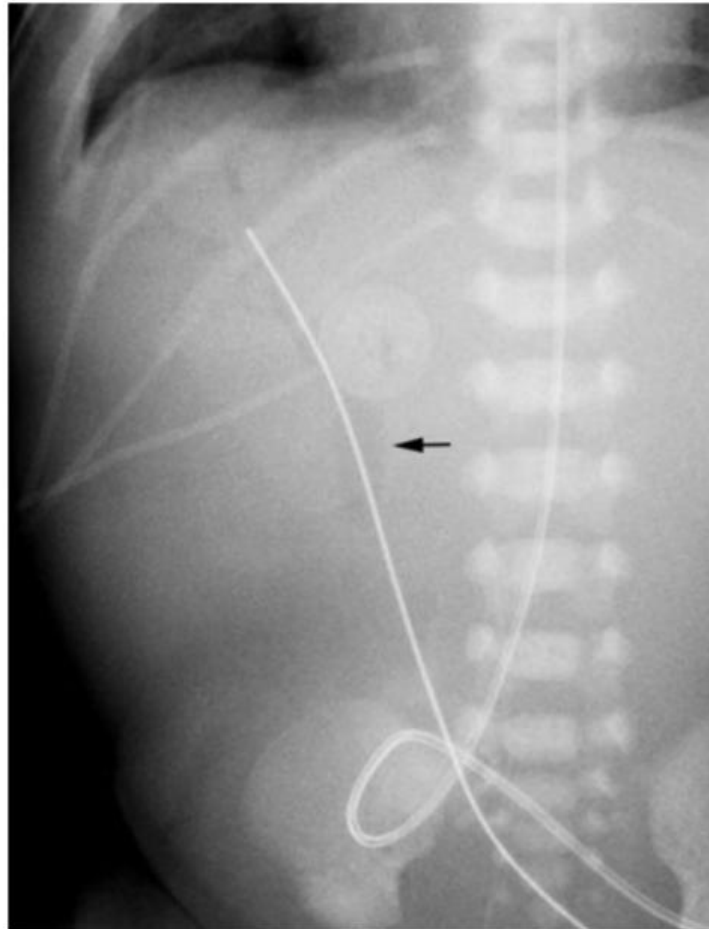
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“Can we do it better?”...tip location..quanti Rx



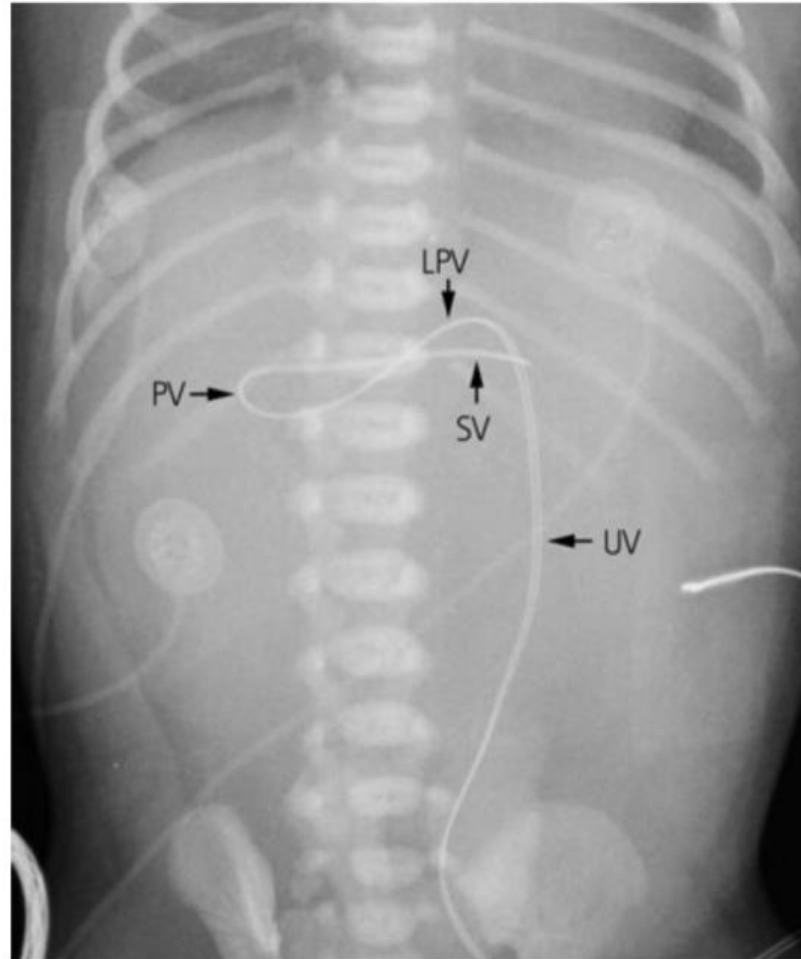
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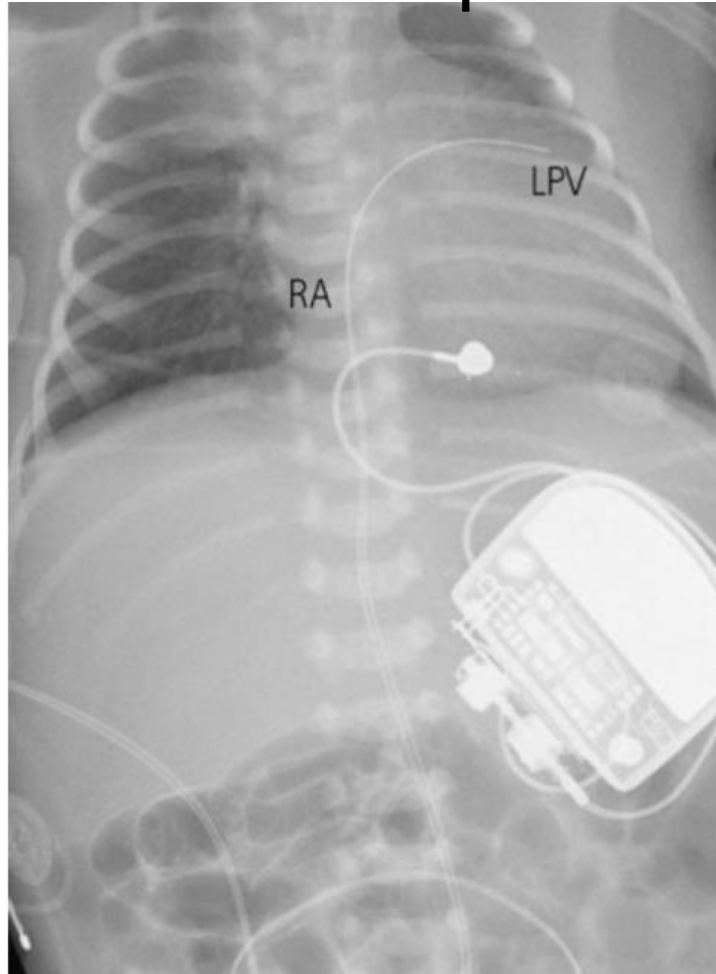
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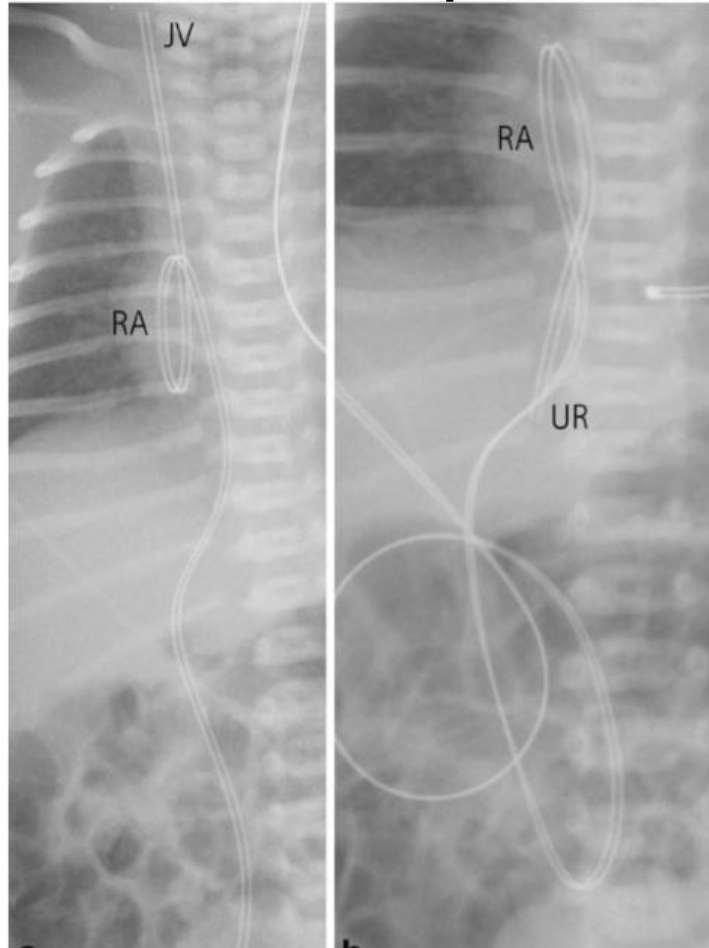
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Umbilical vein catheterization—appropriate and inappropriate placement. Pediatric Radiology 2010

