GAVeCeLT
Gli Accessi Venosi Centrali a Lungo Termine

2019
Verona
2-3-4 Dicembre
December 2nd - 3rd - 4th

XI *11TH* **Congresso GAVeCeLT** Congress
2-3 Dicembre December 2nd - 3rd

II *2ND* **Convegno GAVePed** Conference
3 Dicembre December 3rd

XIII *13TH* **PICC** Day
4 Dicembre December 4th

Tip location methods in neonates and newborn: intra-cavitary ECG vs. echocardiography

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UOSD Neonatologia e Terapia intensiva neonatale
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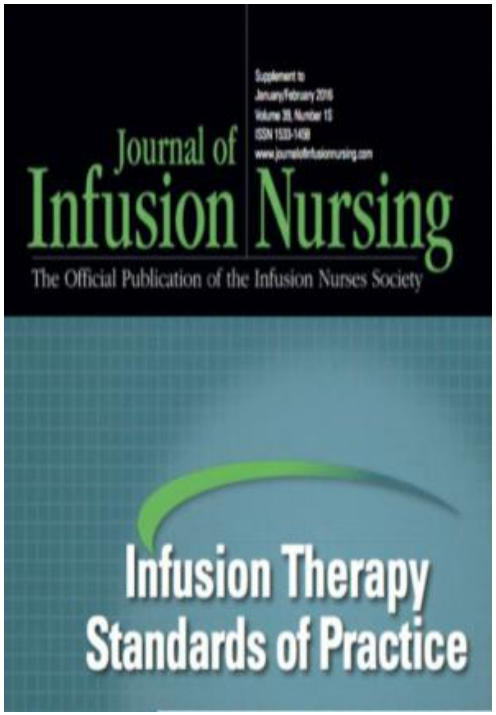
Università degli Studi di Napoli Federico II

Avoid fluoroscopy except in the case of difficult CVAD insertions, as it requires exposure to ionizing radiation.
Postprocedure radiograph imaging is not necessary if alternative tip location technology confirms proper tip placement.[3,12-18] (II)

Confirmation of tip location by postprocedure chest radiograph remains acceptable practice and is required in the absence of technology used during the procedure. This method is less accurate because the CAJ cannot be seen on the radiograph, requiring identification of tip location by measurement from the carina, trachea-bronchial angle, or thoracic vertebral bodies. Additionally, a change in the patient position from supine to standing, usually required for the radiograph, results in movement of the catheter tip by as much as 2 cm.[3,11,12,19,20] (II)



Government of Western Australia
North Metropolitan Health Service

Women and Newborn Health Service
Neonatal Directorate

CLINICAL PRACTICE GUIDELINE
Guideline coverage includes NICU KEMH, NICU PCH and NETS WA

Central Line Imaging in Neonates: Radiographic Views, and Acceptable Line Positions

- **The sensitivity of radiographs in determining malposition was only 64% with a specificity of 55%, while echo- cardiography proved to be more helpful in real-time line manipulation post-PICC insertion .**

- **Ultrasonography is obviously attractive**

- **Neonatal echocardiography may be superior to chest rx for identifying malpositioned catheters or in ELBW neonates**

Jain A, McNamara PJ, Ng E, El-Khuffash A. The use of targeted neonatal echocardiography to confirm placement of peripherally inserted central catheters in neonates. Am J Perinatol. 2012;29(2):101–6.

ULTRASOUND and CVAD

For central vein cannulation, for tip location and navigation, for pnx and emothorax

The United Kingdom's National Institute for Health and Clinical Excellence guidelines recommend real-time use of ultrasound during central vein cannulation in all patients, children and adults

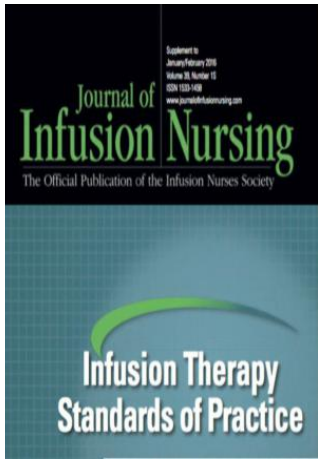
National Institute for Health and Clinical Excellence. NICE Technology Appraisal 49: guidance on the use of ultrasound locating devices for placing central venous catheters. 2002

Verify the presence of the pleural "sliding sign" in the intercostal space, so as to rule out pneumothorax (particularly after axillary or subclavian venipuncture). Ultrasound can be more sensitive than a chest radiograph for detection of pleural injury and pneumothorax

Cattarossi L., et al. Lung ultrasound diagnostic accuracy in neonatal pneumothorax. *Can. Respir. J.* **2016**, 6515069 (2016).

