ULTRASOUND STUDY OF UPPER LIMB VEINS (RAPEVA PROTOCOL) AND SIP-2 PROTOCOL FOR ULTRASOUND/ECG-GUIDED PLACEMENT OF PICC.

Anna Rubinacci
Vascular Access Team
AORN A. Cardarelli

Italian Vascular Access Society

REFERENCE GUIDELINES

- Consensus WoCoVA-GAVeCeLT-WINFOCUS 2012
- Linee guida EPIC 2014
- DAV Expert 2018
- Linee guida ESA 2020
- Linee guida SHEA/IDSA 2022
- Raccomandazioni GAVeCeLT 2024
- Standards INS 2024

IVAS
ItalianVascularAccess Society

BCSH Guidelines

GAVeCeLT
Gli Accessi Venosi Centrali a Lungo Termine

epic2: National Evidence-Based Guidelines for Preventing Healthcare-Associated Infections in NHS Hospitals in England

R.J. Pratt[a*], C.M. Pellowe[a], J.A. Wilson[a,b], H.P. Loveday[a], P.J. Harper[a], S.R.L.J. Jones[a], C. McDougall[b], M.H. Wilcox[c]

CDC
Centers for Disease Control and Prevention

Royal College of Nursing

SHEA 2009

BUNDLE: FEW STRATEGIES *EVIDENCE BASED*

Table 1. The seven steps of the SIC protocol.

Step 1	*Preprocedural evaluation*—choice of the vein by systematic ultrasound examination of the veins of the neck and of the supra/infraclavicular region (RaCeVA protocol) and choice of the ideal exit site (Central ZIM)
Step 2	*Appropriate aseptic technique*—hand hygiene, skin antisepsis with 2% chlorhexidine in 70% alcohol, maximal barrier precautions
Step 3	*Ultrasound-guided insertion*—ultrasound-guided venipuncture, ultrasound verification of the correct direction of the guidewire (tip navigation) and of the absence of pneumothorax (pleural scan)
Step 4	*Intra-procedural assessment of tip location*—verification of the central position of the tip by intracavitary ECG and/or by transthoracic echocardiography, using the "bubble test"
Step 5	*Adequate protection of the exit site*—reduction of the risk of bleeding and risk of contamination by sealing with cyanoacrylate glue
Step 6	*Proper securement of the catheter*—stabilization of the catheter using skin-adhesive sutureless devices, transparent dressing with integrated securement or subcutaneous anchorage
Step 7	*Appropriate coverage of the exit site*—use of semi-permeable transparent dressing, preferably with high breathability

INFORMATION AND CONSENT

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INFORMATIVA POSIZIONAMENTO PICC

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Inquadri il QR Code e risponda al questionario

Gentile Assistito,
In questa informativa troverà alcune informazioni utili sul catetere venoso che le verrà posizionato. Il PICC è un catetere venoso centrale ad inserimento periferico, che viene posizionato attraverso la puntura di una vena del braccio che raggiunge i grossi vasi venosi.

PERCHÉ UN PICC

La scelta del dispositivo viene fatta dal suo curante in considerazione delle sue esigenze infusionali.
Il PICC viene posizionato per somministrare in sicurezza terapie complesse in una vena di grosse dimensioni, riducendo così i danni che alcuni farmaci causerebbero alle vene periferiche. È anche indicato nei casi in cui le vene delle braccia siano piccole, fragili o tortuose, inoltre Il PICC può essere utilizzato per l'esecuzione dei prelievi venosi e per la somministrazione del mezzo di contrasto.
La procedura viene eseguita da personale esperto ed in totale sicurezza, ma ciononostante potrebbero presentarsi delle complicanze quali:

- ematoma e/o sanguinamento nel punto di inserzione
- venipunture ripetute
- puntura arteriosa
- parestesie di breve o media durata dovute a puntura nervosa accidentale

In seguito al posizionamento del suddetto catetere possono verificarsi complicanze rare di altro genere quali: sepsi, ostruzione del sistema, problemi meccanici, trombosi venosa.

LA CURA DEL PICC

- Deve essere irrigato con soluzione salina sterile con tecnica pulsata prima e dopo ogni suo utilizzo, e ogni 7 giorni quando il dispositivo non è in uso.
- Deve essere medicato ogni 7 giorni o prima se la medicazione è staccata, sporca o bagnata.

PRECAUZIONI UTILI

Faccia attenzione se nel punto di fuoriuscita della cute vi sia presenza di:

- arrossamento
- secrezioni
- sanguinamento
- dolore
- gonfiore

Inoltre sintomi diversi da quelli elencati (esempio febbre e brividi), vanno riferiti subito al personale infermieristico contattando i numeri telefonici o la mail elencata.

STEP 1. PRE-PROCEDURAL EVALUATION: CHOOSE THE VEIN CAREFULLY AND THE EXIT SITE

1. **Choosing the ideal vein:**
    1. Rapid Central Vein Assessment (RaCeVA)
    2. Rapid Peripheral Vein Assessment (RaPeVA)
    3. Rapid Femoral Vein Assessment (RaFeVA)
2. **Choosing the ideal exit site**
    1. Zone Insertion Method (ZIM)
    2. Tunnellizzazione (RAVESTO)

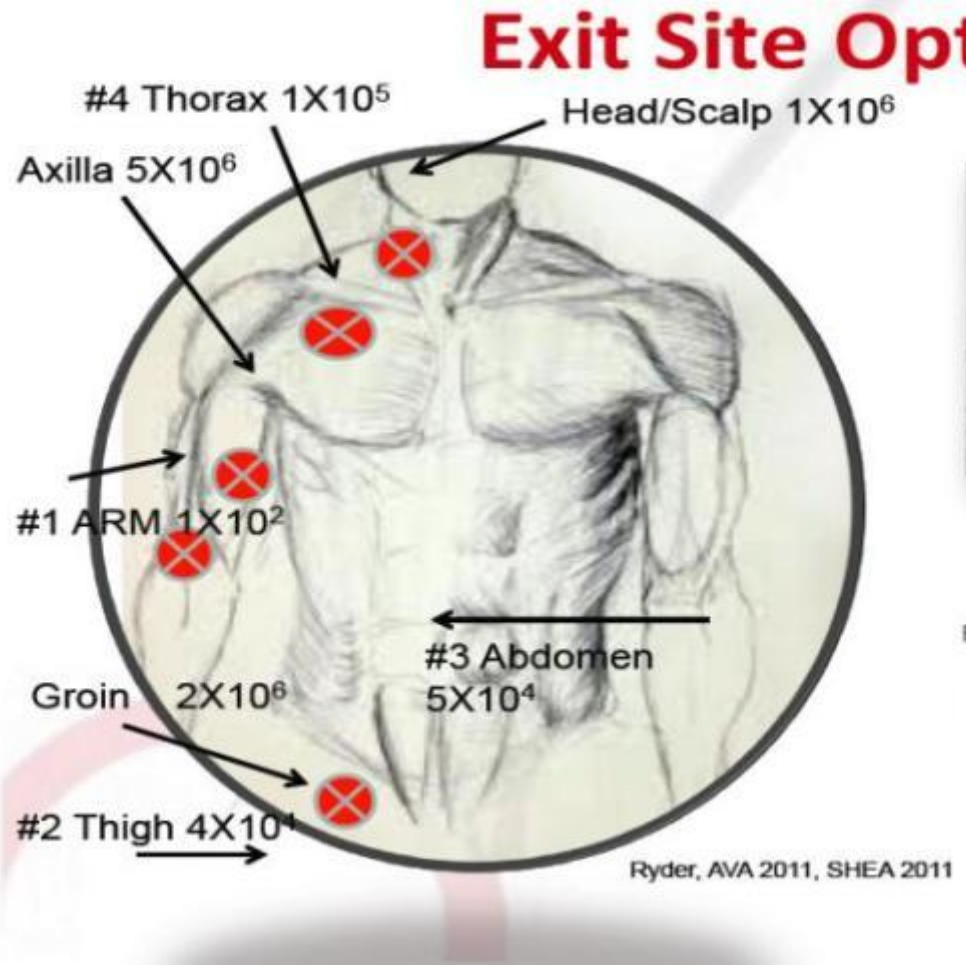
VEIN SELECTION

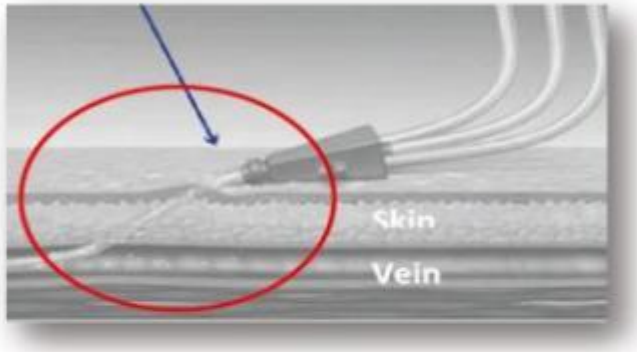
- Caliber (catheter/vein caliber ratio = 1:3)
- Course
- Compressibility
- Collapsibility with respiration
- Previous thrombosis
- Depth…

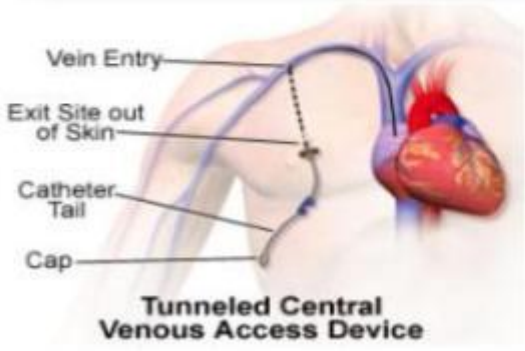
THE IMPORTANCE OF THE EXIT SITE

- Risk of contamination (germs, beard, skin moisture, etc.) + risk of dislodgement (instability of the dressing) + risk of thrombosis (catheter mobility)
  - Most risk areas:
    - Groin
    - Neck
  - Intermediate risk areas:
  - Supraclavicolar area
    - Low risk areas: :
    - Subclavicular area
    - Mid-thigh
    - Arm

THE CRUCIAL POINT IS THE EXIT SITE







2011

JVA | The Journal of Vascular Access

Editorial

Puncture site versus exit site in central venous access procedures: Still a source of confusion

The Journal of Vascular Access
1–6

DOI: 10.1177/11297298251338968
journals.sagepub.com/home/jva
Sage

Maria Giuseppina Annetta[1], Timothy R Spencer[2] and Mauro Pittiruti[3]

THE CRUCIAL POINT IS THE EXIT SITE

Original Article

Journal of Infection Prevention

Evaluation of Skin Colonisation And Placement of vascular access device Exit sites (ESCAPE Study)