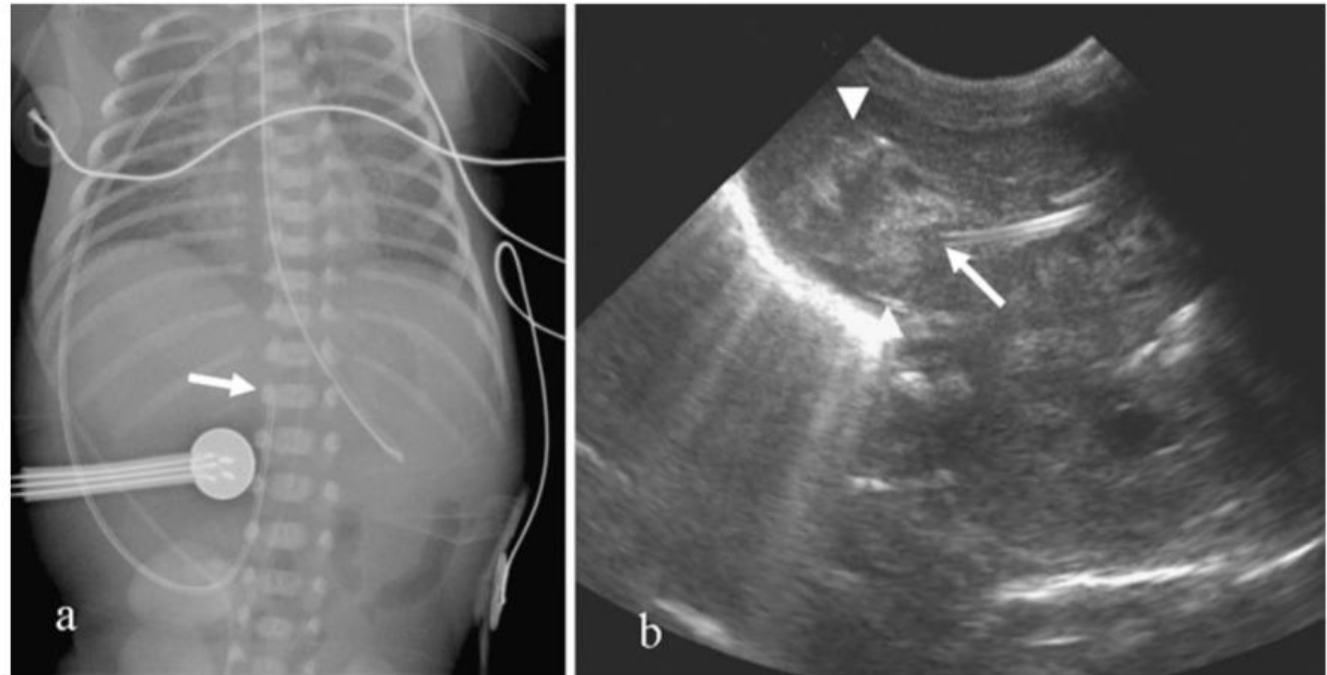
“Can we do it better?”...tip location..quanti Rx



Umbilical vein catheterization—appropriate and inappropriate placement. Pediatric Radiology 2010

“Can we do it better?”...tip location..US

Fig. 5 **a** Abdominal radiograph in a 2-day-old, 1,300 g baby boy. The catheter was judged to be satisfactorily positioned. **b** Ultrasound obtained with a 5–8 MHz transducer reveals the extraluminal position of the catheter (*arrow*) and hyperechoic collection of total parenteral nutrition fluid (*arrowheads*) in the liver parenchyma



“Can we do it better?”...tip location..US

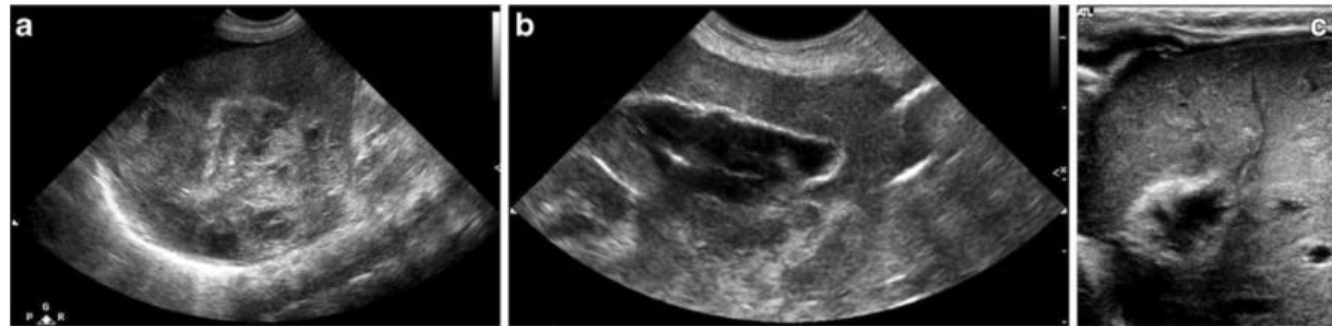


Fig. 5 US-guided drainage of a hepatic collection in a 38-week-old, 4.69-kg infant. **a** US on day 9 of life demonstrates a large heterogeneous fluid complex collection measuring $8.9 \times 8.4 \times 5.4$ cm involving the right lobe of the liver. **b** US shows the hepatic collection during an US-guided drainage demonstrates hepatic abscess aspiration of a complex collection

in the liver. A total of 8 cc of purulent blood-tinged fluid was removed. **c** Follow-up US shows the hepatic collection after undergoing US-guided drainage. Abdominal US performed 1 month following the US-guided aspiration shows slow evolution of the 7.1-cm complex mass in the right lobe of the liver. The echogenic margins suggested early calcification

“Can we do it better?”...tip location..US

ORIGINAL ARTICLE

Superiority of targeted neonatal echocardiography for umbilical venous catheter tip localization: accuracy of a clinician performance model

AS Pulickal¹, PK Charlagorla², SC Tume³, M Chhabra², P Narula² and AM Nadroo²

Antero-posterior (AP) chest radiography is the current standard imaging technique used to localize the tip of the UVC; the landmarks being the thoracic vertebral bodies and the diaphragm. However, case reports suggest that complications of UVC insertion could occur even in situations where chest radiographs had confirmed optimal position of the UVC.¹¹ In view of this phenomenon, attempts have been made to utilize other modalities to confirm UVC tip position. Ades *et al.* showed that



Our study confirms that TnECHO is superior to AP chest radiographs for the purpose of UVC tip localization. Among the study population in which the AP chest radiograph reported the UVC to be in optimal position, more than a quarter of the patients had their UVC readjusted because of suboptimal position on TnECHO. These data suggest that TnECHO be preferred to chest

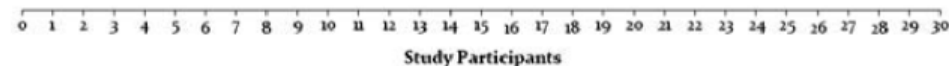


Figure 2. Targeted neonatal echocardiography (TnECHO) reports of pediatric residents and pediatric cardiologist for all participants in the study demonstrating concurrence of umbilical venous catheter (UVC) tip localization in 23 of 30 study cases (77%). In the seven cases with discordant results, there were only two cases (participants 5 and 7, 6% of study population) wherein there was a large discordance (inferior vena cava (IVC) position vs left atrium (LA)) between the two TnECHO reports. y Axis legend: IVC, right atrium (RA), LA.

“Can we do it better?”...tip location..US

Determination of Umbilical Venous Catheter Tip Position With Radiograph

Adam B. Hoellering, MBBCh (Hons), FRACP; Pieter J. Koorts, MBChB, FRACP;
David W. Cartwright, MBBS, FRACP; Mark W. Davies, MBBS, PhD, FRACP

US Gold Standard

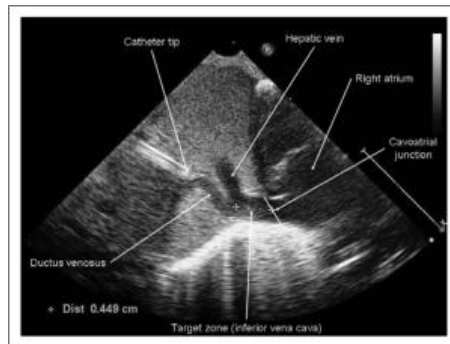


Figure 2. Ultrasound of the target zone (i.e., the length of the inferior vena cava between the insertion of the ductus venosus and the cavoatrial junction) measured as 4.49 mm.

