

Accessi vascolari nell'emergenza intra ed extra ospedaliera

Massimo Donzelli
UOC Anestesia e Rianimazione Cervello



European Society of
Regional Anaesthesia
& Pain Therapy

ESRA ITALIA

ESRA Italian Chapter

XXVIII
CONGRESSO
NAZIONALE

PRESIDENTE
DEL CONGRESSO
Luciano Calderone





Emergency o urgency

Emergency : patient's life-threatening condition which requires immediate intervention

- ✓ Cardiac arrest
- ✓ Peri-arrest period
- ✓ Shock condition
- ✓ Major polytrauma with unstable vital signs

Urgency : other medical or surgical conditions characterised by non deferrability

Vascular access



Extra-hospital
emergency



Disaster



European Society of
Regional Anaesthesia
& Pain Therapy
ESRA ITALIA



Operating room



Intra-hospital
emergency



Emergency
department



ICU

Classification Venous Access Devices (VAD)

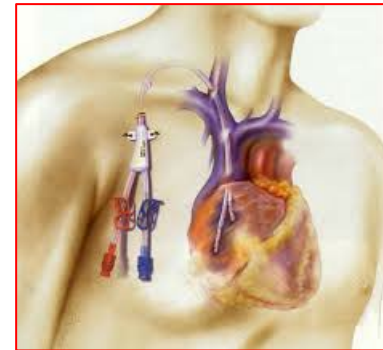


European Society of
Regional Anaesthesia
& Pain Therapy
ESRA ITALIA

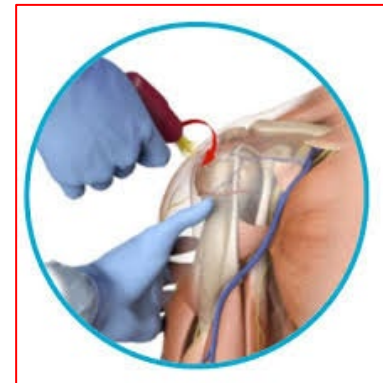
Peripherally venous
access devices



Central venous
vascular access
(CICC, FICC, PICC)



Intraosseous
vascular access





Long peripheral catheters: Is it time to address the confusion?

Kirby R Qin¹, Ramesh M Nataraja^{1,2} and Maurizio Pacilli^{1,2}

The Journal of Vascular Access
1-4
© The Author(s) 2018
Article reuse guidelines:
sagepub.com/journals-permissions
DOI: 10.1177/1129729818819730
journals.sagepub.com/home/jva

Table 1. Comparison of peripheral venous access devices.

	Peripheral intravenous catheter	Long peripheral catheter	Midline catheter
Length	3–6 cm	6–15 cm	15–25 cm
Catheter tip extension	Distal to the axilla	Distal to the axilla	Infra/supraclavicular region
Insertion site	At or distal to the antecubital fossa	Forearm, antecubital fossa or upper arm	Antecubital fossa or upper arm
Material	PTFE, PUR	PUR, PEBA	PUR, silicone
Insertion technique	Catheter-over-needle	Catheter-over-needle Catheter-over-guidewire (direct Seldinger)	Catheter-over-guidewire with tissue dilator (modified Seldinger)
Cost ^a	\$6	\$44	\$160

PTFE: polytetrafluoroethylene; PUR: polyurethane; PEBA: poly-ether-bloc-amide.




^aAt our institution (in 2018 Australian Dollars).


What is the recommended peripheral venous access in emergency ?