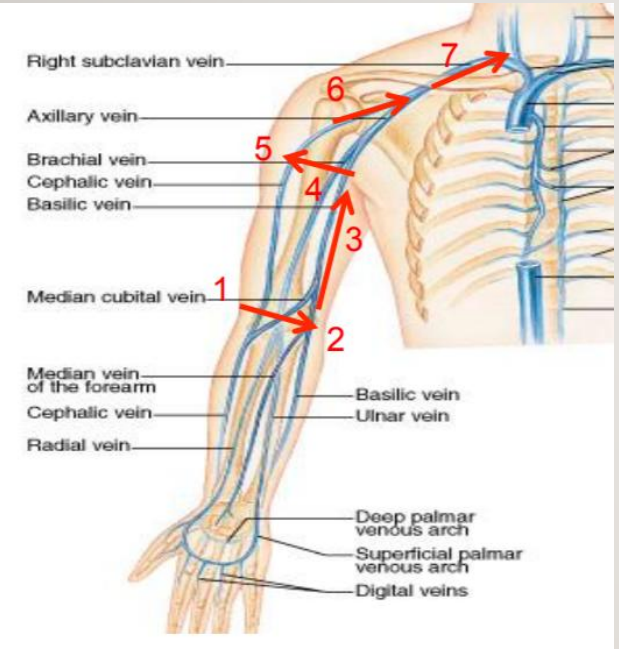
Journal of Infection Prevention
1–9

DOI: 10.1177/1757177418805836
jip.sagepub.com
SAGE

Nancy L Moureau[1], Nicole Marsh[2], Li Zhang[3], Michelle J Bauer[3], Emily Larsen[3], Gabor Mihala[4], Amanda Corley[3,5], India Lye[3,5], Marie Cooke[3] and Claire M Rickard[3,6]

2018

VEIN ASSESSMENT…AND CHOICE



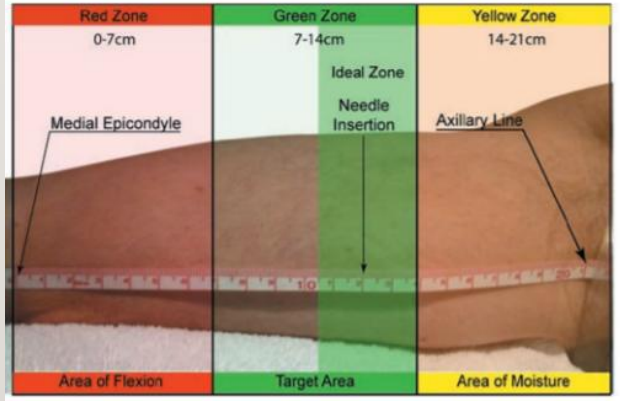
III. Central Venous Access via Peripherally Inserted Central Catheters

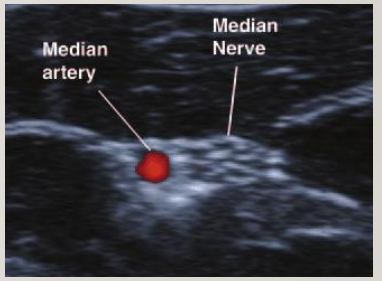
A. Select the median cubital, cephalic, basilic, and brachial veins with sufficient size for peripherally inserted central catheters (PICC) cannulation. A venous site in adults where the catheter-to-vein ratio is equal to or less than 45% is recommended. For

Diameter of Vein
Depth
% Catheter Occupacy

PICC Zone Insertion Method™ (ZIM™): A Systematic Approach to Determine the Ideal Insertion Site for PICCs in the Upper Arm

Robert B. Dawson
MSA, BSN, RN, CRNI, CPUI, VA-BC

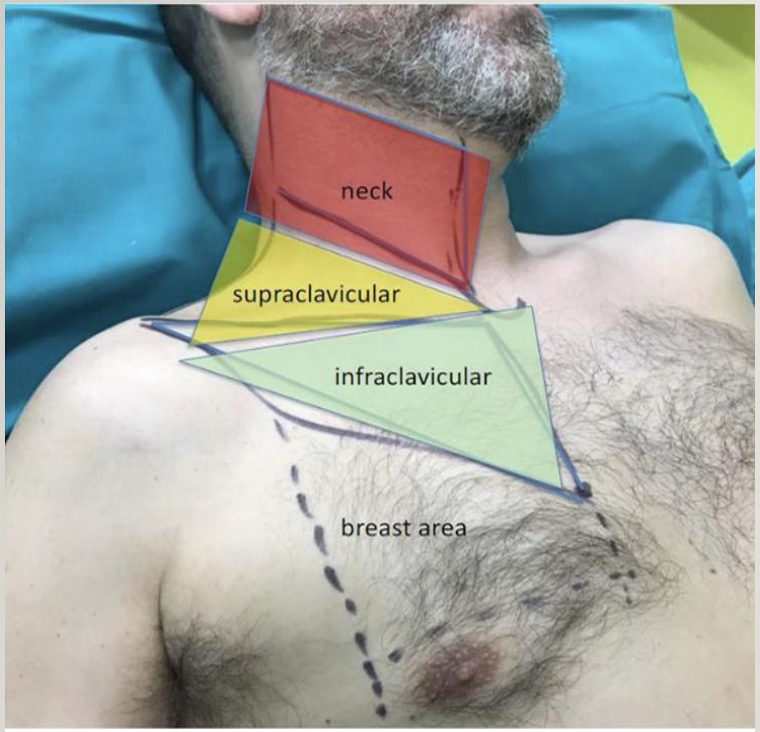




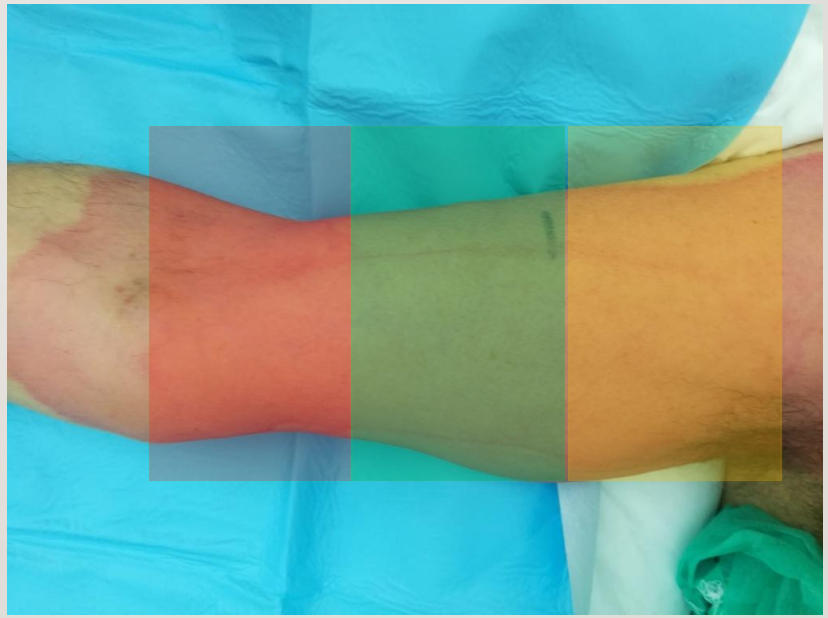
Median Artery and Nerve Identification

THE IDEAL EXIT SITE = SAFE, STABLE & CLEAN

Central ZIM



Upper Arm ZIM



Femoral ZIM

Brescia et al. JVA 2021

TUNNELING:THE RAVESTO PROTOCOL

Techniques in vascular access

JVA The Journal of Vascular Access

Rapid Assessment of Vascular Exit Site and Tunneling Options (RAVESTO): A new decision tool in the management of the complex vascular access patients

Matthew D Ostroff[1], Nancy Moureau[2] and Mauro Pittiruti[3]

The Journal of Vascular Access
1–7

DOI: 10.1177/11297298211034306
journals.sagepub.com/home/jva
SAGE

Rationale for subcutaneous tunneling:

- **Moving the exit site away from areas of high bacterial contamination**
  - **Reducing the risk of infection**
- **Puncture larger vessels:**
  - **Reducing the risk of thrombosis**

Obtaining the exit site in a more stable area

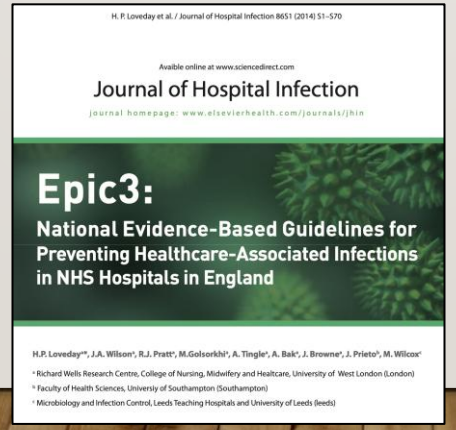
- **Reducing the risk of thrombosis**
- **Reducing the risk of dislocation**

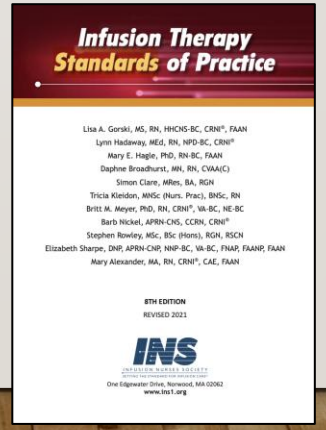
STEP 2: APPROPRIATE ASEPTIC TECHNIQUE

- Hand washing before the procedure
- Skin antisepsis with 2% chlorhexidine in 70% PAH
- Maximum barrier precautions (hat, mask, sterile gloves, sterile drapes, sterile probe cover)

World Health Organization

CDC
CENTERS FOR DISEASE CONTROL AND PREVENTION





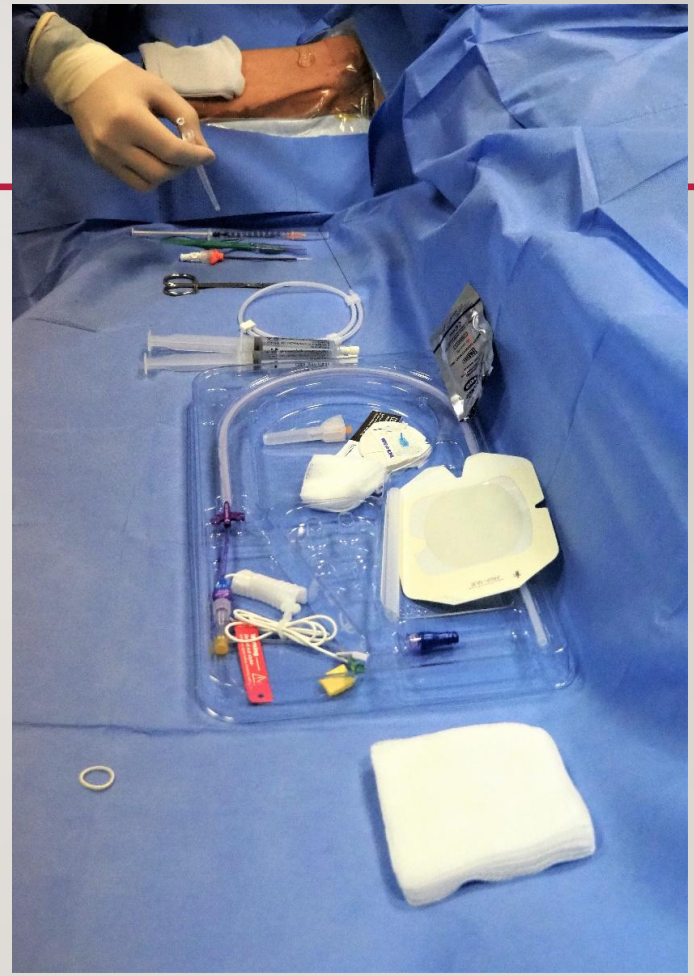
SHEA
The Society for Healthcare Epidemiology of America