Cardiac Silhouette

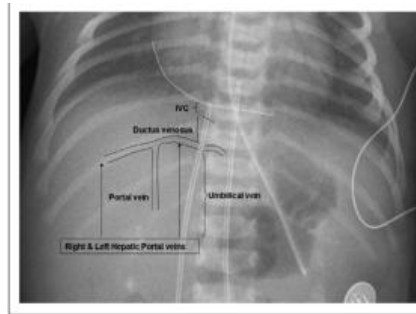


Figure 1. Assessment of umbilical venous catheter tip position by the cardiac silhouette method where the position of the cavoatrial junction is estimated by extrapolating the curve of the right atrial border medially (dotted white line) to its intersection with the inferior vena cava (IVC).

Vertebral body

Vertebral Body Method

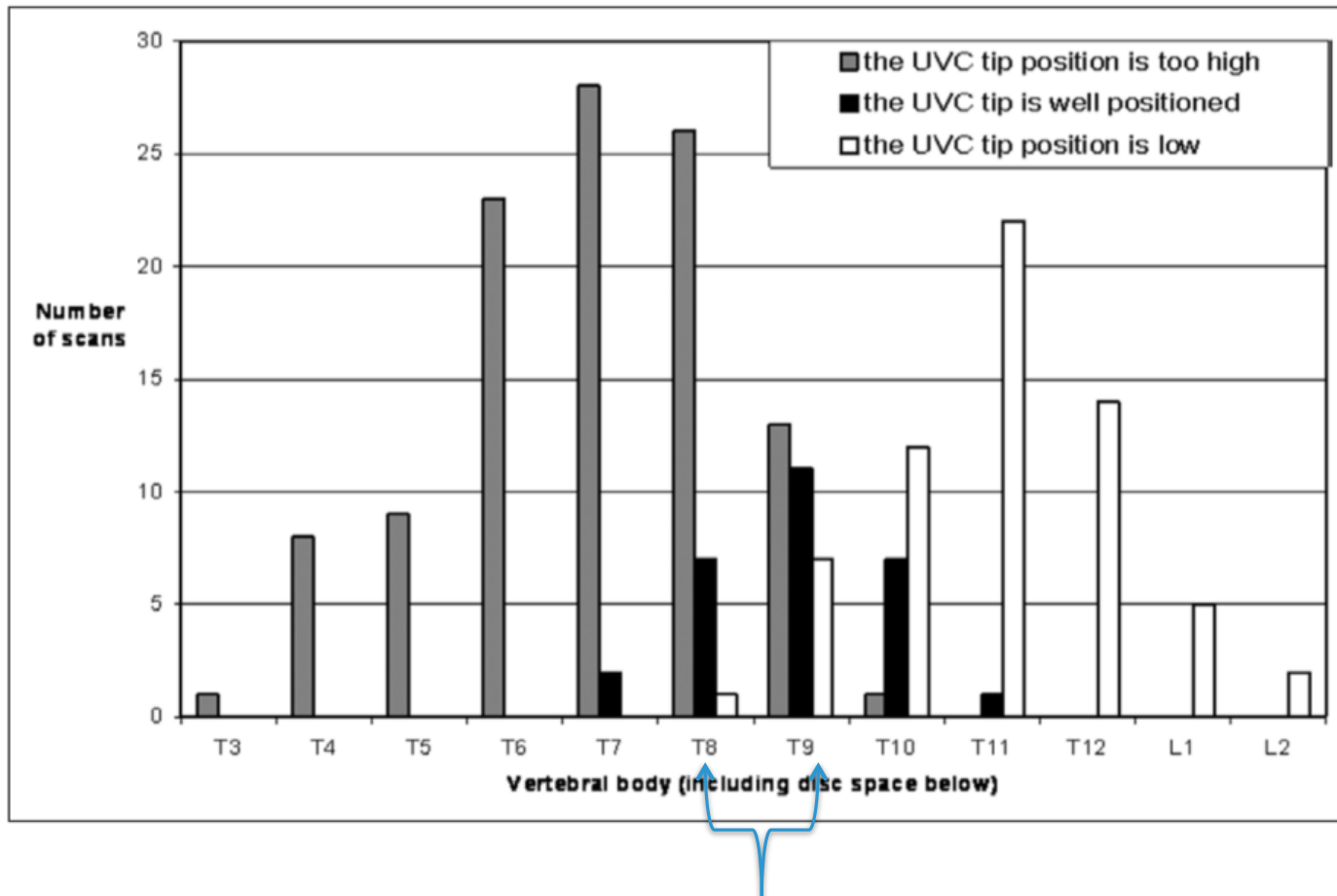
The UVC tip position was defined as “well positioned” if the tip was at the level of T8–T9, “high” if above the body of T8, and “low” if below the body of T9.

“Can we do it better?”...tip location..US

TABLE 1. Test Characteristics (95% CI) for Vertebral Body Level and Cardiac Silhouette Method of Radiographic Analysis Compared With Ultrasound

Variable	Vertebral Body Level Method	Cardiac Silhouette Method
Sensitivity	0.61 (0.41–0.79)	0.86 (0.67–0.96)
Specificity	0.74 (0.66–0.82)	0.94 (0.89–0.97)
Positive predictive value	0.27 (0.17–0.40)	0.69 (0.51–0.83)
Negative predictive value	0.92 (0.86–0.96)	0.98 (0.94–0.99)

“Can we do it better?”...tip location..US



Determination of Umbilical Venous Catheter Tip Position With Radiograph. Pediatric Critical Care Medicine 2014

“Can we do it better?”...tip location..US

In experienced hands, ultrasound is a safe reliable tool for determining the location of UVC tips. Scans were well tolerated and use of saline injection to locate the tip was required in 24% of scans. The average scanning time of 5 minutes is faster than the time required for radiograph acquisition and processing on our unit and compares to an average time of 3 minutes for a radiologist (16). All the scans in this study were performed by neonatologists experienced in the use of ultrasound and inexperienced operators may take longer.

RECOMMENDATIONS

If ultrasound is available, we now use it as the method of first choice for determining UVC tip position. However, ultrasound is not always available. Because of this and based on the results of this study, we recommend the following:

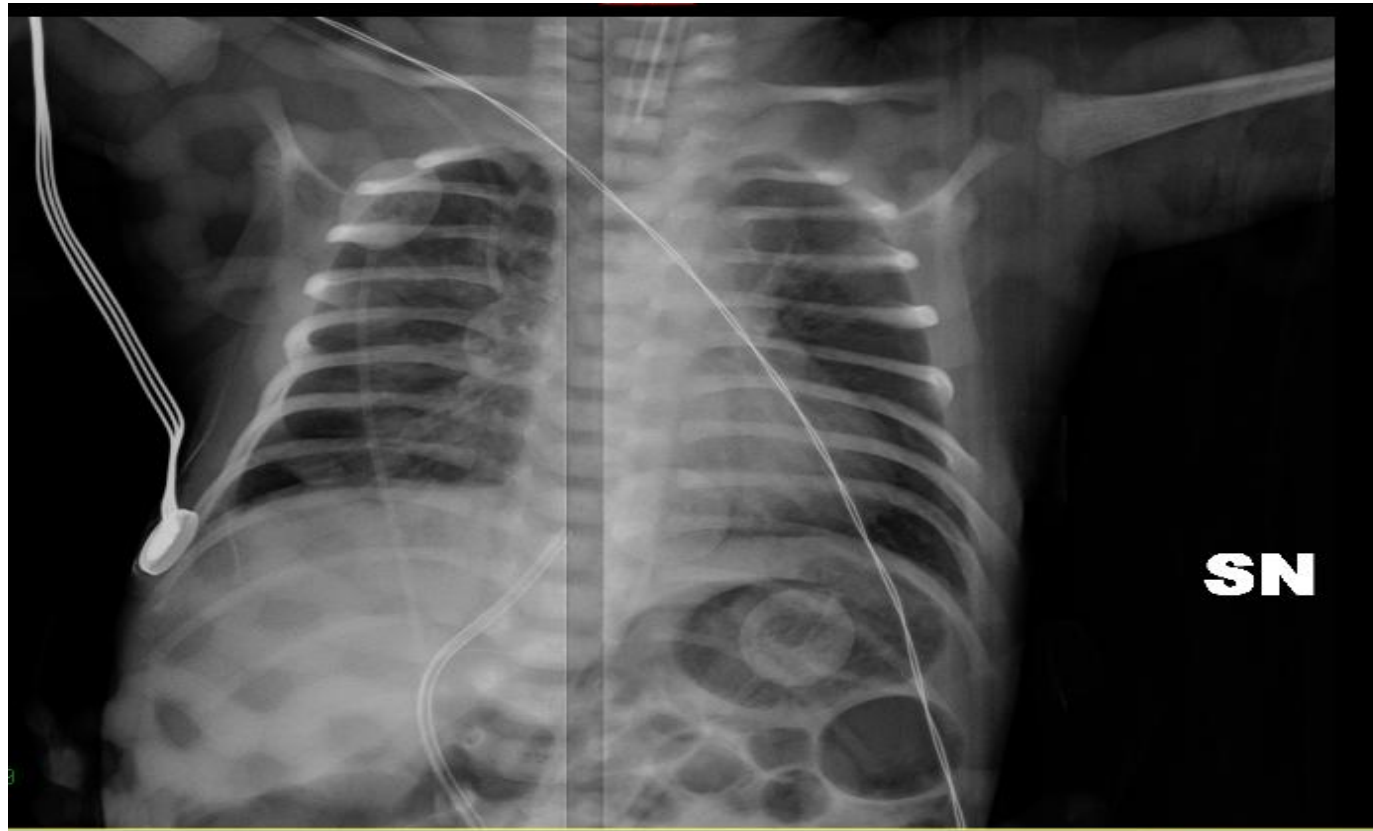
1. Initial assessment of catheter tip position should include an AP chest-abdominal radiograph.
2. If ultrasound evaluation of catheter tip position is not available, the catheter tip position should be determined using the cardiac silhouette method.
3. There should be an appropriately designed prospective studies to assess the reliability of repositioning UVCs with ultrasound guidance and to describe the patterns of umbilical catheter tip migration with time.