Raimondi, F. et al. Lung ultrasound for diagnosing pneumothorax in the critically ill neonate. *J. Pediatr.* **175**, 74–78 (2016).

Use caution with ultrasound for CVAD tip location, as its use in replacing chest radiographs is controversial in all ages due to small sample sizes in available studies and lack of standardized techniques. Consider use in neonates and in emergency departments when immediate knowledge of the CVAD tip location is beneficial.



The introduction of TnECHO into NICUs requires a cost-benefit analysis, trained staff to perform the procedure, and ongoing quality assurance to maintain skills

Jain A, McNamara PJ, Ng E, El-Khuffash A. The use of targeted neonatal echocardiography to confirm placement of peripherally inserted central catheters in neonates. Am J Perinatol. 2012;29(2):101–6.

European Journal of Echocardiography (2011) **12**, 715–736
doi:10.1093/ejechocard/jer181

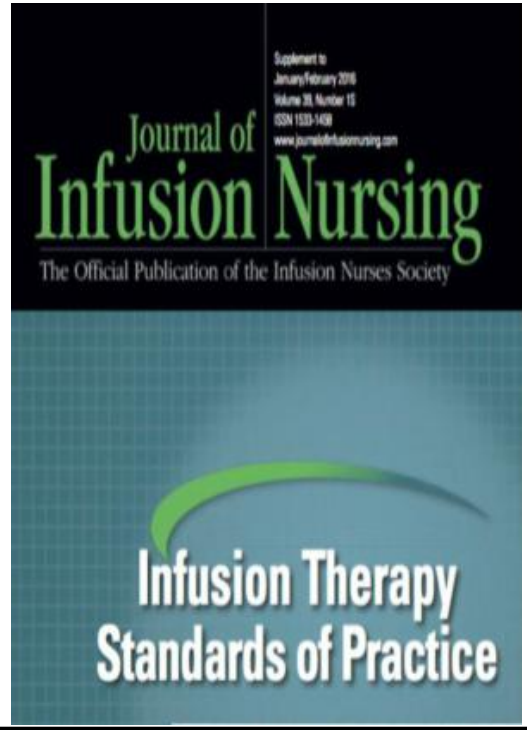
EXPERT CONSENSUS STATEMENT

Targeted Neonatal Echocardiography in the Neonatal Intensive Care Unit: Practice Guidelines and Recommendations for Training

Writing group of the American Society of Echocardiography (ASE) in collaboration with the European Association of Echocardiography (EAE) and the Association for European Pediatric Cardiologists (AEPC)

	Training level			
	Core/basic	**Advanced**	**Expert**	**Accreditation**
ACC/AHA/ASE pediatric echocardiography				
Number of studies	150 studies performed 150 studies reviewed	200 additional studies performed 200 additional reviewed	Not defined	None
Duration of training	4-6 mo	Additional 9-12 mo		
AEPC pediatric echocardiography				
Number of studies	250 studies performed	750 studies performed in total	2,000 studies performed in total	EAE congenital echocardiography exam
Duration of training	Not defined	1y	Not defined	
TNE guidelines				
Number of studies	150 studies reviewed 150 studies performed	150 additional studies reviewed 150 additional studies performed	Not defined	None
Duration of training	4-6 mo	Additional 4-6 mo	Not defined	None

E. Use methods for identifying CVAD tip location during the insertion procedure (ie, "real time") due to greater accuracy, more rapid initiation of infusion therapy, and reduced costs.
   1. Use electrocardiogram (ECG) methods with either a metal guidewire or a column of normal saline inside the catheter lumen and observe the ECG tracing to place the CVAD tip at the CAJ. Follow manufacturers' directions for use with other ECG-based technology using a changing light pattern to detect tip location.