SKIN ANTISEPSIS

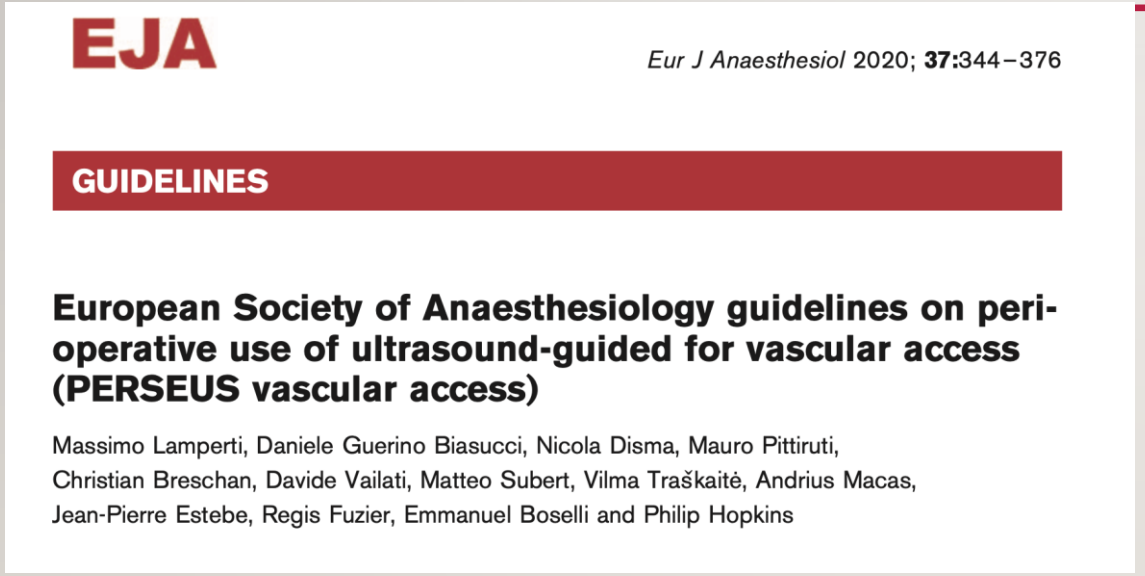
Skin antisepsis with 2% chlorhexidine gluconate in 70% isopropyl alcohol in sterile single-use and single-dose applicators for single patients

ANTT®
Aseptic Non Touch Technique

MAXIMUM BARRIER PRECAUTIONS



STEP 3: USING ULTRASOUND FOR VENIPUNCTURE



EJA

Eur J Anaesthesiol 2020; **37**:344–376

GUIDELINES

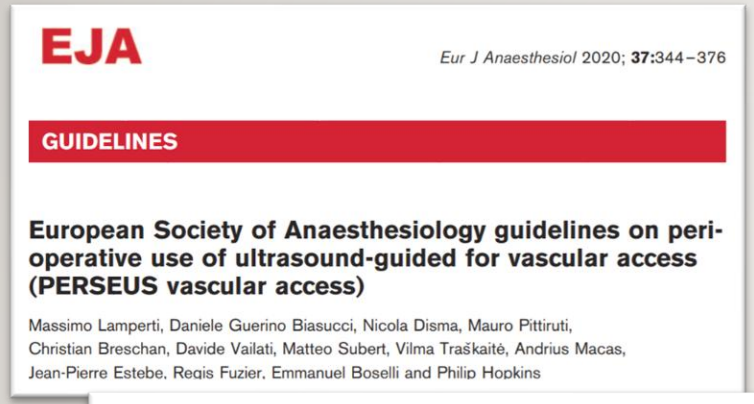
European Society of Anaesthesiology guidelines on peri-operative use of ultrasound-guided for vascular access (PERSEUS vascular access)

Massimo Lamperti, Daniele Guerino Biasucci, Nicola Disma, Mauro Pittiruti, Christian Breschan, Davide Vailati, Matteo Subert, Vilma Traškaitė, Andrius Macas, Jean-Pierre Estebe, Regis Fuzier, Emmanuel Boselli and Philip Hopkins

2020

We recommend **the use of ultrasound-guidance […], as it is safer in terms of reduction of overall complications, it improves both overall and first-time success, and it reduces the time to successfully puncture and cannulate the vein (1B).**

GLOBAL USE OF US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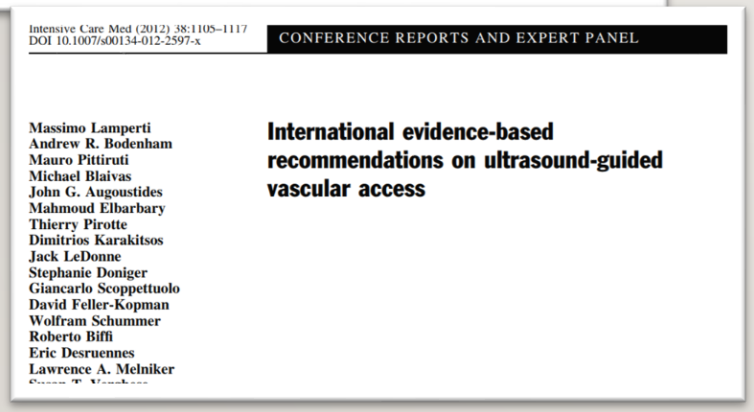
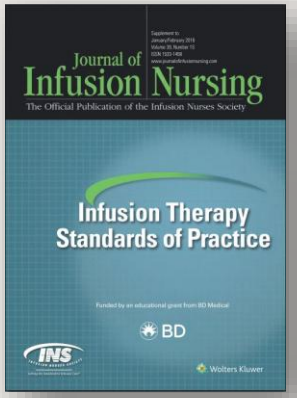

Intensive Care Med (2012) 38:1105–1117
DOI 10.1007/s00134-012-2597-x

CONFERENCE REPORTS AND EXPERT PANEL

Massimo Lamperti
Andrew R. Bodenham
Mauro Pittiruti
Michael Blaivas
John G. Augoustides
Mahmoud Elbarbary
Thierry Pirotte
Dimitrios Karakitsos
Jack LeDonne
Stephanie Doniger
Giancarlo Scoppettuolo
David Feller-Kopman
Wolfram Schummer
Roberto Biffi
Eric Desruennes
Lawrence A. Melniker

International evidence-based recommendations on ultrasound-guided vascular access



Organization Accredited
by Joint Commission International

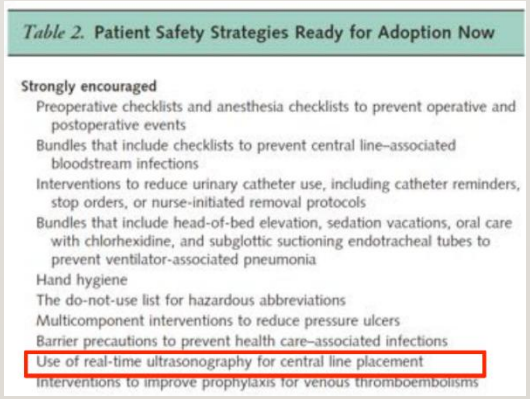
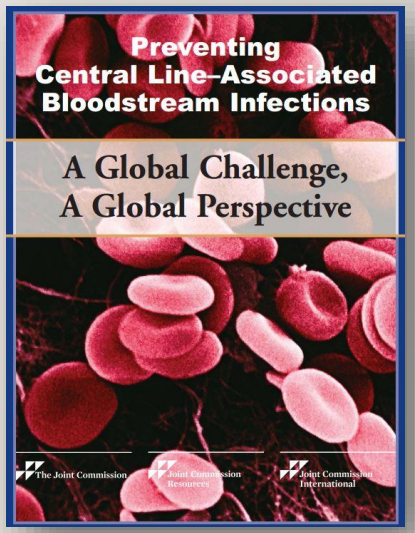


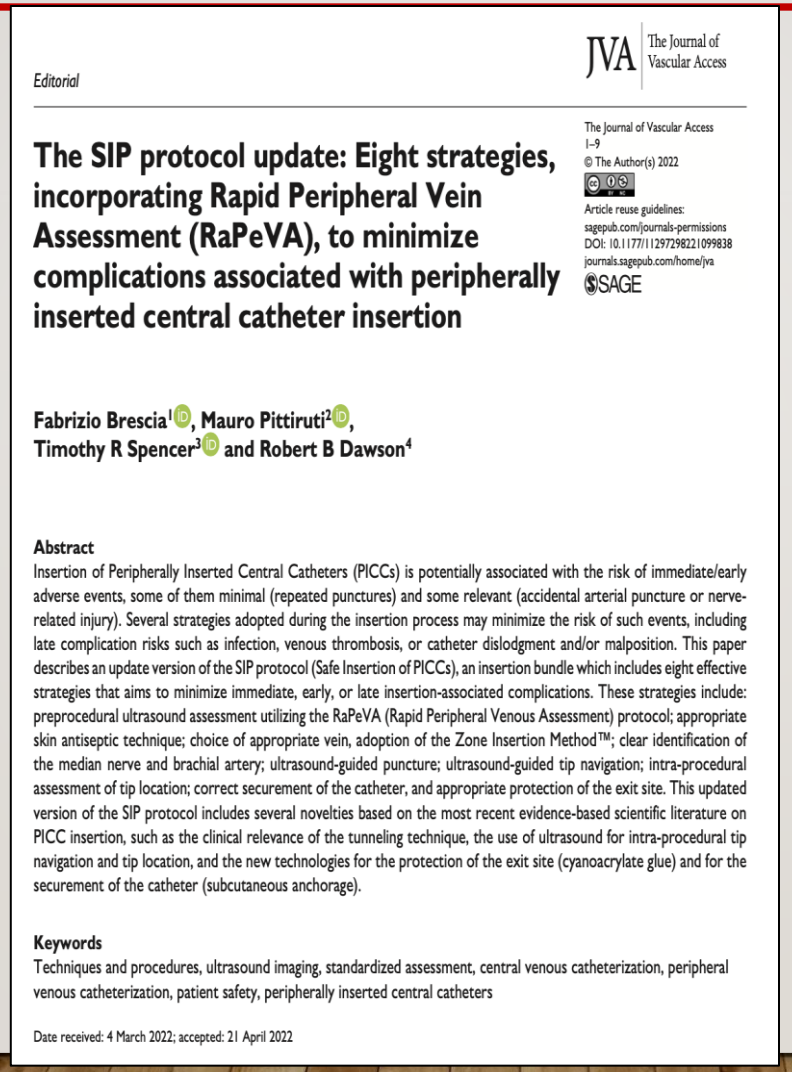
Table 2. Patient Safety Strategies Ready for Adoption Now