“Can we do it better?”...tip location

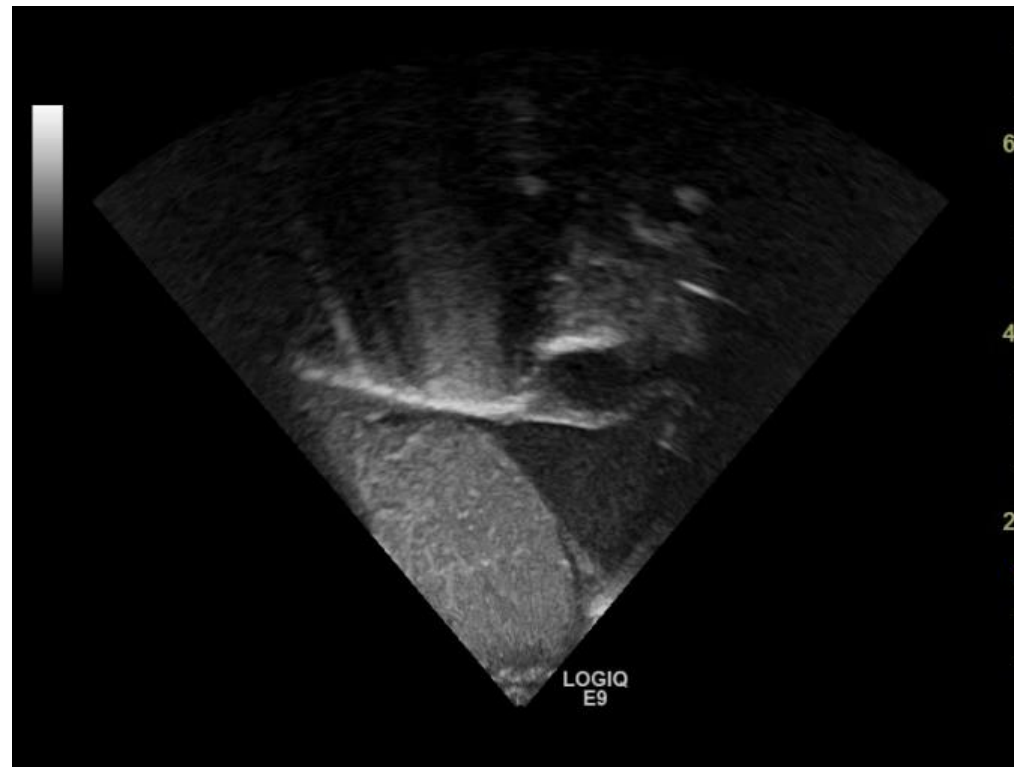
- E. Confirm the catheter tip location by radiography, echocardiography, or ultrasonography before catheter use.
- 4. Ultrasound imaging using parasternal long- and short-axis views for UVC tip location compares favorably to radiography. Injection of normal saline through the catheter may assist in identifying the exact tip location. However, ultrasound will not rule out loops or curls in the catheter pathway.^{18,22,23} (IV)
- 5. Neonatal echocardiography may be superior to chest and abdominal radiography for identifying malpositioned catheters or in extremely low-birth-weight neonates.^{24,25} (V)