A multicenter study 2012 conducted by GAVeCeLT in 8 hospital centers on 1,400 patients has demonstrated the safety and feasibility of IC-ECG in the positioning of short, medium, and long-term central venous accesses in adult patients and has confirmed its accuracy compared with the postoperative chest x-ray.

Pittiruti M,.et al. The intracavitary
ECG method for positioning the tip of central venous catheters:
results of an Italian multicenter study. J Vasc Access. 2012;13(3):357-365.

Defining central venous line position in children: tips for the tip JVA 2015

Serafini in 1985 reported the first example of ECG positioning technique in childrein 52 children needing antineoplastic chemotherapy. The authors stress that this technique may avoid chest X-ray control.

Serafini G .Positioning of a central venous catheter in children by intracavitary ECG. A new technic Minerva Anestesiol.

Three years later, Hoffman and colleagues experimented this technique on 50 patients obtaining a success rate of 96% and 100% accuracy

Hoffmann MA. Central venous catheters no X-rays needed: a prospective study in 50 consecutive infants and children. J Paediatr Anaesth. 1999

Weber in 2013 used a commercialized endovascular ECG-system in 50 pediatric patients: in 44 cases, the CVC was properly placed at first attempt

GAVECELT 2013 PICU (Pediatric Intensive Care Unit) BUNDLE

1.Scelta ragionata mediante esame ecografico sistematico

2.Tecnica asettica appropiata mediante lavaggio delle mani, massime precauzioni di barriere, disinfezione con clorexidina

3.Utilizzo dell'ecografo per la venipuntura e per il successivo controllo delle complicanze

4. Verifica intraprocedurale della posizione centrale della punta mediante la tecnica ECG intracavitario e/o mediante ecografia

6. Protezione del sito di emergenza mediante colla istoacrilica

7. Stabilizzazione del catetere mediante suturless device e membrana trasparente semipermeabile

- **Applicability: 99,4%**
- **Feasibility: 99.4%**
- **Accuracy:95,8%- 98,8%**
- **Safety:100%**

Studio GAVeCeLT ECG pediatrico

JVA
ISSN 1129-7258
ORIGINAL ARTICLE

The intracavitary ECG method for positioning the tip of central venous access devices in pediatric patients: results of an Italian multicenter study

Francesca Rossetti[1], Mauro Pittiruti[2], Massimo Lamperti[3], Ugo Graziano[4], Davide Celentano[2], Giuseppe Capozzoli[5]

[1]Department of Anesthesia, Children's Hospital "Meyer", Firenze - Italy
[2]Department of Surgery, Catholic University Hospital, Roma - Italy
[3]Department of Neuroanesthesia, Neurological Institute "Besta", Milano - Italy
[4]Department of Surgery, Children's Hospital "Santobono", Napoli - Italy
[5]Pediatric Intensive Care Unit, Catholic University Hospital, Roma - Italy
[6]Department of Anesthesia and Intensive Care, Ospedale Civile di Bolzano, Bolzano - Italy

Studio Prospettico

Studio Multicentrico

(1) Ospedale Pediatrico Meyer- Firenze (F.Rossetti) Centro coordinatore

(2) Policlinico Universitario "A.Gemelli"- Roma (M.Pittiruti, D. Celentano)

(3) Istituto Besta - Milano (M.Lamperti)

(4) Ospedale pediatrico Santobono – Napoli (U.Graziano)

(5) Azienda Ospedaliera di Bolzano (G.Capozzoli)

Low cost….


Energia selezionata: 4 J
SCHILLER


DIMED
99
60
14
120 93 80
20


Alphacard

Training ……..