Strongly encouraged

- Preoperative checklists and anesthesia checklists to prevent operative and postoperative events
- Bundles that include checklists to prevent central line–associated bloodstream infections
- Interventions to reduce urinary catheter use, including catheter reminders, stop orders, or nurse-initiated removal protocols
- Bundles that include head-of-bed elevation, sedation vacations, oral care with chlorhexidine, and subglottic suctioning endotracheal tubes to prevent ventilator-associated pneumonia
- Hand hygiene
- The do-not-use list for hazardous abbreviations
- Multicomponent interventions to reduce pressure ulcers
- Barrier precautions to prevent health care–associated infections
- Use of real-time ultrasonography for central line placement
- Interventions to improve prophylaxis for venous thromboembolisms



USE SIP INSERTION PROTOCOL



Editorial

JVA The Journal of Vascular Access

The SIP protocol update: Eight strategies, incorporating Rapid Peripheral Vein Assessment (RaPeVA), to minimize complications associated with peripherally inserted central catheter insertion

The Journal of Vascular Access
1–9

DOI: 10.1177/11297298221099838
journals.sagepub.com/home/jva
SAGE

Fabrizio Brescia[1], Mauro Pittiruti[2], Timothy R Spencer[3] and Robert B Dawson[4]

Abstract

Insertion of Peripherally Inserted Central Catheters (PICCs) is potentially associated with the risk of immediate/early adverse events, some of them minimal (repeated punctures) and some relevant (accidental arterial puncture or nerve-related injury). Several strategies adopted during the insertion process may minimize the risk of such events, including late complication risks such as infection, venous thrombosis, or catheter dislodgment and/or malposition. This paper describes an update version of the SIP protocol (Safe Insertion of PICCs), an insertion bundle which includes eight effective strategies that aims to minimize immediate, early, or late insertion-associated complications. These strategies include: preprocedural ultrasound assessment utilizing the RaPeVA (Rapid Peripheral Venous Assessment) protocol; appropriate skin antiseptic technique; choice of appropriate vein, adoption of the Zone Insertion Method™; clear identification of the median nerve and brachial artery; ultrasound-guided puncture; ultrasound-guided tip navigation; intra-procedural assessment of tip location; correct securement of the catheter, and appropriate protection of the exit site. This updated version of the SIP protocol includes several novelties based on the most recent evidence-based scientific literature on PICC insertion, such as the clinical relevance of the tunneling technique, the use of ultrasound for intra-procedural tip navigation and tip location, and the new technologies for the protection of the exit site (cyanoacrylate glue) and for the securement of the catheter (subcutaneous anchorage).

Keywords

Techniques and procedures, ultrasound imaging, standardized assessment, central venous catheterization, peripheral venous catheterization, patient safety, peripherally inserted central catheters

Date received: 4 March 2022; accepted: 21 April 2022

In case of PICC

Rapid

Peripherally

Vein

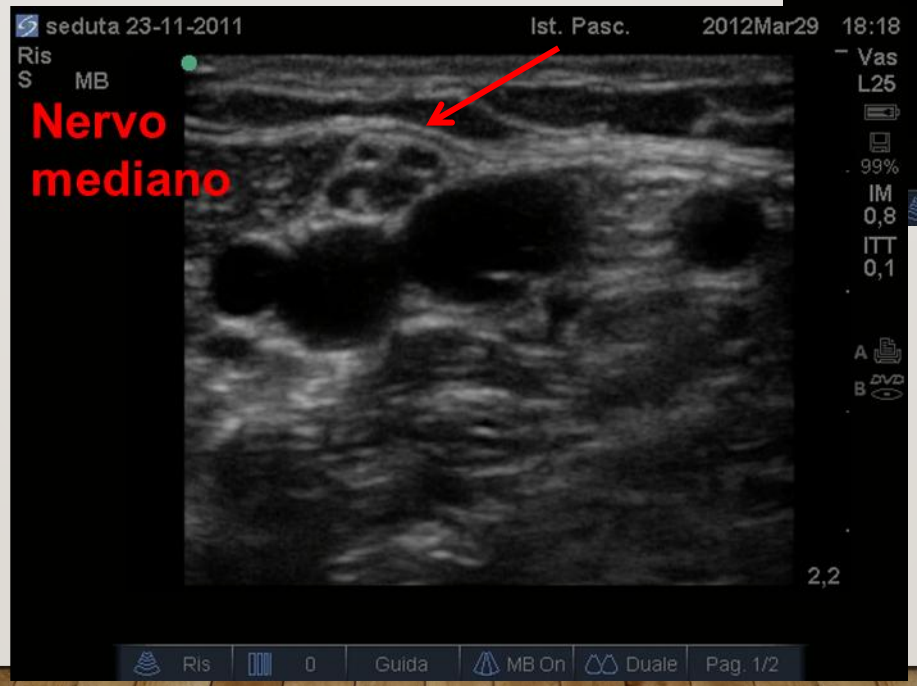
Assessment

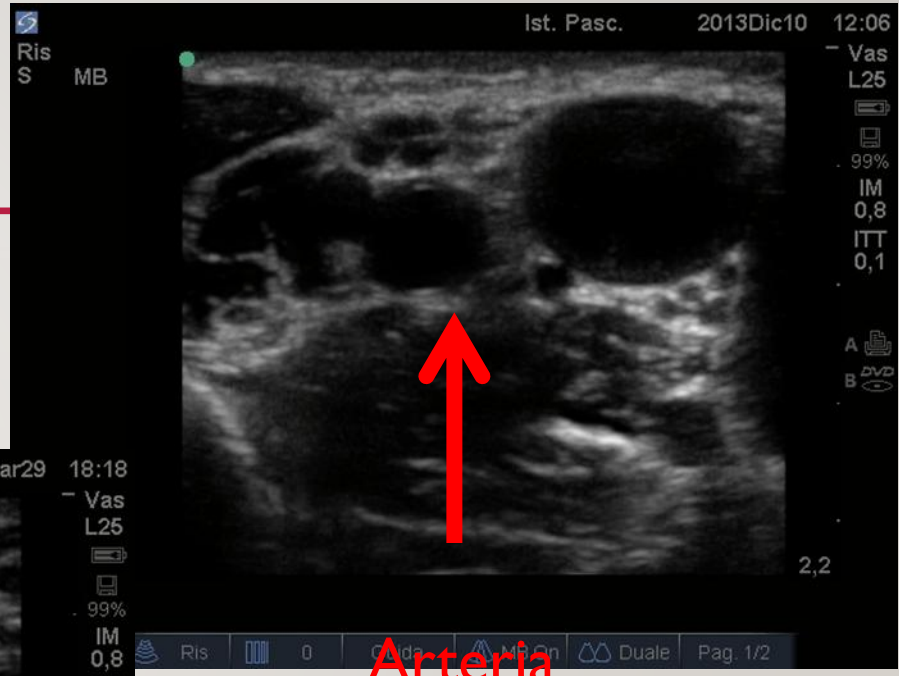
1. Cephalic vein at the antecubital fossa
2. Artery and brachial veins and the confluence between the antecubital vein and basilic vein
3. Basilic vein in the bicipital-humeral groove
4. Nerve-vascular bundle of the arm
5. Cephalic vein over the biceps muscle
6. Axillary vein in the infraclavicular area
7. Internal jugular, the subclavian, and the brachio-cephalic vein in the supraclavicular area

Brescia F, et al.. J Vasc Access. 2022

NERVE AND ARTERY

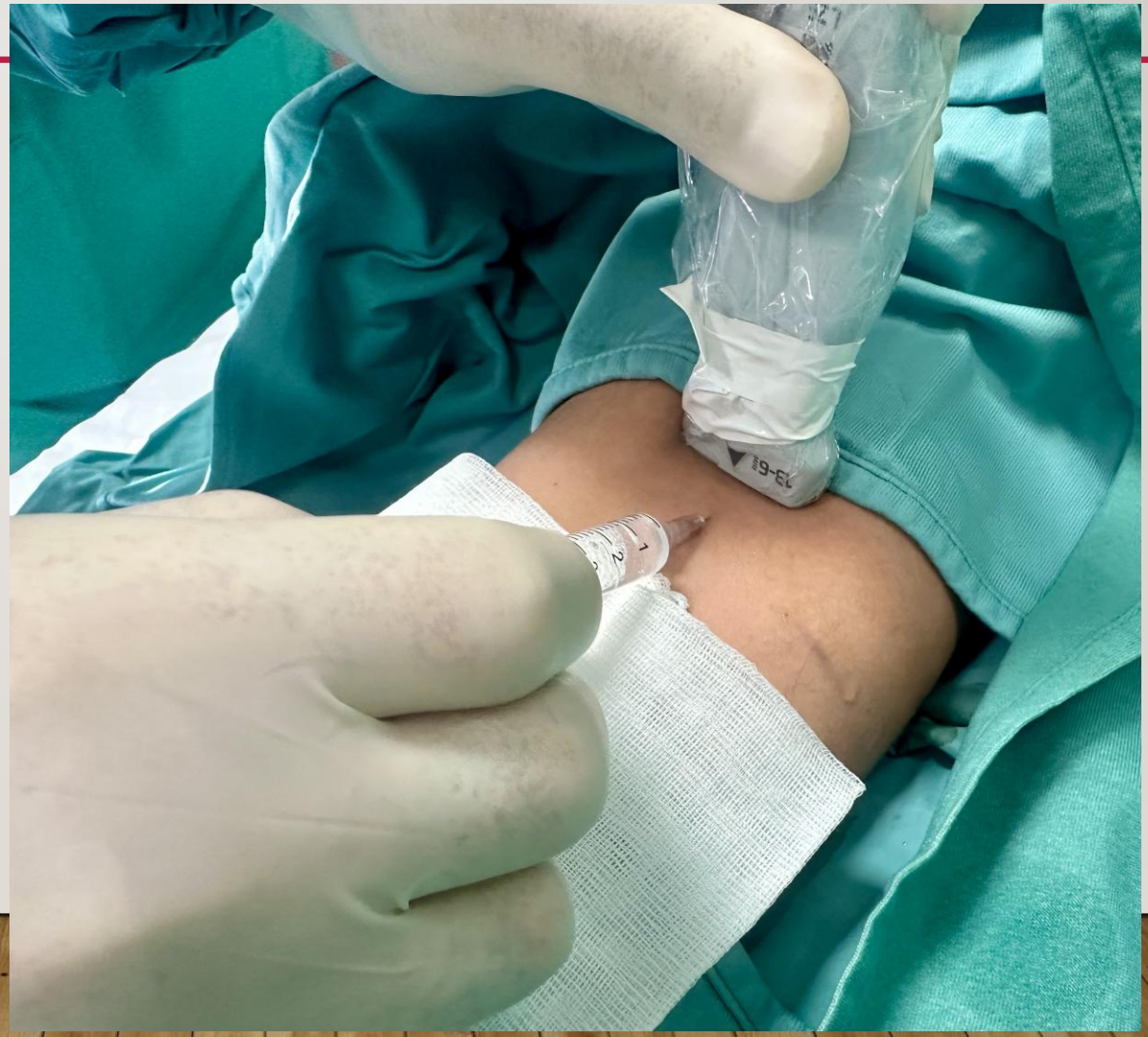
- The most effective method to avoid accidental damage to the median nerve is direct identification of the nerve before and during venipuncture using ultrasound.
- Ultrasound also allows us to distinguish the artery and avoid puncture.
- Adequate training and suitable ultrasound equipment are essential.