**Prospettiva futura: Localizzazione
intraprocedurale del catetere**

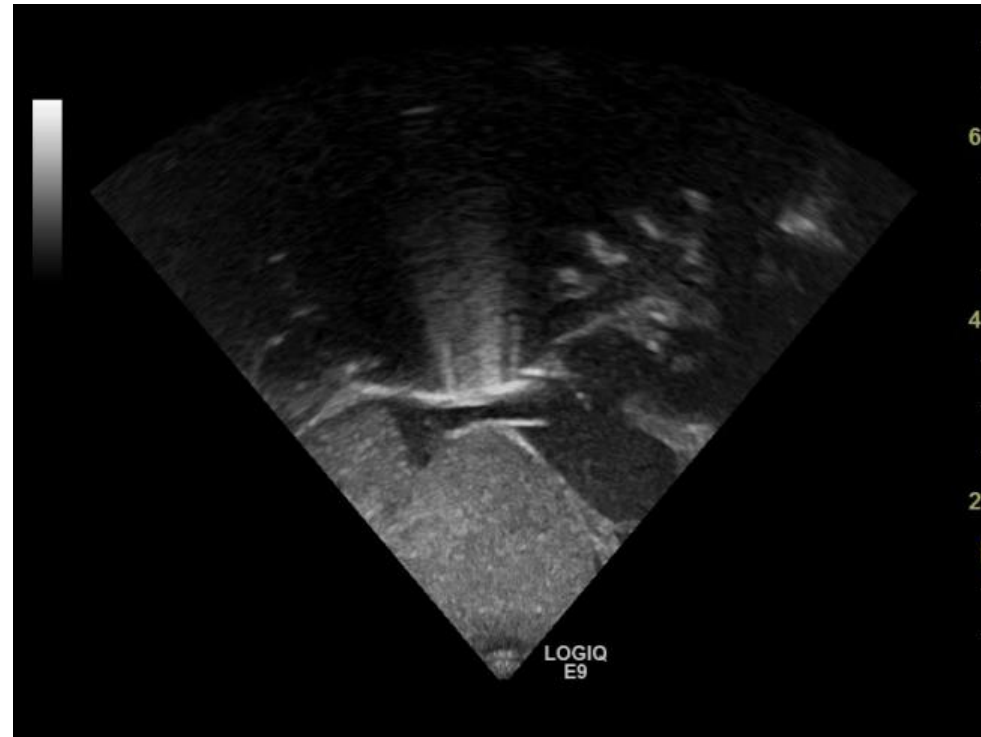
“Can we do it better?”...our case



“Can we do it better?”...our case



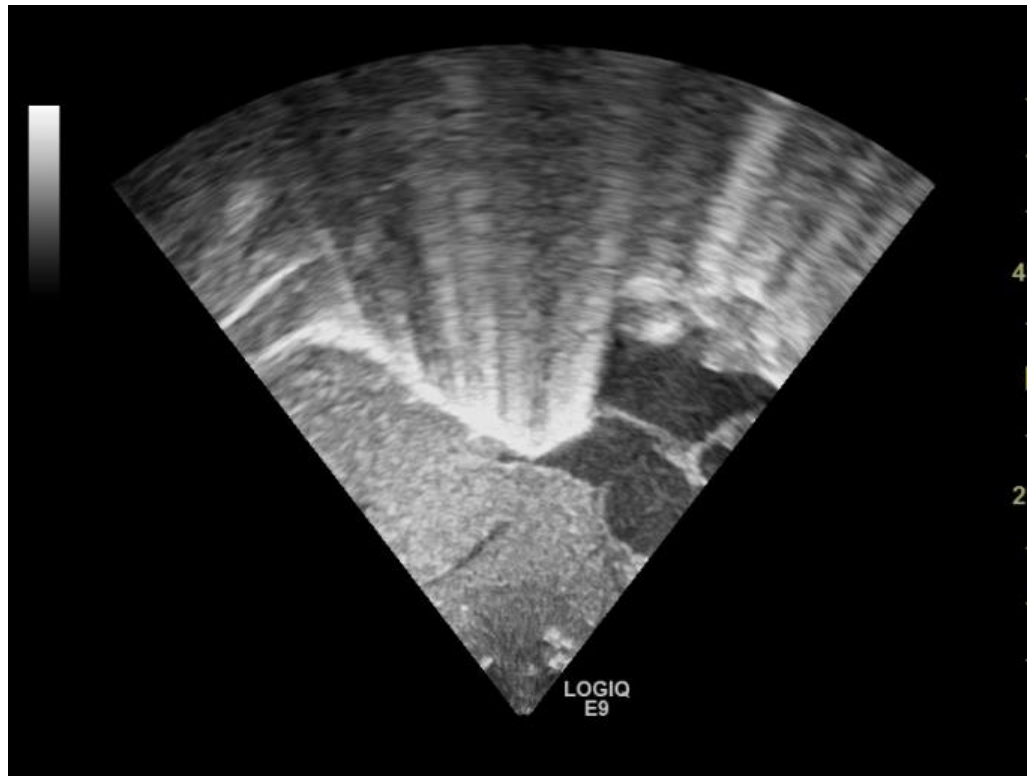
“Can we do it better?”...our case



“Can we do it better?”...our case



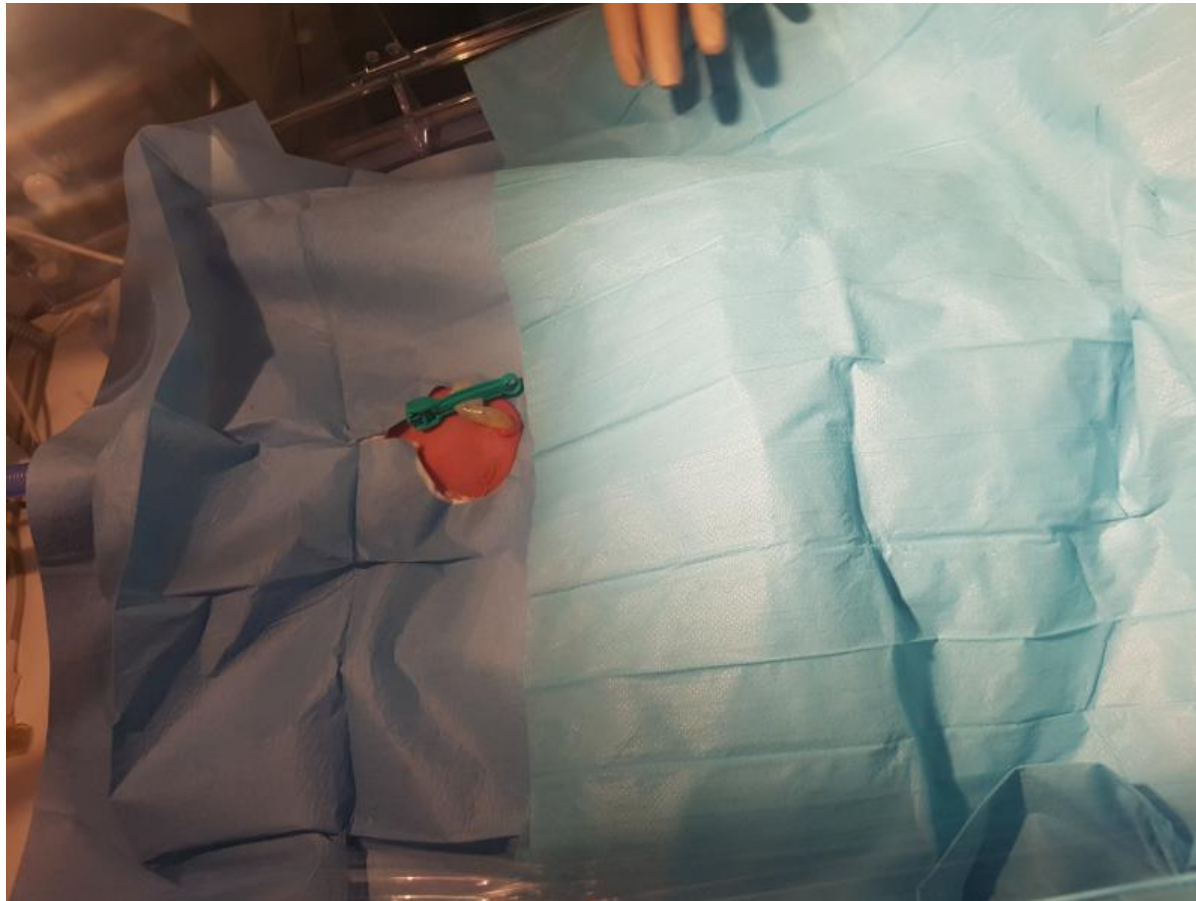
“Can we do it better?”...our case



“How we do it better”...



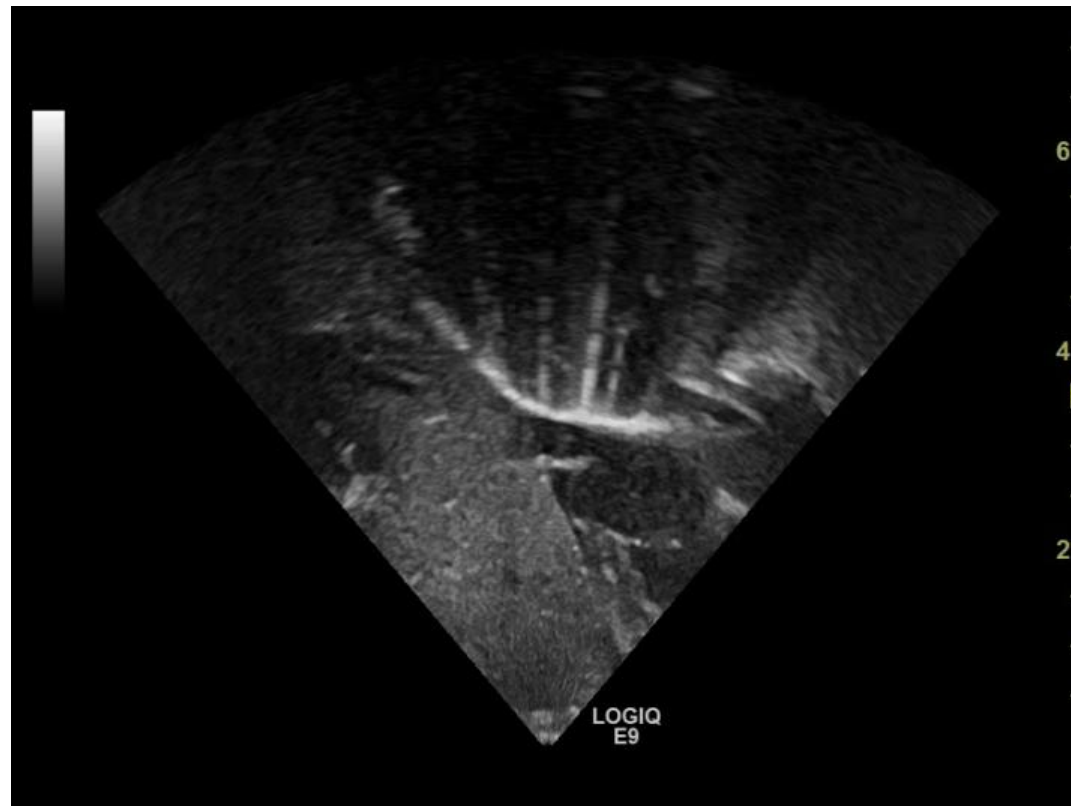
“How we do it better”...



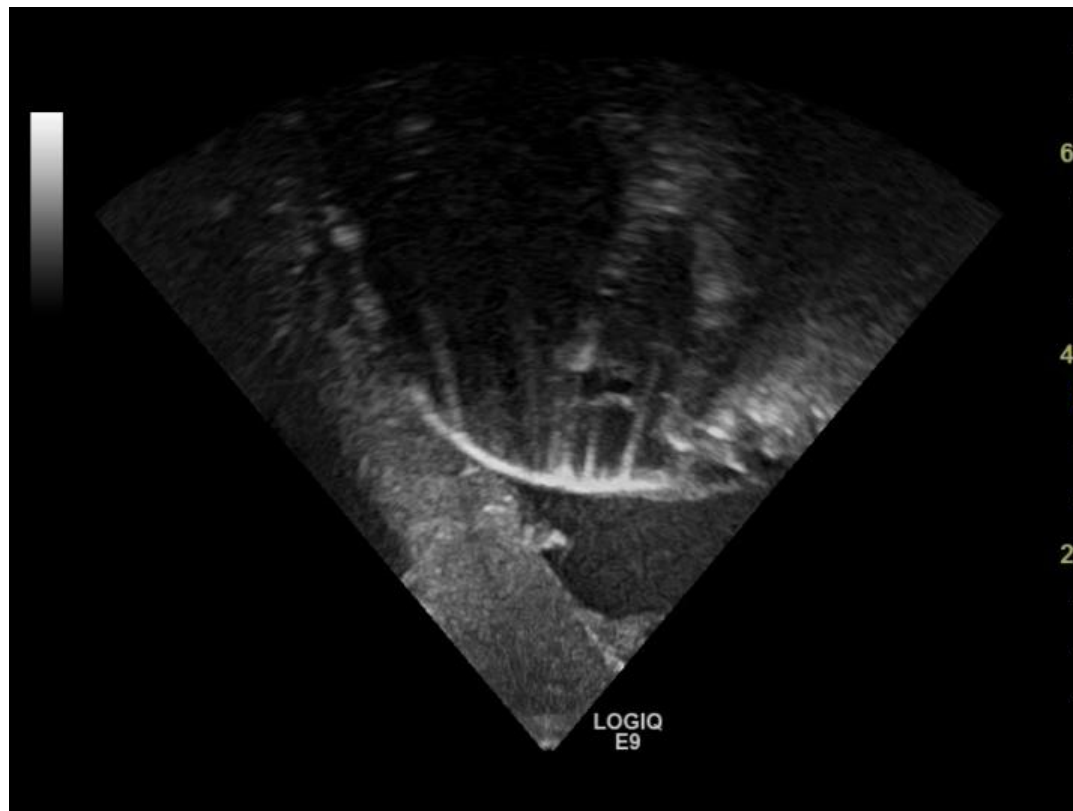
“How we do it better”...