Review

JVA | The Journal of
Vascular Access

European recommendations on the proper indication and use of peripheral venous access devices (the ERPIUP consensus): A WoCoVA project

Mauro Pittiruti¹ , Ton Van Boxtel² , Giancarlo Scoppettuolo¹, Peter Carr³, Evangelos Konstantinou⁴, Gloria Ortiz Miluy⁵, Massimo Lamperti⁶, Godelieve Alice Goossens⁷, Liz Simcock⁸, Christian Dupont⁹, Sheila Inwood¹⁰, Sergio Bertoglio¹¹ , Jackie Nicholson¹², Fulvio Pinelli¹³  and Gilda Pepe¹

The Journal of Vascular Access
1–18
© The Author(s) 2021
Article reuse guidelines:
sagepub.com/journals-permissions
DOI: 10.1177/11297298211023274
journals.sagepub.com/home/jva


ERPIUP Consensus

The indications for specific PVADs are mainly based on the expected duration of treatment:

- *SPCs are appropriate for emergency and/or short duration access (24–48 h)*
- *“integrated” SPCs are appropriate for non-emergency access, when expected duration is 2–7 days*
- *LPCs are appropriate in DIVA patients, or when expected duration is 1–4 weeks*
- *MCs are appropriate when expected duration >4 weeks.*





Contents lists available at SciVerse ScienceDirect

ELSEVIER

Resuscitation

journal homepage: www.elsevier.com/locate/resuscitation

RESUSCITATION

Clinical paper


Comparison of intraosseous versus central venous vascular access in adults under resuscitation in the emergency department with inaccessible peripheral veins[☆]

Bernd A. Leidel^{a,c,*}, Chlodwig Kirchhoff^b, Viktoria Bogner^b, Volker Braunstein^b, Peter Biberthaler^b, Karl-Georg Kanz^b

SO
E



- Peripherally intravenous (IV) access might be difficult, especially in dehydrated patients, those in shock, following chemotherapy, obese, with oedema or IV drug users.
- Failure rates of IV access in the emergency setting are described around **10–40%** and average time needed for peripheral IV catheterisation is reported between **2.5 and 16** min in patients with difficult IV access.
- Delays in vascular access result in a delay in the start of the necessary diagnostic procedures and treatment.



IV access not possible or difficult...
(DIVA = Difficult IntraVenous Access)



European Society of
Regional Anaesthesia
& Pain Therapy
ESRA ITALIA

- ...if IV access is not possible or associated with more than 3 attempts or a delay in the first 90-120 s of resuscitation

Comparison of intraosseous versus central venous vascular access in adults under resuscitation in the emergency department with inaccessible peripheral veins[☆]

Bernd A. Leidel^{a,c,*}, Chlodwig Kirchhoff^b, Viktoria Bogner^b, Volker Braunstein^b,
Peter Biberthaler^b, Karl-Georg Kanz^b

- during resuscitation of an infant or child: if attempts at establishing IV access are unsuccessful after one minute


European Resuscitation Council Guidelines for Resuscitation 2015
Section 6. Paediatric life support

Central Access Vascular Devices (CAVD): definition

- Catheters whose tip is located in the venous system in the **superior vena cava**, the **right atrium** and the **inferior vena cava**
- **Classification sec. WoCoVA**
 - ✓ CICC – centrally inserted central catheters
 - ✓ FICC – femorally inserted central catheters
 - ✓ PICC – peripherally inserted central catheters