The IC-ECG focuses on lead II (red to green), which is ideal for the visualization of the P wave

In agree with (TEE) transesophageal echocardiography

Pmax= CAJ in agree with TEE (crista terminalis)

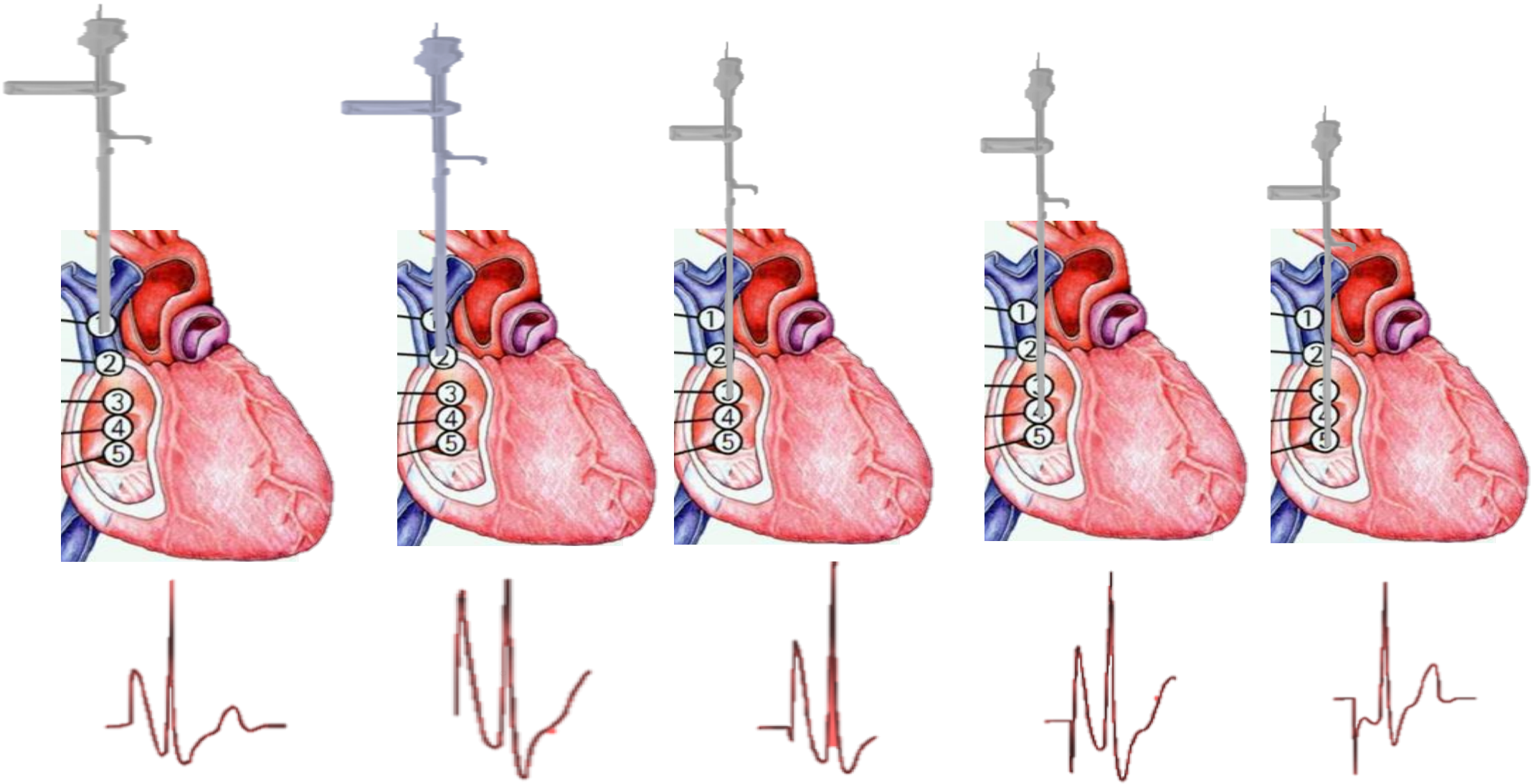
(Cost comparison of elettrocardiography versus fluoroscopy for central venous line in children. SN Tierney, J.katke, J.Langer. Journal of the American College of Surgeon, 2000, 191: 209-211)

Tip location : IC ECG

The catheter acts as an intracavitary electrode which transmits an electric signal thanks to a column of saline solution (or metallic guide inserted inside)

After the removal of the guidewire (direct Seldinger) and/or removal of the introducer (indirect Seldinger), the catheter is filled with saline and attached to the connector of the transducer.