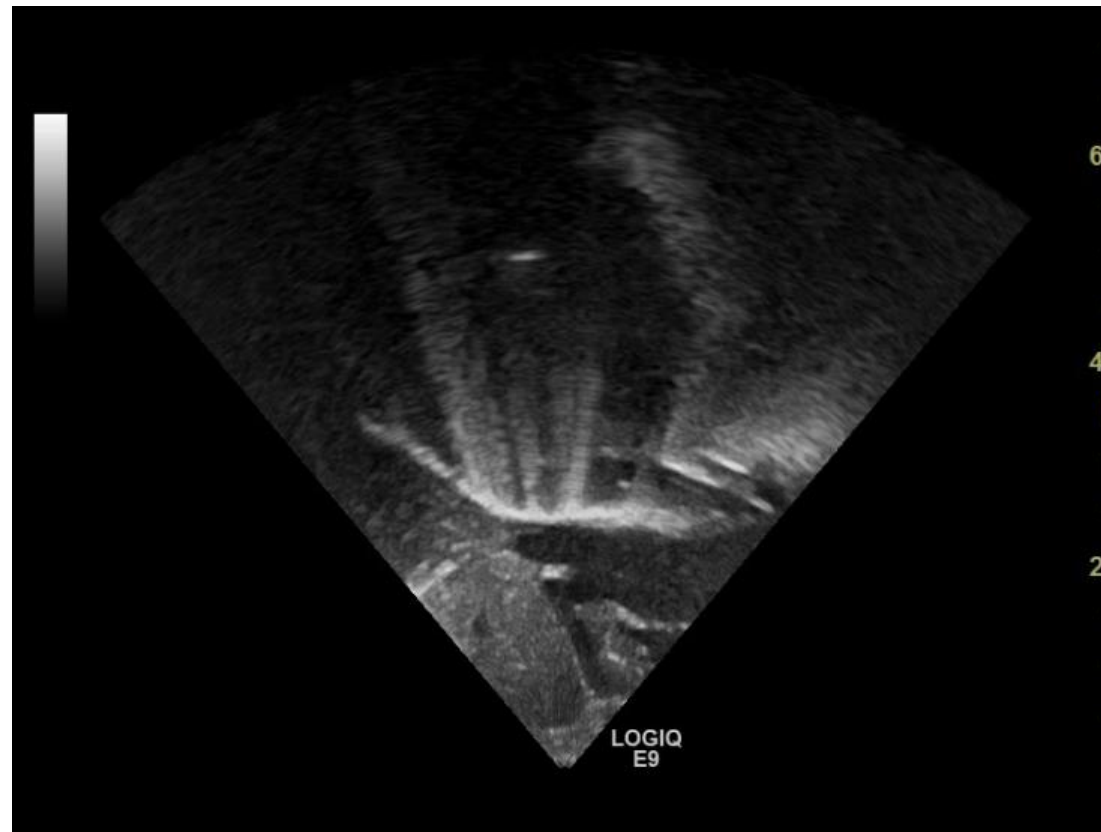
“How we do it better”...



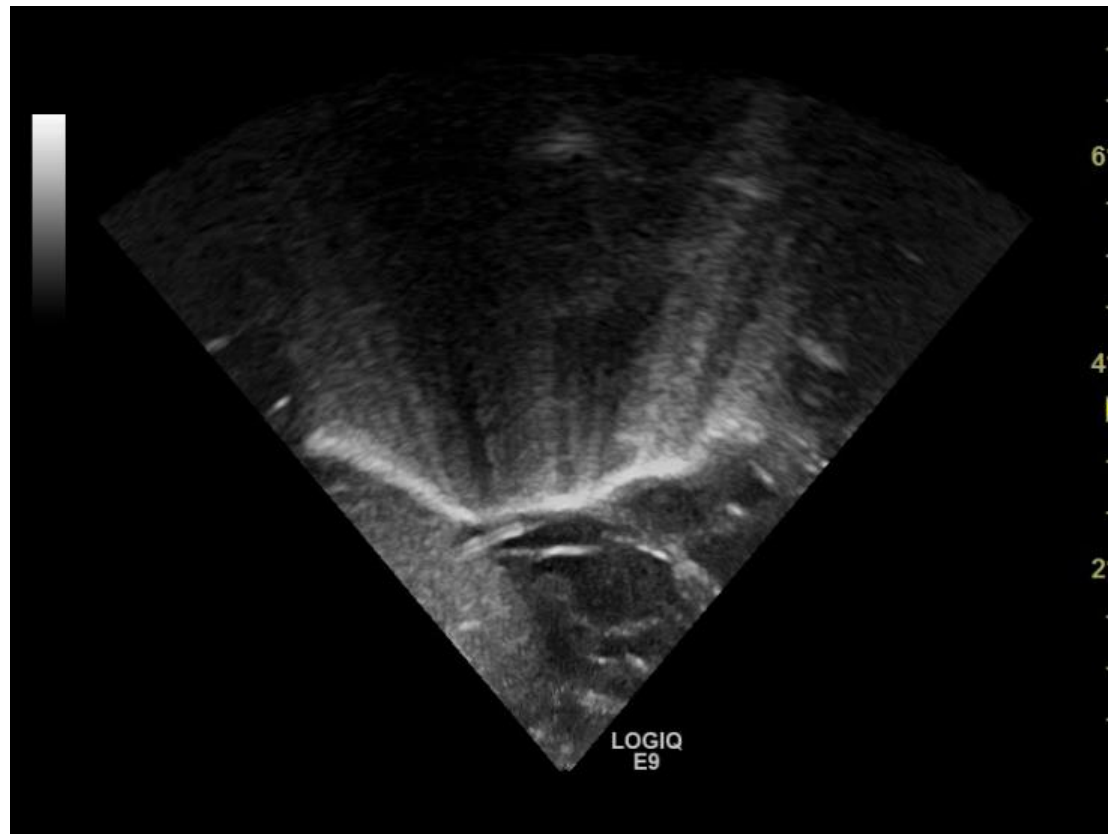
“How we do it better”...



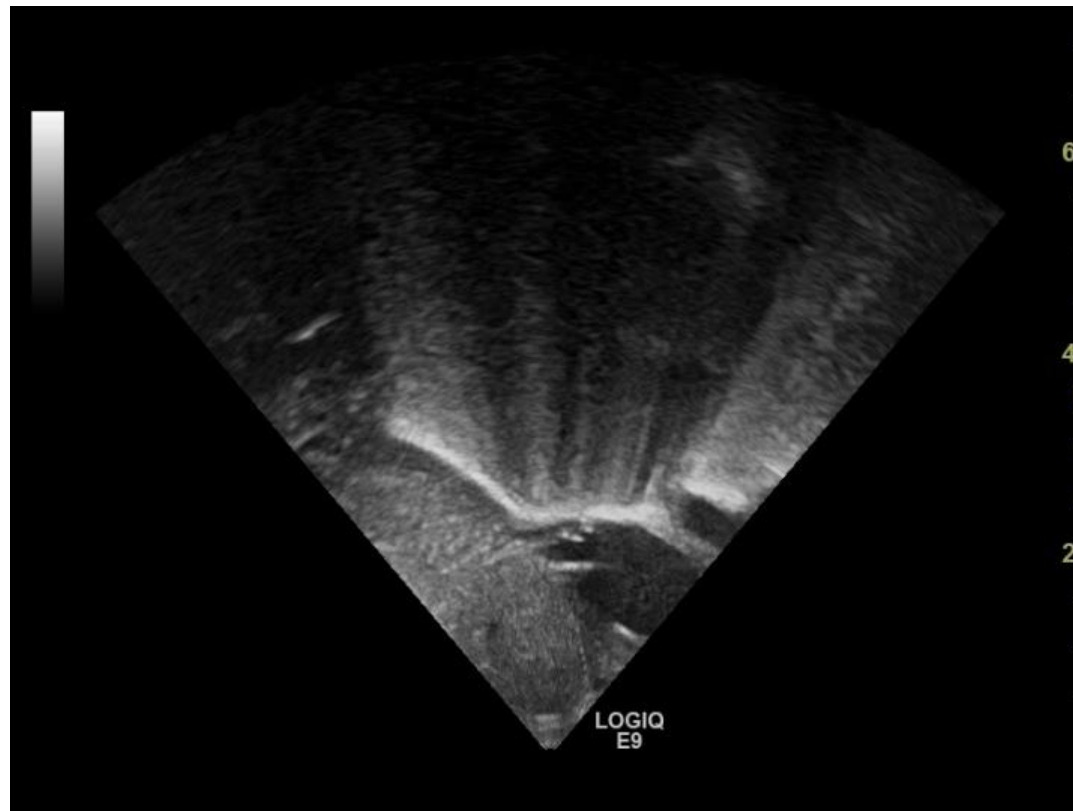
“How we do it better”...