Central Access Vascular Devices (CAVD): indications

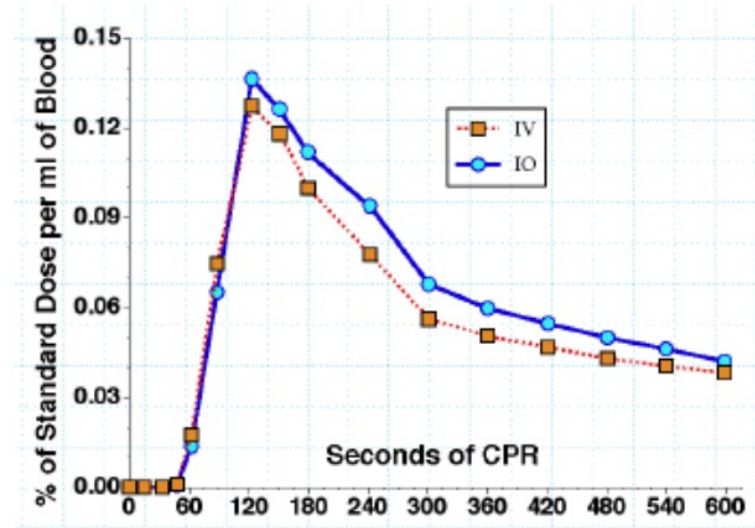
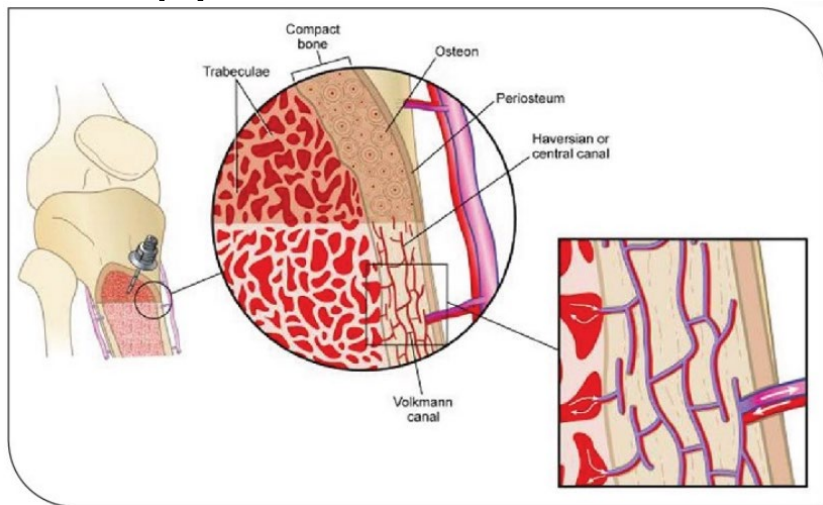
- Infusions incompatible with peripheral intravenous access:
 - ✓ pH < 5 or pH > 9
 - ✓ Osmolarity > 600 mOsm/l
 - ✓ NPT > 800 mOsm/l
 - ✓ vesicant medication
- The initiation of extracorporeal therapies, such as hemodialysis, plasmapheresis, and continuous renal replacement therapy.
- Hemodynamic monitoring, including central venous pressures.
-  **Inability to obtain venous access in emergent situations.**

Intraosseous Vascular Access (IO)



European Society of
Regional Anaesthesia
& Pain Therapy
ESRA ITALIA

- Intraosseous (IO) vascular access refers to the placement of a specialized hollow bore needle through the cortex of a bone into the medullary space for infusion of medical therapy



CPR

- Although IO access is superior in many clinical situations, it is highly underutilized
- Barriers exist to its use: **a lack of confidence in the indications** for using IO access by physicians and the **belief that nursing staff is not familiar with IO access**



PALERMO 5-7 Ottobre

XXVIII CONGRESSO NAZIONALE



European Society of
Regional Anaesthesia
& Pain Therapy

ESRA ITALIA

3 Sites, 6 Options

- Proximal Humerus**
Preferred site for adults
Optimal site for high flow and quick drug uptake
Awake, responsive patients
Less painful
- Proximal Tibia**
Unresponsive
Unfamiliarity with other sites
Unable to landmark other sites
- Distal Tibia**
Larger patient
Unable to access other sites

5 mm mark or "black line"

15 mm/15g

25 mm/15g

45 mm/15g



PALERMO 5-7 Ottobre

XXVIII

CONGRESSO
NAZIONALE



European Society of
Regional Anaesthesia
& Pain Therapy
ESRA ITALIA



ELSEVIER

Available online at www.sciencedirect.com

Resuscitation

journal homepage: www.elsevier.com/locate/resuscitation



EUROPEAN
RESUSCITATION
COUNCIL

European Resuscitation Council Guidelines 2021: Adult advanced life support



Drugs and fluids

Vascular access

- Attempt intravenous (IV) access first to enable drug delivery in adults in cardiac arrest.
- Consider intraosseous (IO) access if attempts at IV access are unsuccessful or IV access is not feasible