The catheter is threaded further on into the venous system.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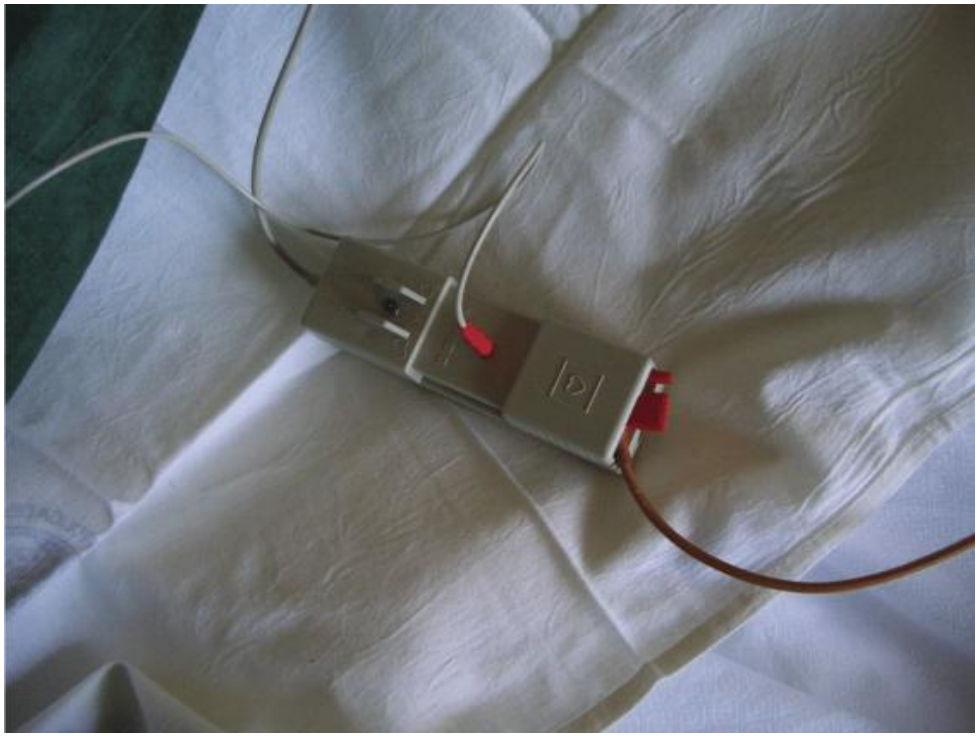
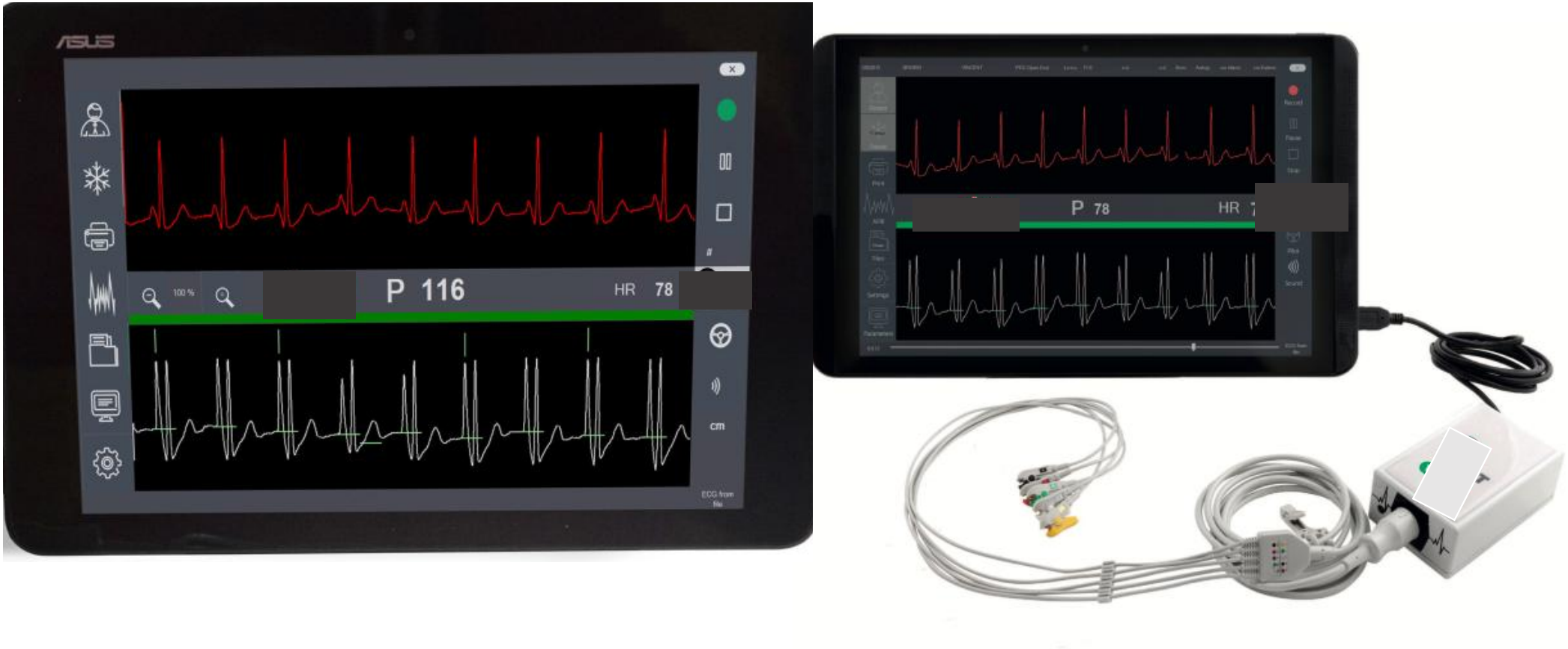