EXTERNAL ANTHROPOMETRIC MEASUREMENT

ULTRASOUND-GUIDED VENIPUNCTURE

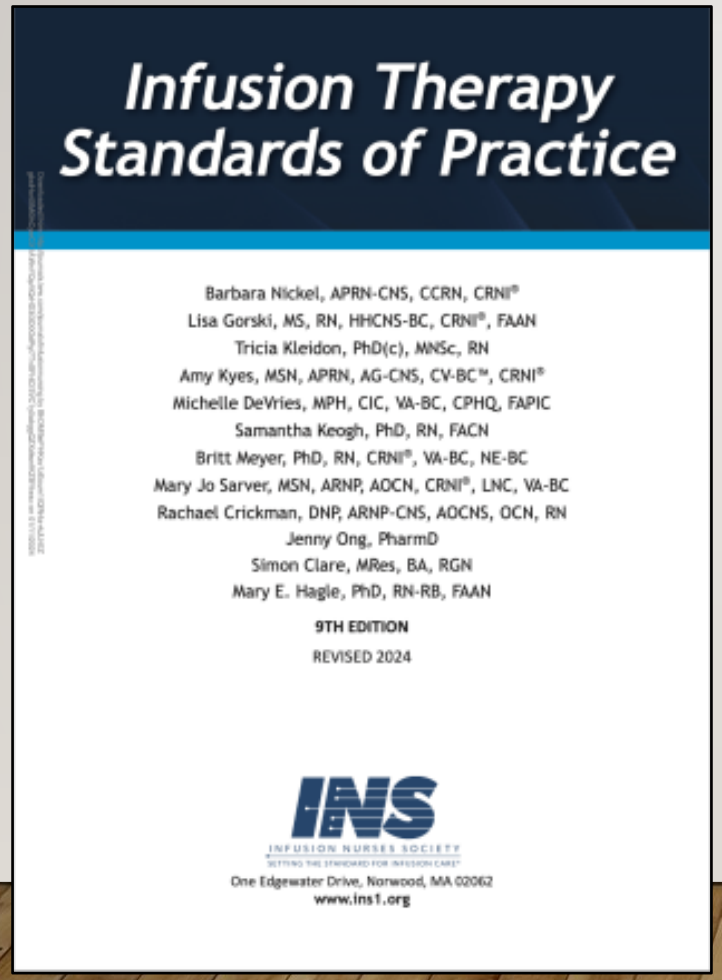


STEP 4: RIGHT TIP LOCATION

Avoid radiology!

X-rays = waste of time and resources, less safety, less accuracy, higher costs, and… post-procedural issues!

STEP 4: RIGHT TIP LOCATION



- *«Use tip locating methods to identify CVAD tip location during the insertion procedure (i.e., "real-time")…»*
- *«Use electrocardiogram (ECG) methods…»*
- *«Consider the use of ultrasound for CVAD tip location…»*

Gorsky et al. *INS* 2024

CONSENSUS

JVA | The Journal of Vascular Access

Editorial

An Italian expert consensus on the choice of the method of tip location for central venous access devices

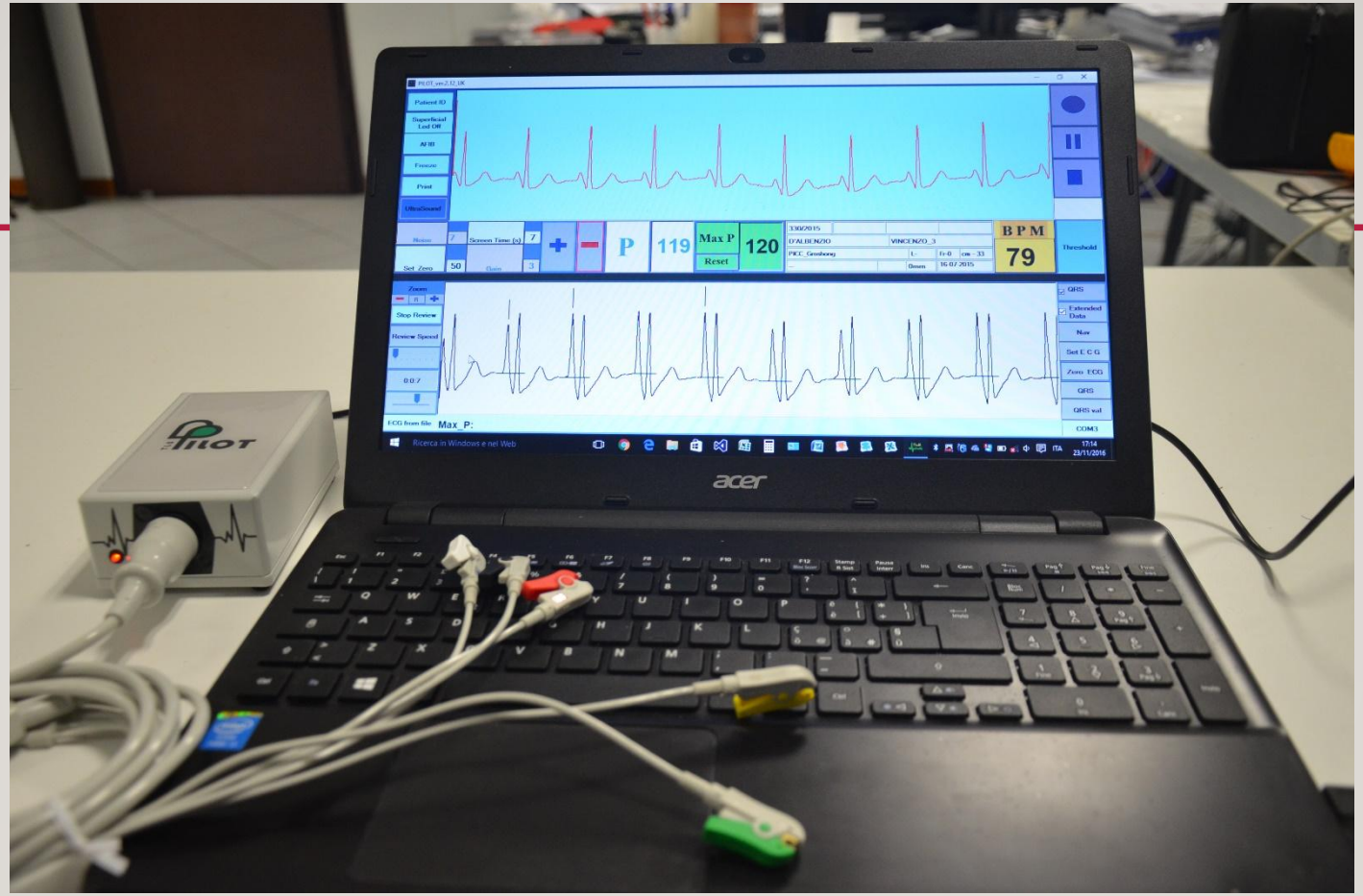
The Journal of Vascular Access
1–14

DOI: 10.1177/11297298251336809
journals.sagepub.com/home/jva
Sage

Vincenzo Faraone[1], Mauro Pittiruti[2], Maria Giuseppina Annetta[3], Giovanni Barone[4], Fabrizio Brescia[5], Maria Calabrese[6], Antonella Capasso[7], Giuseppe Capozzoli[8], Vito D'Andrea[9], Sonia D'Arrigo[3], Daniele Elisei[10], Stefano Elli[11], Igor Giarretta[12], Antonio Gidaro[13], Davide Giustivi[14], Emanuele Iacobone[10], Rossella Mastroianni[15], Fulvio Pinelli[16], Giancarlo Scoppettuolo[17], Ferdinando Spagnuolo[18], Geremia Zito Marinosci[19], Gilda Pepe[2] and Daniele G Biasucci[20]

PILOT TLS

"Why measuring is better than just observing"



PILOT TLS it's a system designed for the correct positioning of central venous catheters through the analysis of the intracavitary ECG, exploiting the potential of the Windows platform