ALS 2021




5 TOP MESSAGES


1. High-quality chest compression with minimal interruption, early defibrillation, and treatment of reversible causes remain the priority
2. Premonitory signs and symptoms often occur before cardiac arrest in- or out-of-hospital - cardiac arrest is preventable in many patients
3. Use a basic or advanced airway technique - only rescuers with a high success rate should use tracheal intubation
4. Use adrenaline early for non-shockable cardiac arrest
5. In select patients, if feasible, consider extracorporeal CPR (eCPR) as a rescue therapy when conventional ALS is failing

2021




Contents lists available at [ScienceDirect](#)

 **Resuscitation**
journal homepage: www.elsevier.com/locate/resuscitation

 EUROPEAN RESUSCITATION COUNCIL

European Resuscitation Council Guidelines for Resuscitation 2015
Section 3. Adult advanced life support

 CrossMark

Jasmeet Soar^{a,*}, Jerry P. Nolan^{b,c}, Bernd W. Böttiger^d, Gavin D. Perkins^{e,f}, Carsten Lott^g, Pierre Carli^h, Tommaso Pellisⁱ, Claudio Sandroni^j, Markus B. Skrifvars^k, Gary B. Smith^l, Kjetil Sunde^{m,n}, Charles D. Deakin^o, on behalf of the Adult advanced life support section Collaborators¹

ESSO
ALE

 European Society of Regional Anaesthesia & Pain Therapy
ESRA ITALIA

2015

- Established intravenous access ...
- Although peak drug concentrations are higher and circulation times are shorter when drugs are injected into a CVC compared with PIVs ... **insertion of a CVC** requires interruption of CPR and can be technically challenging and associated with complications ...
- ... **PIV is quicker, easier to perform and safer** ...
- **If intravenous is difficult or impossible, consider IO** ...
- IO injection of drugs achieves adequate plasma concentrations in a time comparable with injection through a vein
- Delivery of drugs via a tracheal tube is no longer recommended ...



ATLS®

Advanced Trauma Life Support®



European Society of
Regional Anaesthesia
& Pain Therapy

ESRA ITALIA

ADULT

- Access to the vascular system must be obtained promptly
- This is best accomplished by inserting **two large-caliber** (minimum of 16-gauge in an adult) **PIV** before placement of a CVC is considered
- When peripheral sites cannot be accessed, **intraosseous infusion, central venous access, or venous cutdown** may be used depending on the **patient's injuries** and the **clinician's skill level**.
- Frequently in an emergency situation, CVC is not accomplished under tightly controlled or completely sterile conditions. Therefore, these lines should be changed in a more controlled environment as soon as the patient's condition permits



ATLS[®]

Advanced Trauma Life Support[®]



CHILD

- Intravenous access in young children with hypovolemia can be a challenging skill, even in the most experienced hands. A peripheral percutaneous route is preferable to establish venous access.
- If percutaneous access is unsuccessful after two attempts, consider **intraosseous infusion** via a bone-marrow needle: 18-gauge in infants, 15-gauge in young children **or insertion of a femoral venous** line of appropriate size using the Seldinger technique.
- If these procedures fail, a physician with skill and expertise can perform direct **venous cutdown**, but this procedure should be used only as a last resort.