Alphacard

Dedicate system : advantages



The proper reading of P wave variations may be influenced by many technical factors:

- **Position of electrodes (the green electrode should be placed in an appropriately low position)**
- **Choice of the most appropriate voltage values (the amplitude must be set in order to comfortably visualize the P variations)**
- **Choice of the monitoring mode (the "diagnostic" mode is preferred)**
- **Interference caused by other electro-medical devices operating in proximity of the patient**
- **In the pediatric setting, passive warmers may significantly interfere with the reading of the IC-ECG trace.**

…and in neonates: does IC ECG work?

J Perinat Neonatal Nurs. 2017 Oct/Dec;31(4):326-331. doi: 10.1097/JPN.0000000000000264.

Effectiveness of Intracavitary Electrocardiogram Guidance in Peripherally Inserted Central Catheter Tip Placement in Neonates.

Zhou L[1], Xu H, Liang J, Xu M, Yu J.

Table 1. **General information of enrolled neonates and success rate of PICC placement on the first attempt**

	Traditional PICC	Induction of IC-ECG	IC-ECG–guided PICC
Case number	200	32	49
Sex (male/female)	101/99	23/9	32/17
Gestational age, mean ± SD (range), wk	36 ± 3 (28-41)	34 ± 3 (27-40)	35 ± 4 (28-41)
Postnatal age, mean ± SD (range), d	13 ± 12 (1-28)	13 ± 9 (1-28)	17 ± 16 (1-28)
Weight, mean ± SD (range), kg	2.7 ± 0.9 (1-5)	2.3 ± 0.7 (0.9-4.3)	2.7 ± 0.9 (1.1-4.9)
Success on first attempt	125/200 (62.5%)		46/49 (93.9%)

American Journal of Nursing Science
2019; 8(4): 142-144
http://www.sciencepublishinggroup.com/j/ajns
doi: 10.11648/j.ajns.20190804.13
ISSN: 2328-5745 (Print); ISSN: 2328-5753 (Online)

SciencePG
Science Publishing Group

Outcome of Intracavitary Electrocardiogram Guidance in PICC Tip Placement in Preterm Infants: A Single-center Experience of 327 Cases

Lilan He, Weiju Chen*, Meng Zhang, Na Lin, Wenyan Yang

Neonatal Department, The First Affiliated Hospital of Jinan University, Guangzhou, China

327 preterm infants in China
mean gestation of 31.3 weeks (25.3 to 36.8)