THE PILOT SCREEN

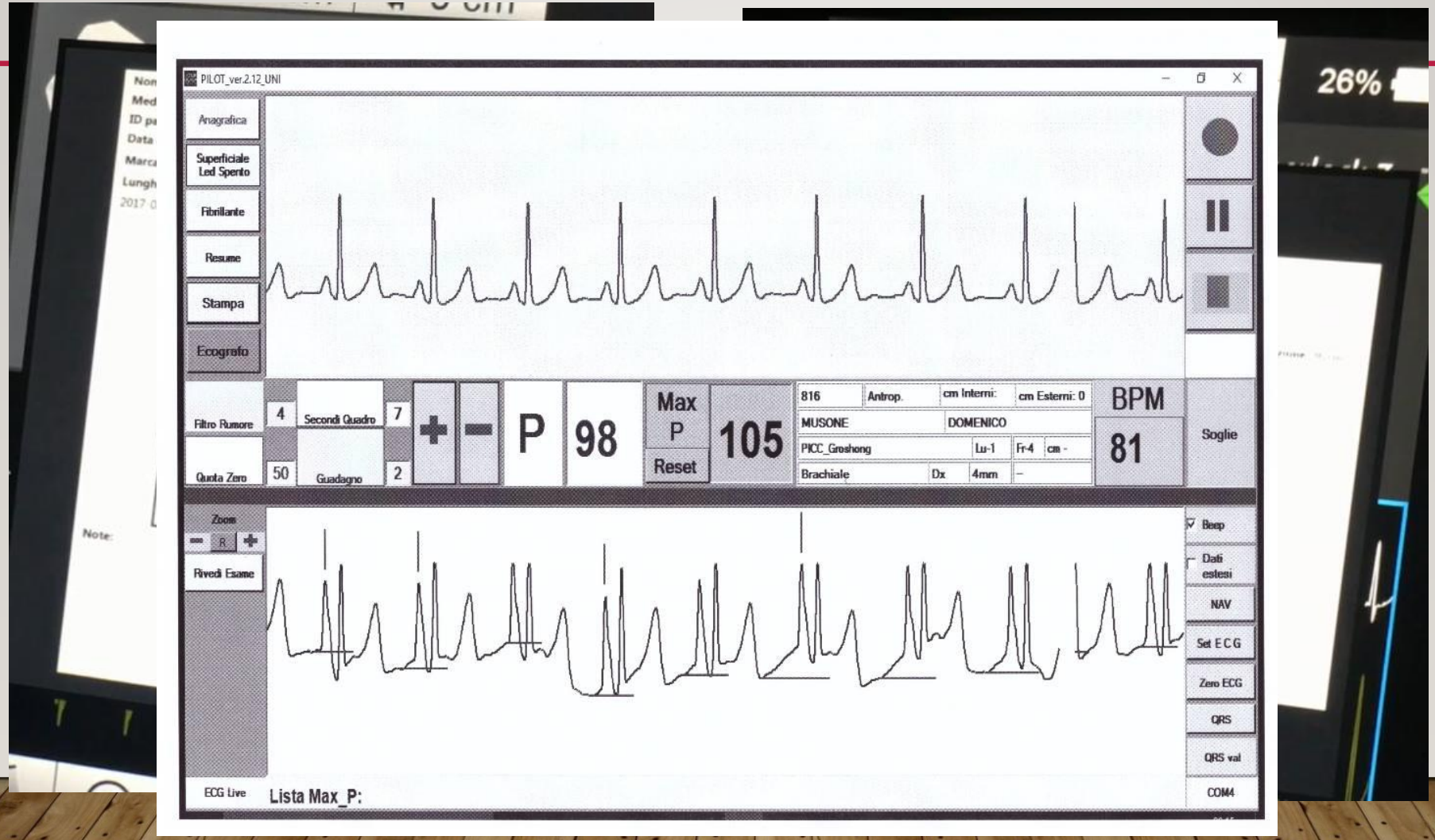
Clear Signal

Superficial EKG

Superimposed EKG

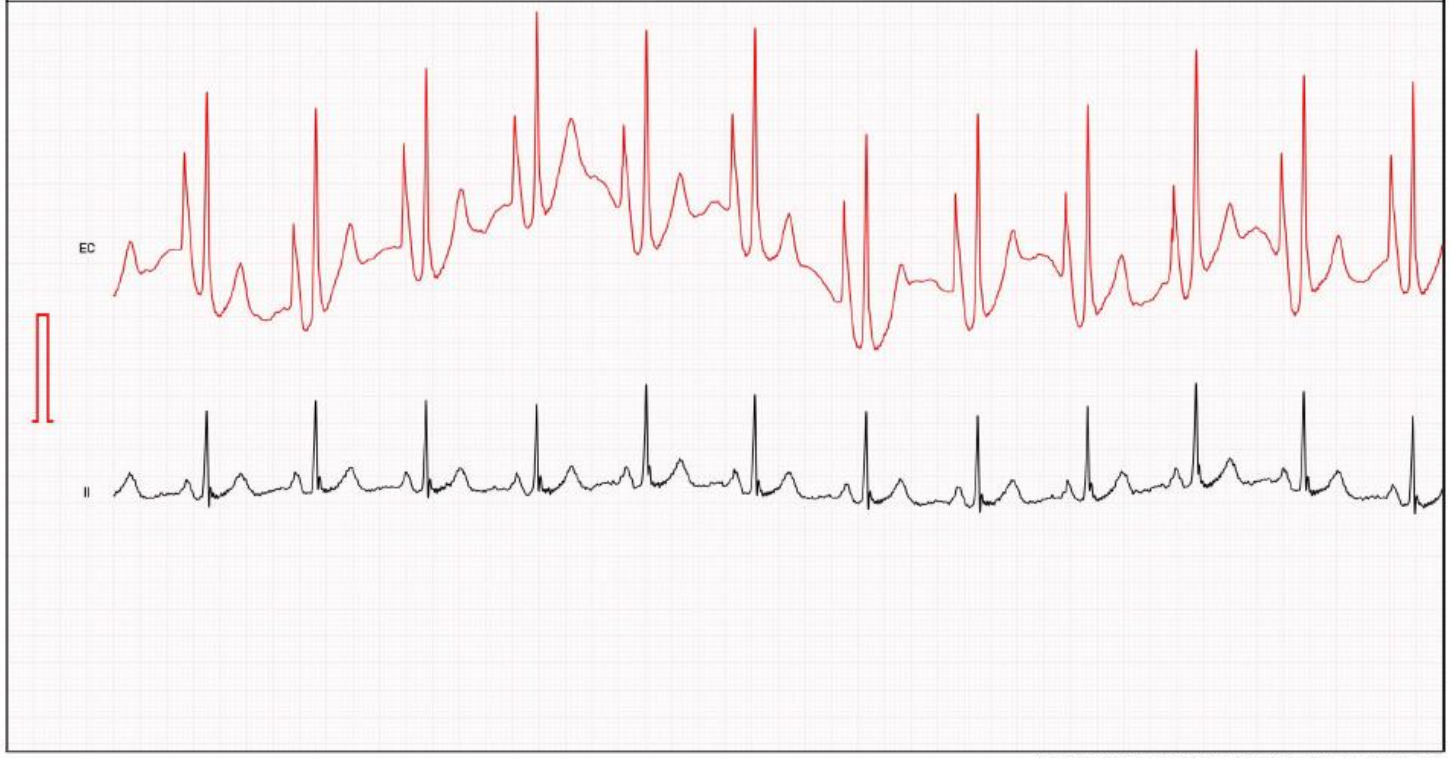
Automatic P Wave Detection

REPORT OF TIP LOCATION – TIP NAVIGATION



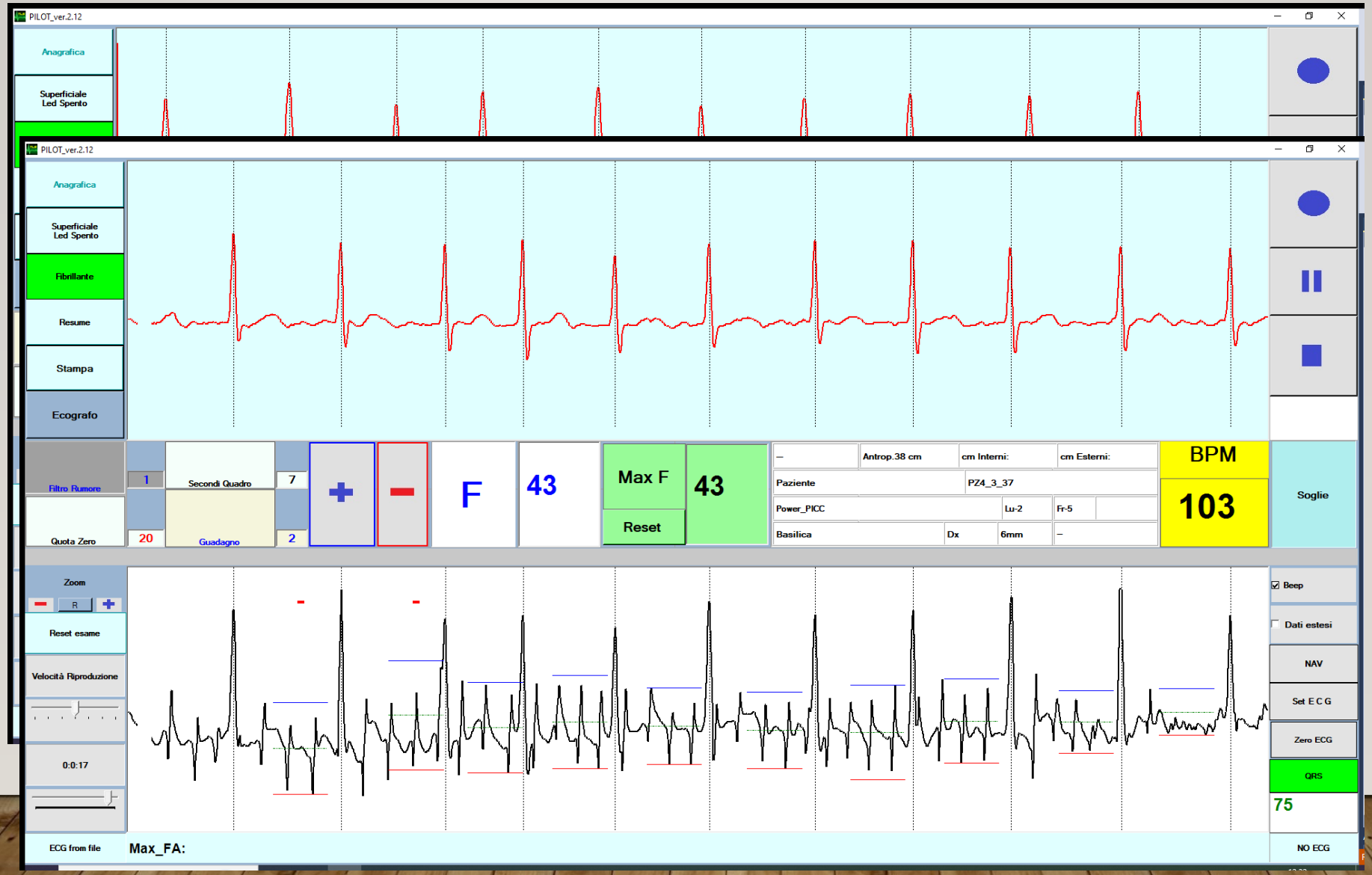
INTRACAVITARY ECG

Medico: Test Physician Istituto:	Software: Endocavitary ECG 3.5.4.0 Versione del registratore: 2.6.2.0	Serie del registratore: 20011486
Nome del paziente: Età: Altezza: ID stazione: Peso: Nato/a: Sesso:		Interpretazione di ECG:
ECG congelato 1.	FC: 73	Registrato a: 27/01/2022 11:21:52 Lunghezza della registrazione: 00:00:10



25 mm/s; 20 mm/mV; Filtri: Linea di base, Leviqatura, Rete elettrica

MODIFIED ECG IN PATIENTS WITH A.F.