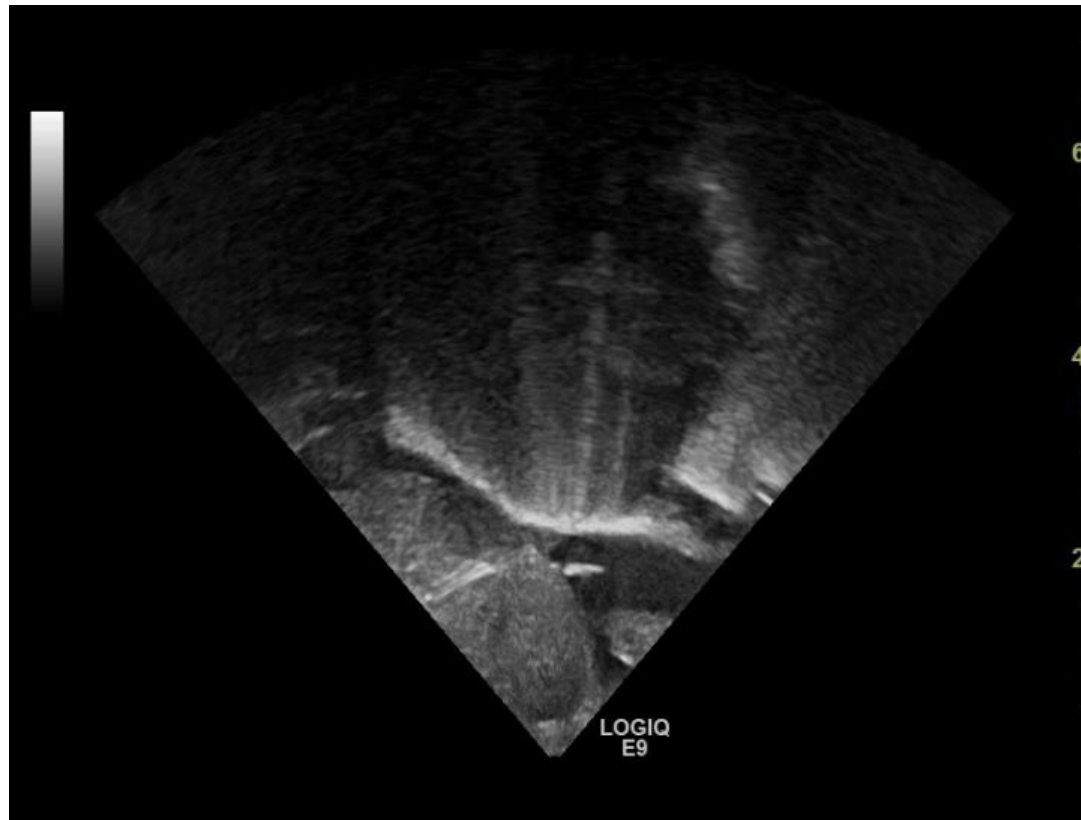
“How we do it better”...



“How we do it better”...



“How we do it better”...



“Can we do it better?”...tip check and re-check

- 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

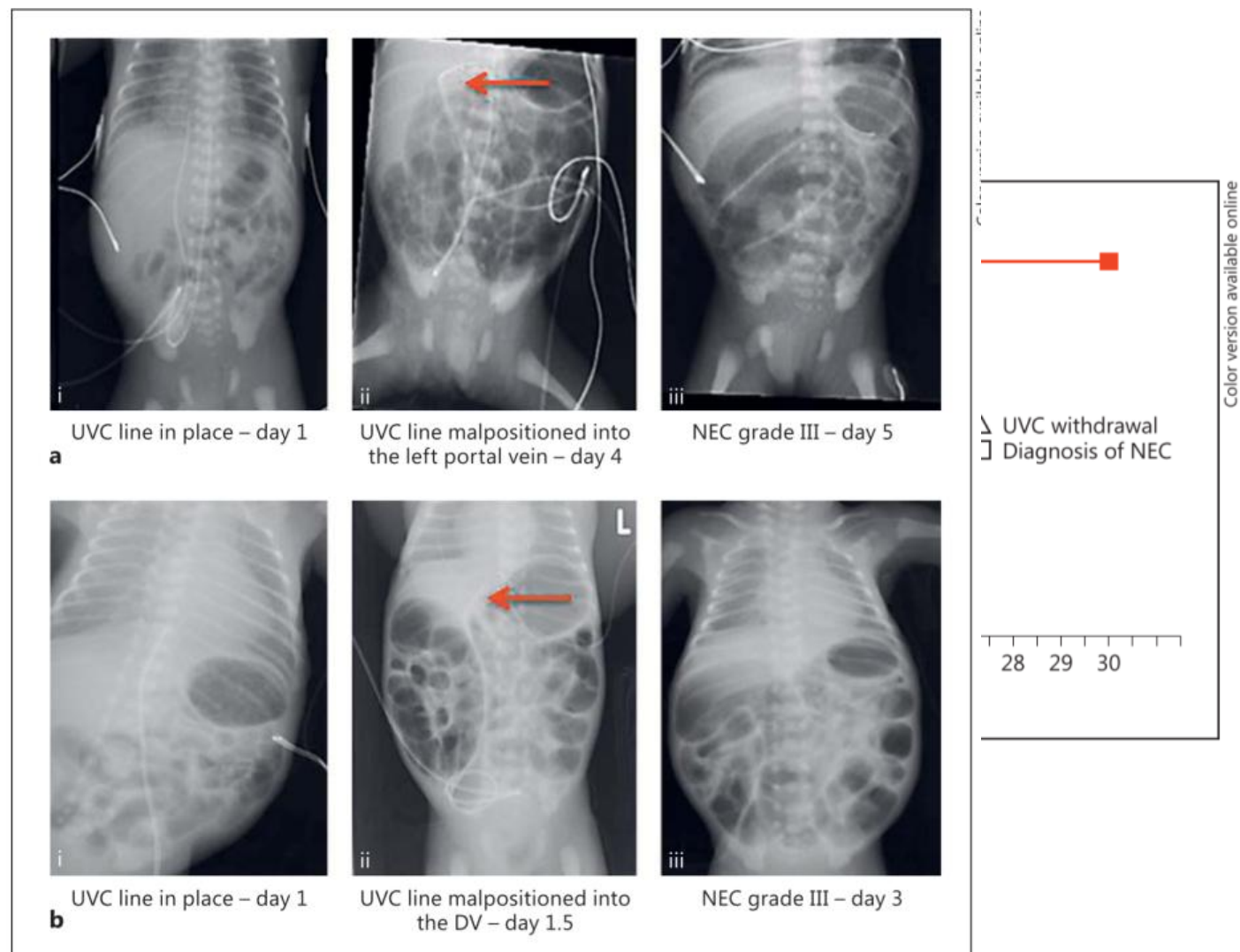
Umbilical Venous Catheter Malposition Is Associated with Necrotizing Enterocolitis in Premature Infants

Mustafa Sulemanji^{a, d} Khashayar Vakili^a David Zurakowski^{a, b}
Wayne Tworetzky^c Steven J. Fishman^a Heung Bae Kim^a

Table 1. Descriptive and univariate characteristics of the cohort based on NEC as the outcome

	Prospective cohort (n = 132)		Subset cohort ≤1,500 g (n = 62)	
	no NEC (n = 120)	NEC (n = 12)	no NEC (n = 50)	NEC (n = 12)
<u>Birth weight, g</u>	1,644±533	868±289*	1,168±277	868±289*
<u>Gestational age, weeks</u>	31.5±2.8	28.0±2.1*	29.2±2.6	28.0±2.1
SGA status (<10 percentile) ^a			9 (18)	4 (33)
Gender				
Male	54 (45)	4 (33)	26 (52)	4 (33)
Female	66 (55)	8 (67)	24 (48)	8 (67)
Media				
1 m				
5 m				
Matern				
Prenat				
PDA s				
Respir				
Histor				
Time t				
UVC c				
UVC s				
No UVC (n = 65)	65 (52)	0 (0)	37 (74)	2 (17)
Routine removal (n = 44/39) ^b	42 (35)	2 (17)	6 (12)	3 (25) ⁺
<u>Failure to insert</u> (n = 10/9) ^c	7 (6)	3 (25) ⁺	7 (14)	7 (58) ⁺
<u>Malposition</u> (n = 15/14) ^d	8 (7)	7 (58) ⁺		
NEC grade				
No NEC	120	–	50	–
Medical NEC (>grade II)	–	9 (7)	–	9 (15)
Surgical NEC (necrotic bowel +)	–	3 (3)	–	3 (5)
Time to diagnosis of NEC, days	–	9.5±9.3 (3.0–30.0)	–	9.5±9.3 (3.0–30.0)

Fig. 2. Timeline of event course of UVC status and t of NEC in individual subje figure represents the time discontinued and NEC dia erage time for UVC discor non-NEC subjects ($n = 50$ by the green triangle in sub 1–7, UVC malposition ar purple); subjects 8–10, U NEC ($n = 3$, blue); subjects routine and NEC ($n = 2$, re only.