J Perinat Neonatal Nurs. **2019 Accuracy and Safety Study of Intracavitary Electrocardiographic Guidance for Peripherally Inserted Central Catheter Placement in Neonates.**
Ling Q1, Chen H, Tang M, Qu Y, Tang B

DE GRUYTER Open Med. 2017; 12: 125-130

Research Article Open Access

Lian-juan Zhou, Hong-zhen Xua*, Mei-fang Xu, Yan Hu, Xiao-Fang Lou

An accuracy study of the Intracavitary Electrocardiogram (IC-ECG) guided peripherally inserted central catheter tip placement among neonates

ECG IC and epicutaneous cava catheter in neonates

Original research article

JVA The Journal of Vascular Access

The Journal of Vascular Access
1–6
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sagepub.co.uk/journalsPermissions.nav
DOI: 10.1177/1129729818761292
journals.sagepub.com/home/jva
SAGE

The intracavitary electrocardiography method for positioning the tip of epicutaneous cava catheter in neonates: Pilot study

A.Capasso,R.Mastroianni,G.Ausanio

Epicutaneous cava catheters 1 Fr in neonates 29.41±3.04 (range: 25-40) weeks

Tip location with ECG IG vs echocardiography and RX

Applicabilità : 100%
Fattibilità: 86% (monitor non dedicato)
Accuratezza: 97 %
Sicurezza :100%

Issues of ECG IC in neonates

J Perinat Neonatal Nurs. 2017 Oct/Dec;31(4):326-331. doi: 10.1097/JPN.0000000000000264.

Effectiveness of Intracavitary Electrocardiogram Guidance in Peripherally Inserted Central Catheter Tip Placement in Neonates.

Zhou L[1], Xu H, Liang J, Xu M, Yu J.

1. **Ridotto calibro del catetere**

2. Ridotta sedazione del paziente

1. Apparecchi elettromedicali

2. Difficoltà di progressione del catetere che non consente modifica del percorso

Issues of ECG IC in neonates

Original research article

JVA The Journal of Vascular Access

The intracavitary electrocardiography method for tip location of jugular internal vein access device in infants of less than 5 kg: A pilot study

The Journal of Vascular Access
1–5

DOI: 10.1177/1129729818769028
journals.sagepub.com/home/jva
SAGE

Rossella Mastroianni, Antonella Capasso and Gaetano Ausanio

FATTIBILITA ‘ 100%

ECHOTIP		ECG IC
	(Lack of studies)	
• Safety	=	• Safety
• Feasibility	>	• Feasibility
• Sensitivity	=	• Sensitivity
• Specificity for malposition	≥	• Specificity for malposition
• Real time	=	• Real time
• Bed side	=	• Bed side
• Low cost	>	• Low cost
• Training	>	• Training

Take Home messages

The combined use of IC-ECG and echocardiography for tip location is ideal because of the following reasons:

1. It allows you to establish exactly the tip of the catheter in the target zone (CAJ), thus reducing the incidence of malpositions and complications caused by them.

2. It leaves little or no space to x-ray, which can be limited to selected cases, and so reduces newborn's exposure to x-ray.

3. It reduces the costs because the IC-ECG use–related products are easily available and very cheap. Our study is a

Original research article

JVA The Journal of Vascular Access

The intracavitary electrocardiography method for positioning the tip of epicutaneous cava catheter in neonates: Pilot study

The Journal of Vascular Access
1–6

DOI: 10.1177/1129729818761292
journals.sagepub.com/home/jva
SAGE

A.Capasso,R.Mastroianni,G.Ausanio

In our NICU we hope for an "x ray free" future

Pediatric RESEARCH 2018

REVIEW ARTICLE

Point-of-care lung ultrasound in neonatology: classification into descriptive and functional applications

Francesco Raimondi[1], Nadya Yousef[2], Fiorella Migliaro[1], Letizia Capasso[1] and Daniele De Luca[3]

UNIVERSITÀ DEGLI STUDI DI NAPOLI FEDERICO II

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AMIETIP

GAVeCeLT
Gli Accessi Venosi Centrali a Lungo Termine

TIPI
GAS Terapia Intensiva Prima Infanzia

SIN
Società Italiana di Neonatologia

Thanks

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