PALERMO 5-7 Ottobre
XXVIII CONGRESSO
NAZIONALE



Intravenous (peripherally)
access



intraosseous access






Review
Intravenous vs. intraosseous
 administration of drugs during cardiac arrest: **intravenous**
 vascular access was associated with better likelihood of ROSC, increases in survival to hospital admission and discharge, and favored improved neurological outcome

Emergency medical services/original research
Intraosseous Vascular Access Is Associated With Lower Survival and Neurologic Recovery Among Patients With Out-of-Hospital Cardiac Arrest

*Although a limited number of studies comparing IV vs. IO administration of drugs during cardiac arrest: **intravenous vascular access** was associated with **better likelihood of ROSC, increases in survival to hospital admission and discharge, and favored improved neurological outcome***


 Clinical
Intraosseous compared to intravenous drug resuscitation in out-of-hospital cardiac arrest ☆
 Bryan A. Feinstein^a, Benjamin A. Stubbs^b, Tom Rea^c, Peter J. Kudenchuk^d


 patients with out of hospital cardiac arrest: Insights from the resuscitation outcomes consortium continuous chest compression trial
 Purav Mody^a, Siobhan P. Brown^b, Peter J. Kudenchuk^c, Paul S. Chan^{d,e}, Rohan Khara^a, Colby Ayers^a, Ambarish Pandey^a, Karl B. Kern^f, James A. de Lemos^a, Mark S. Link^a, Ahamed H. Idris^g



Intraosseous VS. Central Access Vascular Devices





Clinical paper

Comparison of intraosseous versus central venous vascular access in adults under resuscitation in the emergency department with inaccessible peripheral veins[☆]

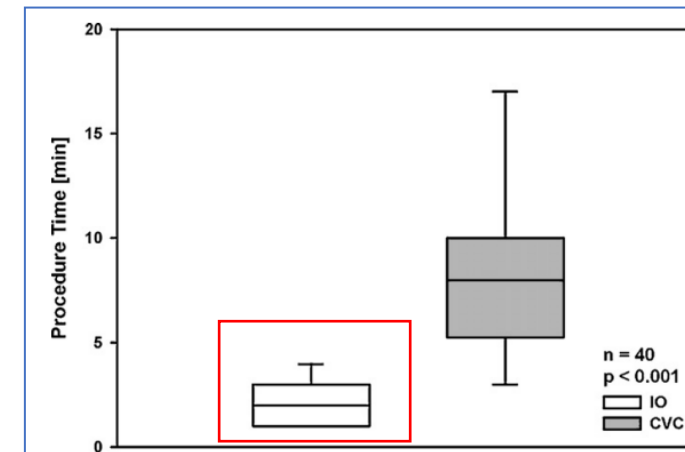
Bernd A. Leidel^{a,c,*}, Chlodwig Kirchhoff^b, Viktoria Bogner^b, Volker Braunstein^b, Peter Biberthaler^b, Karl-Georg Kanz^b

Table 2

Success rate and procedure time.

	IO (n = 40)	CVC (n = 40)	p
Success rate on first attempt (%)	34/40 (85)	24/40 (60)	0.024
95% CI, percentage	74–96	45–75	
Procedure time median, min	2.0	8.0	<0.001
Procedure time Q _{0.25} –Q _{0.75} , min	1.0–3.0	5.5–10.0	
Procedure time IQR, min	2.0	4.5	
Procedure time, min–max, min	1.0–4.0	3.0–17.0	
95% CI, min	1.0–3.0	4.0–13.0	

IO: intraosseous, CVC: central venous catheterisation; Q_{0.25}: lower quartile, 25%, Q_{0.75}: upper quartile, 75%, IQR: inter quartile range.



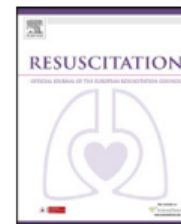
- ATLS & ALS
- Tecnica di incannulamento cvc ... BLIND !!!