“Can we do it better?”...fissaggio CVO

- Choose a method for securing the UVC and UAC based on promoting skin integrity, decreasing complications, and ease of use. There is a lack of evidence demonstrating the best method.²⁶ (IV)



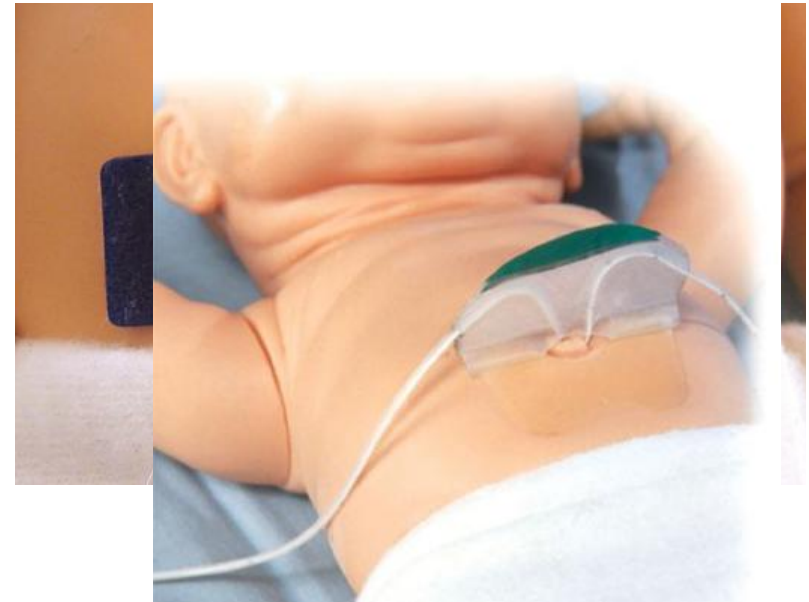
“Can we do it better?”...fissaggio CVO

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





AGENDA

Indicazioni ai cateteri venosi ombelicali

La scelta del catetere

“Can we do it better?”

Durata del CVO

Take Home Messages

La durata del Catetere



CLINICAL REPORT

Strategies for Prevention of Health Care–Associated Infections in the NICU

TABLE 4 Guidelines for the Prevention of Intravascular Catheter-related Infections

1. Remove and do not replace umbilical artery catheters if any signs of central line–associated bloodstream infection, vascular insufficiency in the lower extremities, or thrombosis are present (Category II).
2. Remove and do not replace umbilical venous catheters if any signs of central line–associated bloodstream infection or thrombosis are present (Category II).
3. Cleanse the umbilical insertion site with an antiseptic before catheter insertion. Avoid tincture of iodine because of the potential effect on the neonatal thyroid. Other iodine-containing products (eg, povidone-iodine) can be used (Category IB).
4. Do not use topical antibiotic ointment or creams on catheter insertion sites because of the potential to promote fungal infections and antimicrobial resistance (Category IA).
5. Add low doses of heparin (0.25–1.0 U/mL) to the fluid infused through umbilical arterial catheter (Category IB).
6. Remove umbilical catheters as soon as possible when no longer needed or when any sign of vascular insufficiency to the lower extremities is observed. Optimally, umbilical artery catheters should not be left in place for more than 5 d (Category II).
7. Umbilical venous catheters should be removed as soon as possible when no longer needed but can be used up to 14 d if managed aseptically (Category II).
8. An umbilical catheter may be replaced if it is malfunctioning and there is no other indication for catheter removal and the total duration of catheterization has not exceeded 5 d for an umbilical artery catheter or 14 d for an umbilical vein catheter (Category II).

La durata del CVO

Le raccomandazioni della AAP sono basate sullo studio di Butler-O'Hara pubblicato su paediatrics nel 2006. Ma questo studio presenta numerosi limiti:

- 12% dei neonati che dovevano mettere il ECC lo hanno posizionato dopo il 10 giorno
- L'incidenza di CLABSI in questo 12% non è dichiarata
- Mancano dati demografici dei due gruppi (gravità clinica, uso antibiotici, PROM)
- CVO e ECC avevano medicazioni e gestioni diverse (es tempo di sostituzione set infusionali)
- La definizione di CLABSI non rispecchia quella del CDC, escludendo le colture prese il giorno dopo la rimozione del catetere
- Non chiara gestione delle infezione da CONS

La durata del CVO

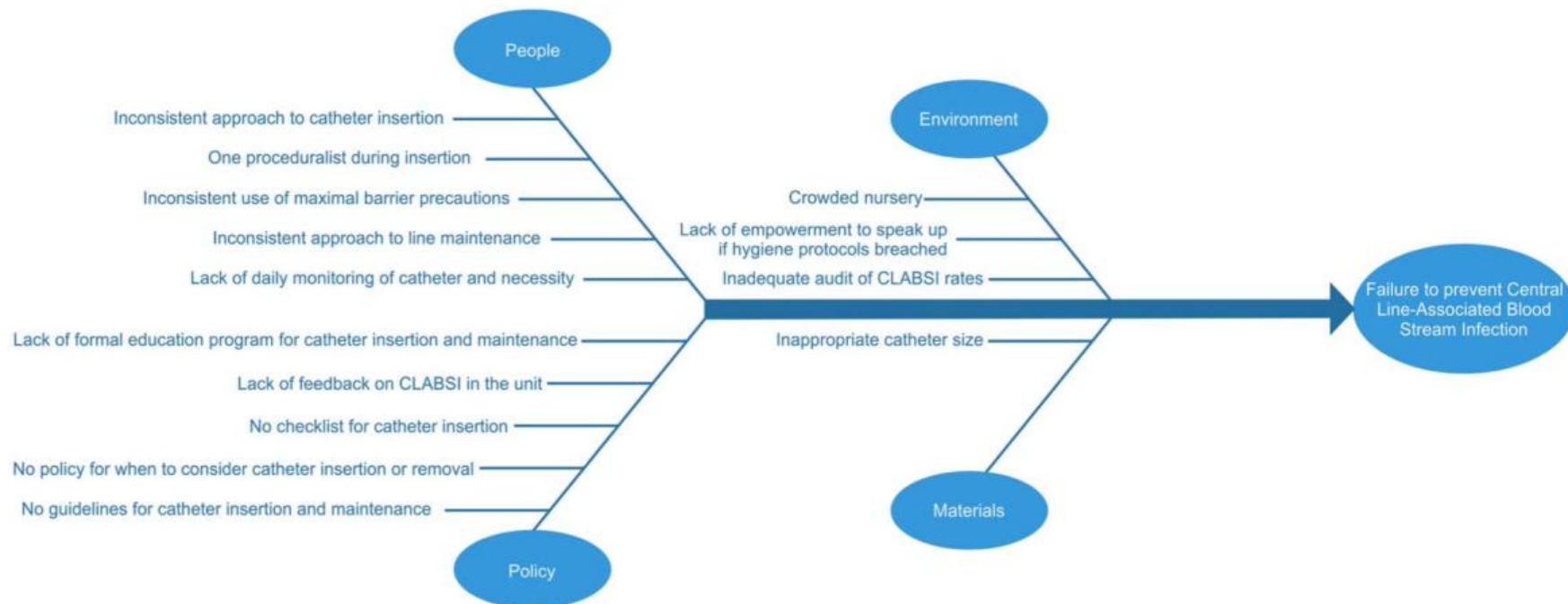
Clinical Bottom Lines

- 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)

L'importanza del “bundle”...anche per i CVO





AGENDA

Indicazioni ai cateteri venosi ombelicali

La scelta del catetere

“Can we do it better?”

Durata del CVO

Take Home Messages

Take Home Messages

- Sviluppo di LG relative alle indicazioni al CVO
- Monitoraggio e verifica delle LG
- Razionalizzare la scelta del catetere (monolume vs bilume, catetere agli ioni d'argento?)
- Valutazione intraprocedurale della punta con US
- Monitoraggio della punta del CVO dopo 48 ore dal posizionamento
- Monitoraggio delle complicanze
- Rimozione del CVO entro 5-7 giorni

THANK YOU

GRACIAS
ARIGATO
SHUKURIA
GOZAIMASHITA
EFCHARISTO

DANKSCHEEN
JUSPAXAR
SHACHALHYA
HUIHUI
CHALTU
YAQHANYELAY
TASHAKKUR ATU
YUSPAGABATAM
HADEEJA
HAITEKA
HAJI
SUKSAMA
EKHMET
ATTO
ANHA
SHAHYABAD
SPASIBO
DENKAUJA
HEHACHALHYA
UNALCHESH
HAUTUR
GUE
TINGKI
BIYAN
SHUKRIA
MAAKE
GRAZIE
MEHRBANI
PALDIES
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LAH
KOMAPSUMNIDA
FAKAAUE
AGUY-JE
SAKCO
MERASTAMHY
GAEJTHO
TAVTAPUCH
MEDAWAGSE
BAHKA
SPASSIBO