Editorial

JVA The Journal of Vascular Access

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

Antonio La Greca[1], Emanuele Iacobone[2], Daniele Elisei[2], Daniele Guerino Biasucci[3], Vito D'Andrea[4], Giovanni Barone[5], Geremia Zito Marinosci[6] and Mauro Pittiruti[1]

The Journal of Vascular Access
1–10

DOI: 10.1177/11297298211044325
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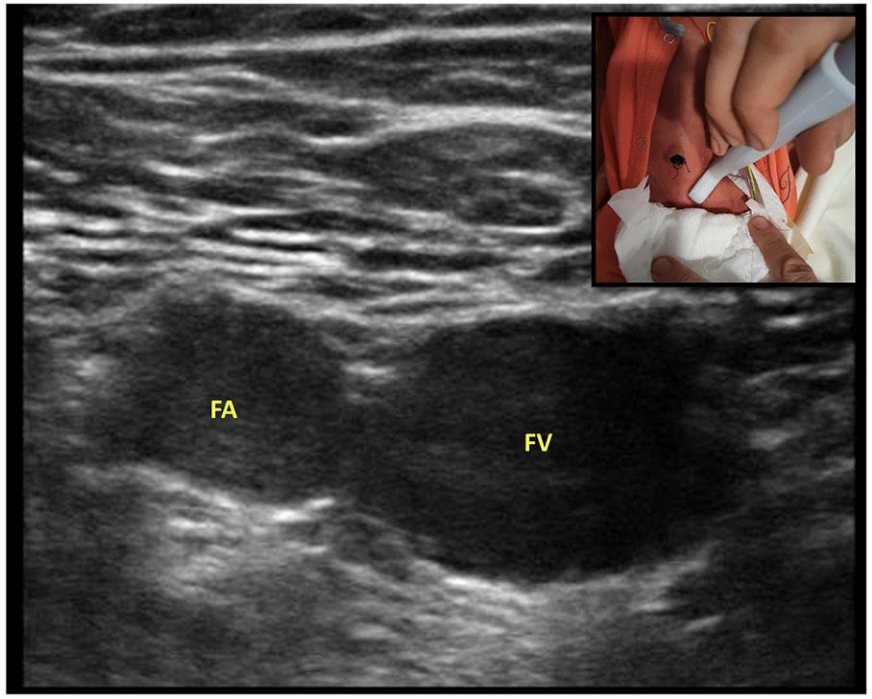
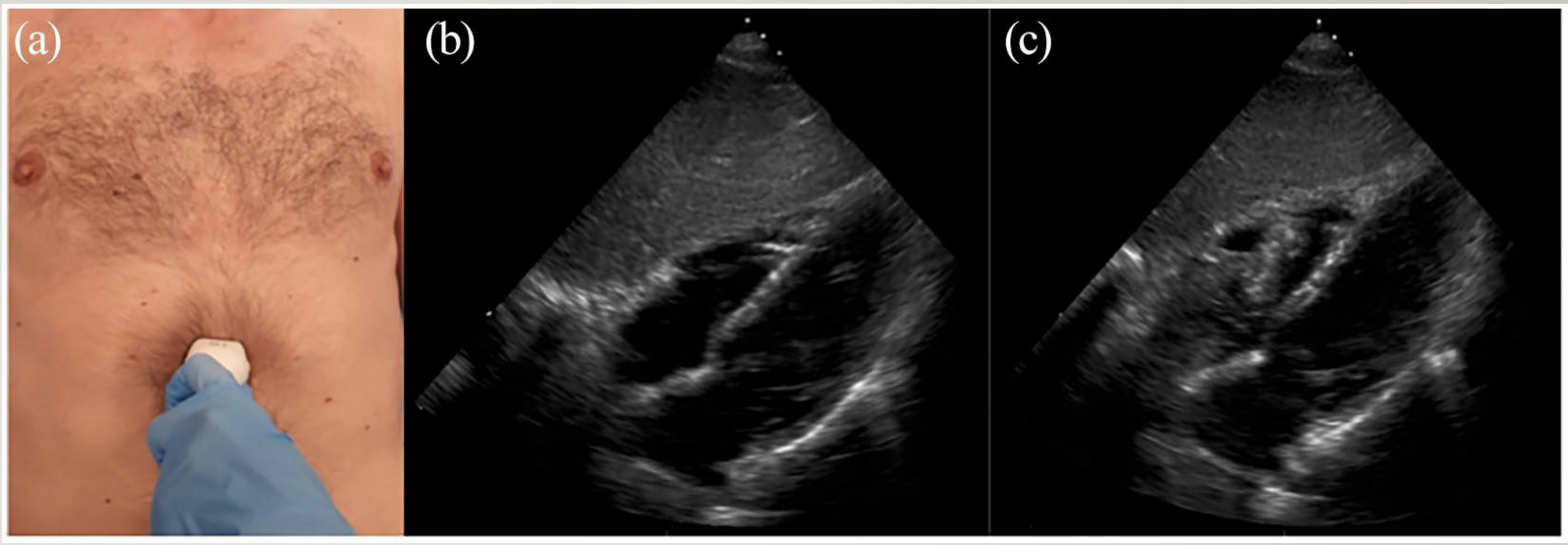
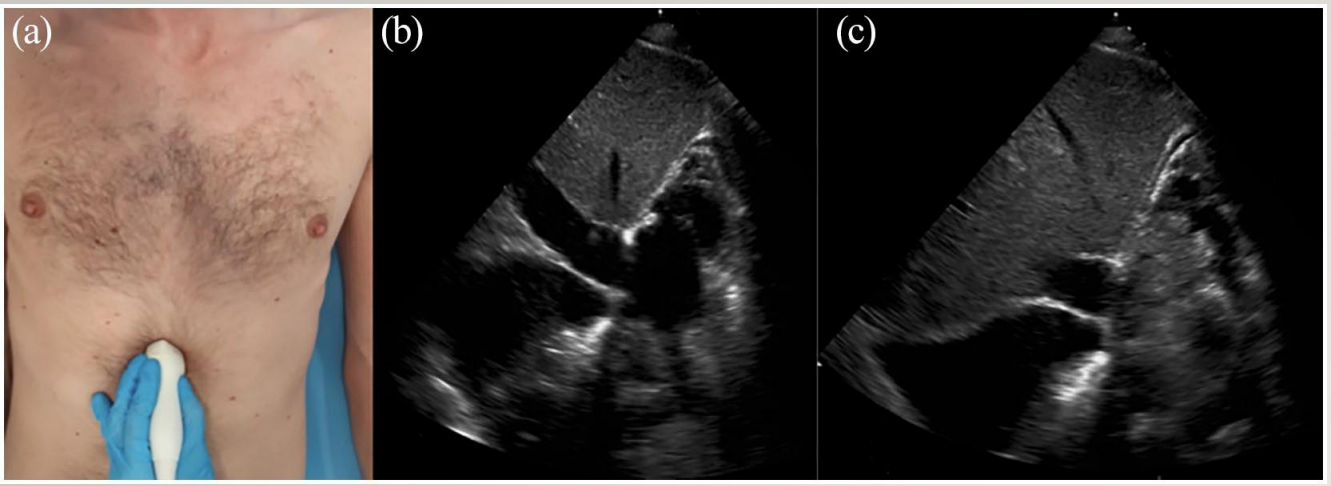


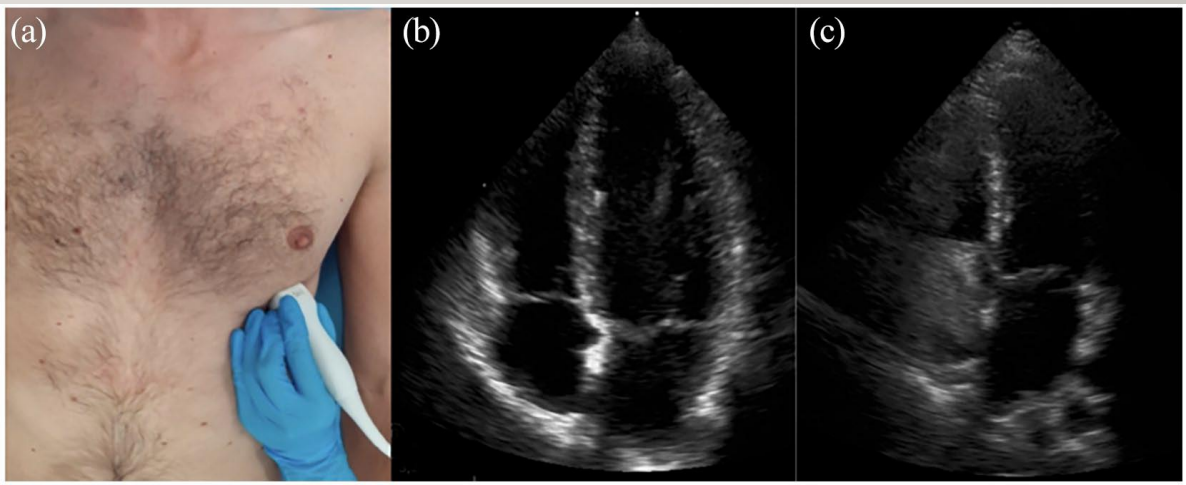
VFC Short Axis Scan



Subcostal (longitudinal) four-chamber window: probe placement (a), visualization of the cardiac chambers (b), and visualization of microbubbles in the right atrium (c).

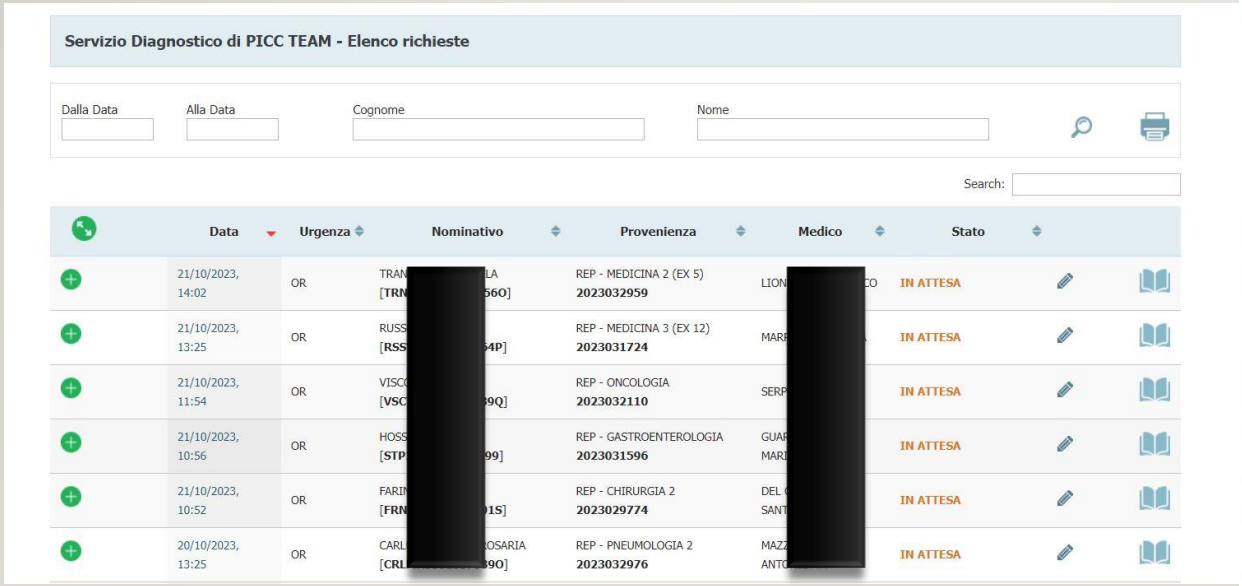


Subcostal bi-caval scan (oblique): probe positioning (a), visualization of the superior vena cava, inferior vena cava and right atrium (b) and visualization of microbubbles in the right atrium (c).



Apical transthoracic four-chamber view: probe placement (a), visualization of the cardiac chambers (b), and visualization of microbubbles in the right atrium (c).

STANDARDIZATION IN REPORTING



Servizio Diagnostico di PICC TEAM - Elenco richieste

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Regione Campania

Antonio Cardarelli

[redacted]

Codice Fiscale: PLMGNN70D65F839G Sesso: F Comune Nascita: 063049

Comune Residenza: Asl Residenza:

Richiesta del: 20/10/2023 Data accettazione: 20/10/2023

Richiedente: AMBULATORIALE 2023160007 Medico richiedente: FIORENTINO ROBERTO

Quesito diagnostico: Inizio cs

Prestazioni

IMPIANTO CVC TIPO PICC [PICC_0004]

Referto

D'accordo con i curanti, considerate le esigenze cliniche e infusionali, previa disinfezione con Clorexidina al 2% in A.I.P al 70%, si posiziona CVC tipo PICC con tecnica eco guidata nella vena brachiale di mm 4 del braccio dx a 33 cm interni e 2 cm esterni.