Contents lists available at SciVerse ScienceDirect

Resuscitation

journal homepage: www.elsevier.com/locate/resuscitation



European Society of
Regional Anaesthesia
& Pain Therapy

ESRA ITALIA

Clinical paper

Comparison of intraosseous versus central venous vascular access in adults under resuscitation in the emergency department with inaccessible peripheral veins[☆]

Bernd A. Leidel^{a,c,*}, Chlodwig Kirchhoff^b, Viktoria Bogner^b, Volker Braunstein^b,
Peter Biberthaler^b, Karl-Georg Kanz^b



We found IO vascular access a safe, reliable and rapid option in adults under resuscitation in the emergency department with inaccessible peripheral veins. Compared to landmark-based CVC, IO cannulation was significantly more successful on first attempt and required significantly less time. However, IO access is not a surrogate for CVC and cannot replace it. Complications following IO access are rare, providing correct indication and appropriate handling. Therefore, IO access is worth to be considering a valuable bridging technique in the emergency department, if peripheral IV access was attempted unsuccessful 3 times for a maximum duration of 2 min. These findings are in accordance with current guidelines of the European Resuscitation Council.¹



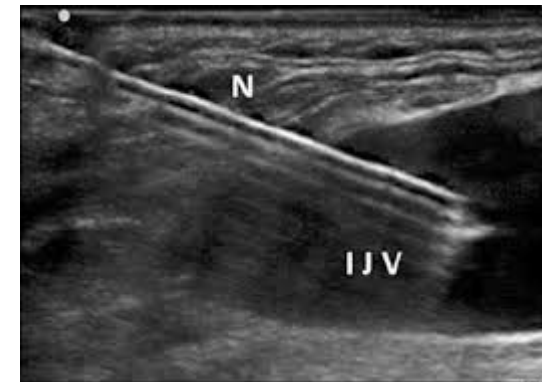
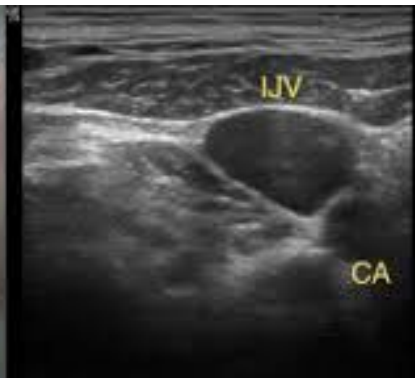
Vascular Visualization

RESSO
NALE



European Society of
Regional Anaesthesia
& Pain Therapy
ESRA ITALIA

- The ILCOR and ACS guidelines *do not take into account the ecoguide or other techniques of visualization* of venous vessels
- Most studies comparing CVC vs PIV vs IO *do not take into account ultrasound* or other vessel display techniques





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

Ultrasound-guided cannulation of any peripheral vein during emergency or elective situations

We recommend the use of ultrasound guidance for peripheral vein cannulation in adults with moderate to difficult venous access, both in emergency and elective situations, as it is safer and more effective in terms of a reduction of complications, improved overall success rate and reduced time to achieve vascular access (1C).

Ultrasound-guided vascular cannulation in adults

Should ultrasound-guidance be used during cannulation of the internal jugular vein for central venous line placement in adults?

The IJV represents the most commonly used central vein for central venous catheter placement in the peri-operative period. Figure 2 shows the transverse view visualisation of the IJV. Existing guidelines,^{13,14} meta-analyses¹⁷ and RCTs¹⁸ recommend the use of ultrasound in both elective and emergency settings but, in some of them, the recommendation is qualified by an assumption that the technology may not be available.¹⁸ Five hundred and

Ultrasound-guided for CICC/FICC: raccomandazioni GAVECELT

Determinate situazioni cliniche raccomandano invece il **posizionamento di un CICC**, ovvero di un catetere venoso centrale inserito mediante puntura diretta ecoguidata delle vene profonde della regione sotto/sopraclaveare e del collo (v. ascellare, succlavia, giugulare interna e anonima):

3. **necessità di accesso venoso in emergenza e/o in paziente emodinamicamente instabile (tipicamente, in pronto soccorso o in sala operatoria o in terapia intensiva);**

Il posizionamento di un accesso venoso tramite venipuntura ed incannulamento ecoguidato della vena femorale comune o superficiale **(FICC)** può essere indicato nei seguenti casi:

1. **accesso venoso in emergenza, ad esempio in un paziente traumatizzato;**

È importante sottolineare – per quanto riguarda il primo punto – che ogni CVC inserito in situazioni di emergenza-urgenza (non soltanto i FICC non tunnellizzati ad emergenza inguinale, ma anche ad esempio i CICC non tunnellizzati ad emergenza sopraclaveare;) dovrà essere rimosso preferibilmente entro 24-48 ore, per evitare complicanze infettive, e sostituito – se necessario – con accesso venoso centrale posizionato secondo le corrette tecniche di asepsi.



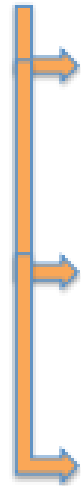
Bambino - **Emergenza**

Non DIVA



cannula periferica corta 'standard'

DIVA



accesso periferico ecoguidato



Cannula periferica corta
Mini-midline

accesso centrale ecoguidato



CICC non tunnellizzato
FICC non tunnellizzato

accesso intraosseo

Ultrasonography-guided peripheral intravenous catheter

International Journal of Critical Illness and Injury
Science

Wolters Kluwer – Medknow Publications

Ultrasonography-guided peripheral intravenous catheter in emergency department patients with difficult access

Luciano Santana-Cabre
Sánchez-Palacios



> [Ann Emerg Med.](#) 1999 Dec;34(6):711-4. doi: 10.1016/s0196-0644(99)70095-8.

Ultrasound-guided brachial and basilic vein cannulation in emergency department patients with difficult intravenous access

L E Keyes¹, B W Frazee, E R Snoey, B C Simon, D Christy

Limitations of these studies:

1. Critical patients but not in emergency condition
2. Adequate training is indispensable for operators

[Lori A Stoiz, Owe Stoiz, \[...\], and Shikar Adhikari, MD, MS](#)   
Volume 16, Issue 4 | <https://doi.org/10.5301/jva.5000346>

Review

Ultrasound guidance for difficult peripheral venous access: systematic review and meta-analysis

Grace Egan^{1, 2}, Donagh Healy¹, Heidi O'Neill², Mary Clarke-Moloney¹, Pierce A Grace², Stewart R Walsh^{1, 2}

Correspondence to Dr Mary Clarke-Moloney, Research Manager, Vascular Research Unit, University Hospital Limerick, Limerick, Ireland; mary.clarkemoloney@hse.ie

DOI 10.1186/s12245-016-0100-0

International Journal of Emergency Medicine
a SpringerOpen Journal

ORIGINAL RESEARCH

Open Access



Ultrasound-guided “short” midline catheters for difficult venous access in the emergency department: a retrospective analysis

Giancarlo Scoppettuolo^{1*}, Mauro Pittiruti², Sara Pitoni³, Laura Dolcetti¹, Alessandro Emoli⁴, Alessandro Mitidieri⁵, Ivano Migliorini² and Maria Giuseppina Annetta³

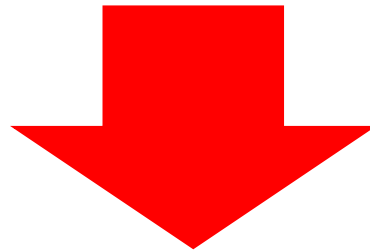


Conclusions

CONGRESSO
NAZIONALE



- Emergency identification
- Peripherally intravenous access: **1° choice**
- **If DIVA:** *intraosseous* or *central venous catheter-ecoguide*



The important determinant for selecting a procedure or route for establishing vascular access is the **clinician's experience and skill**



PALERMO 5-7 Ottobre

XXVIII

**CONGRESSO
NAZIONALE**



European Society of
Regional Anaesthesia
& Pain Therapy

ESRA ITALIA

GRAZIE