Si esegue controllo del posizionamento tramite TIP Location con ECG.

Estremo distale in vena cava superiore.

Stabilizzato con sistema di fissaggio sottocutaneo.

Circonferenza Arto: cm 24

Sostituisce la prima medicazione tra 48h e successivamente ogni 7 gg.

La gestione della linea infusionale e del cambio medicazione deve essere eseguita come da procedura Aziendale n° 224 del 18/02/2022.

Primo operatore: Rubinacci

Secondo operatore: Viteritti

NAPOLI, 20/10/2023

IL REFERTANTE

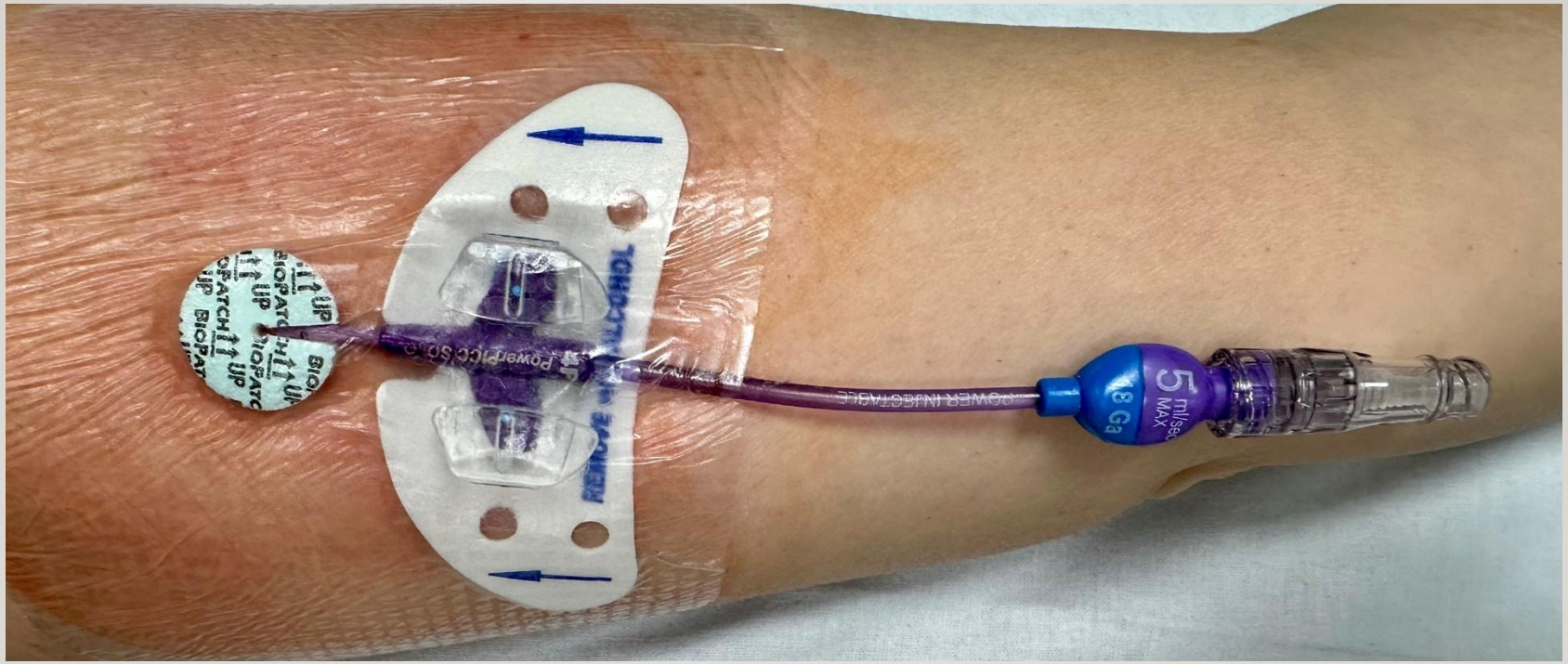
[52735] Dr. GIAMPIERO VITERITTI

AORN CARDARELLI

STEPS 5,6,7: STABILIZE THE CATHETER AND PROTECT THE EXIT SITE (*SECURE & PROTECT*)

- **Prevent dislocation with SUTURELESS DEVICES**
  - **Do not use sutures: they increase the risk of infection and are less effective than sutureless devices.**
  - **Use subcutaneous anchoring systems (SAS) in patients at high risk of catheter dislocation (e.g., pronation, delirium).**
- **Use CYANOACRYLATE GLUE**
  - - Stabilizing, antibacterial, haemostatic properties
- **Use SEMI-PERMEABLE TRANSPARENT DRESSINGS**

FINAL DRESSING

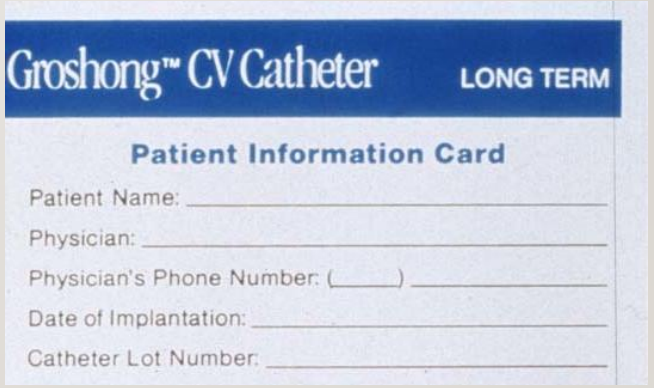


DEVICE IDENTIFICATION CARD

None of the guidelines include a specific recommendation on this topic. Nevertheless, it is certainly very useful for the person administering the dressing to know which type of catheter they are handling.

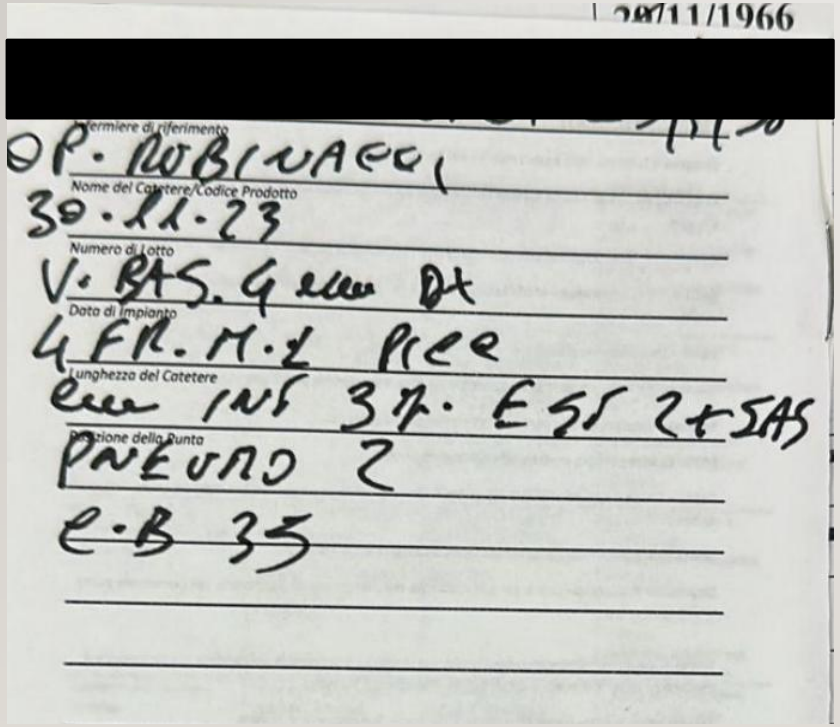
The information should include:

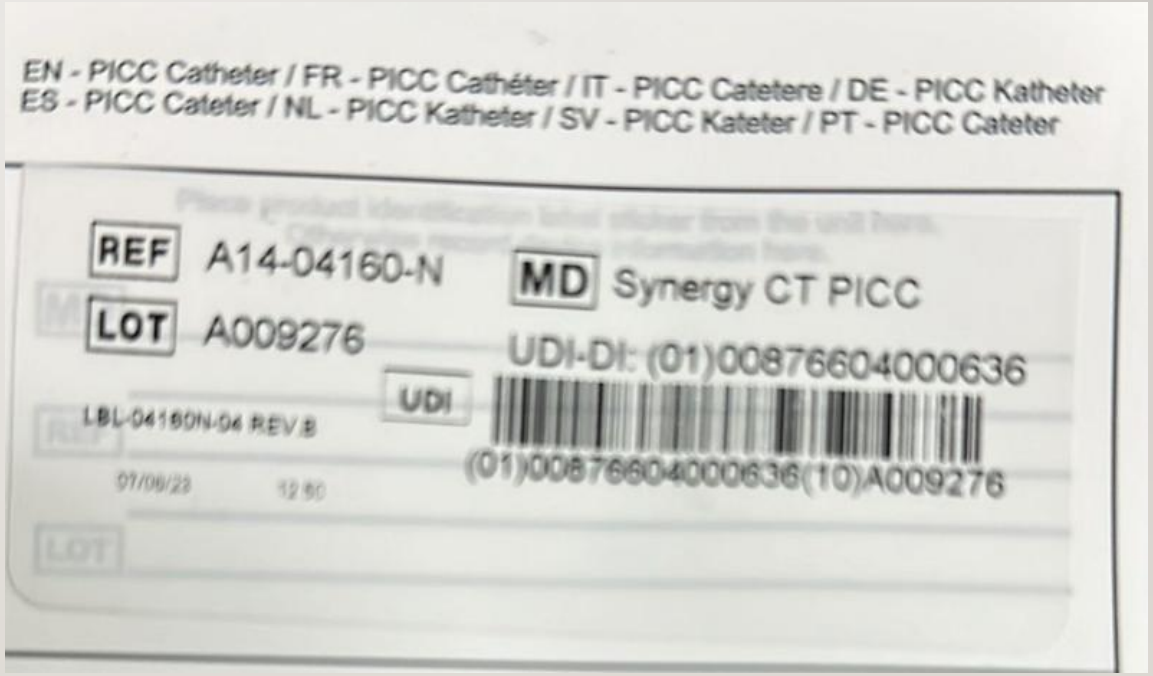
1. Catheter type
2. Date of implantation
3. Catheter length
4. Fill volume



The identification card is included in the packaging of all medium- and long-term vascular access devices. Always give it, duly completed, to the patient after the implant.

IDENTIFICATION TAG – DEVICE LOT TRACEABILITY





CONCLUSIONS PROCEDURE AZIENDALI

FINAL RECCOMENDATION

- Develop and adopt company procedures that correctly define the criteria for choosing the device, the implantation technique and the management technique, following safety and cost-effectiveness criteria.

THANK YOU FOR YOUR ATTENTION

anna.rubinacci76@gmail.com