

**MANUAL PARA LA PROTECCIÓN DE
LOS VASOS SANGUÍNEOS EN
PERSONAS CON ENFERMEDAD RENAL**

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Presidente del GEMAV (Grupo Español Multidisciplinar del Acceso Vascular) 2019-2023

Coordinador del grupo de trabajo del acceso vascular de la Sociedad Española de Nefrología (SEN)

Coordinador del grupo de trabajo del acceso vascular de la Sociedad Catalana de Nefrología (SCN)

Miembro del Patronato de la Fundación Española de Diálisis (FED)

Miembro de la Junta Directiva de la Vascular Access Society (VAS) 2011-2023

Conflicto de intereses: ninguno



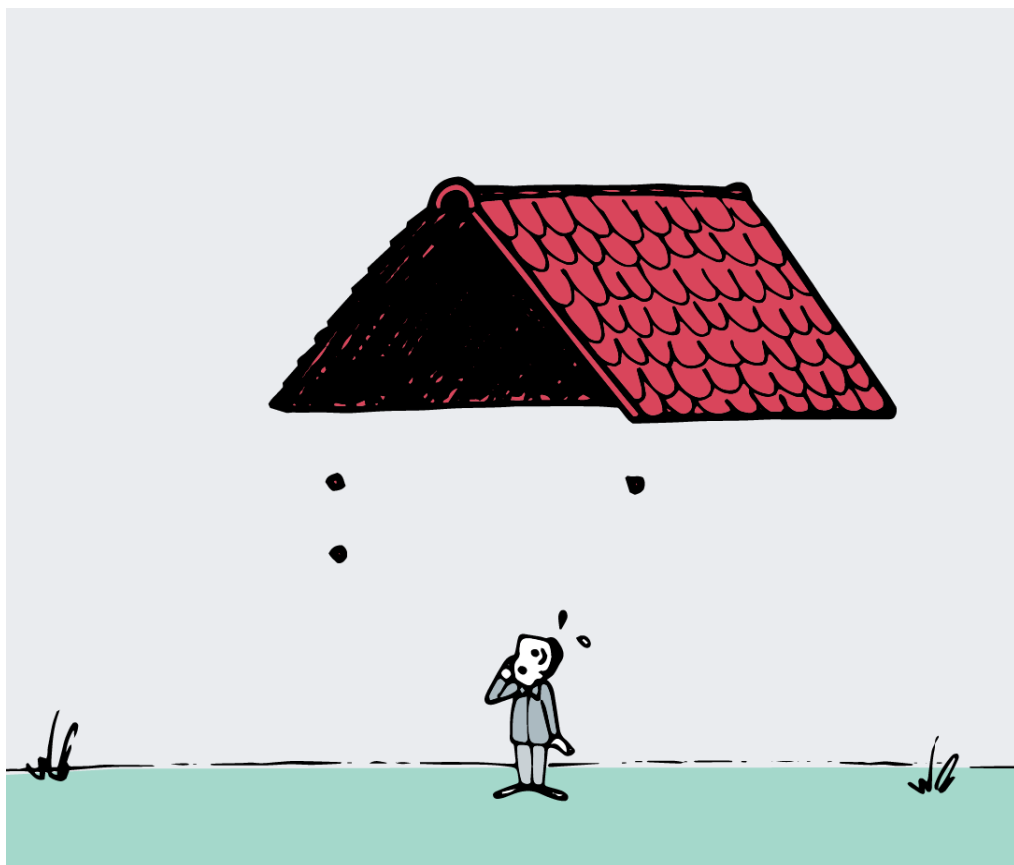
PROYECTO

“Spanish **PRO**tection **VE**ssels **IN**itiative”
(**SPROVEIN**)

OBJETIVO



**PROTEGER AL MÁXIMO
LOS VASOS SANGUÍNEOS
(ARTERIAS Y VENAS)
DE LAS PERSONAS CON
ENFERMEDAD RENAL**





PROYECTO

“Spanish **PRO**tection **VE**ssels **IN**itiative”

(**SPROVEIN**)

Hemodialysis International 2006; 10:173-179

Evaluation of primary failure in native AV-fistulae (early fistula failure)

Seiji OHIRA, Tadamasa KON, Takashi IMURA
Sapporo Kita Clinic, Sapporo, Hokkaido, Japan

**n=5007 FAV radiocefálicas
construídas durante 3 años**

Table 1 Causes of primary failure in AVF

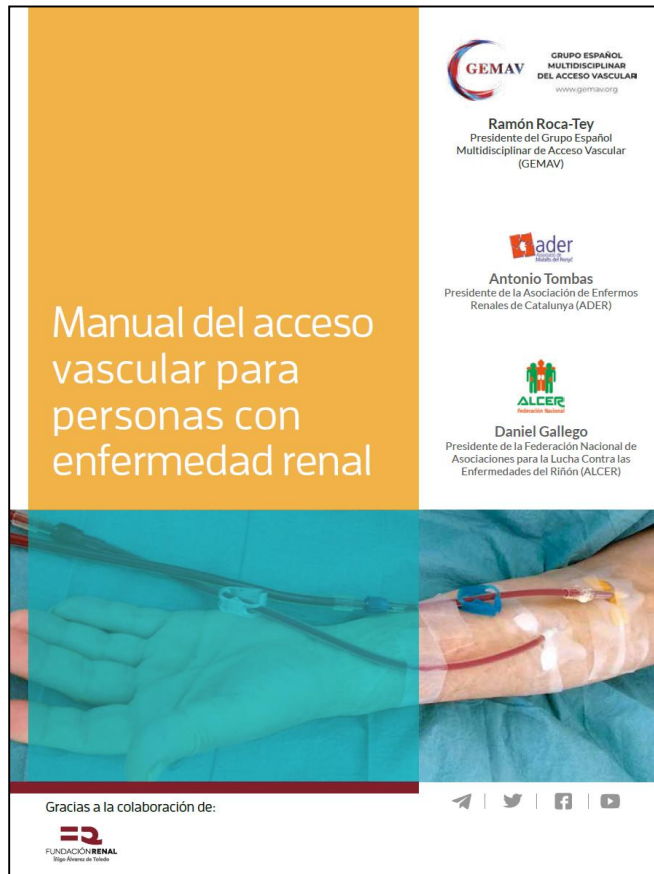
Multiple answers from 23 facilities

Venous damage	17 ←
Inadequate blood flow in supplying artery	14 ←
Error in location selection	7
Inexperienced in procedure	2
Accessory vein	1
Construction attempted despite expected failure	4
Hypotension	4
Hypercoagulability	3
Antiphospholipid syndrome	1
Advanced age	1
Diabetic nephropathy	1



PROYECTO

“Spanish **PRO**tection **VE**ssels **IN**itiative”
(**SPROVEIN**)



Premio de la **FUNDACIÓN ALCER ESPAÑA**, en el Área de Diálisis 2021

Primer Premio en la modalidad de “Contribución social” en la Cuarta Edición de los **PREMIOS SOCIALES MARTÍ FABRÉ**, Fundació Sanitària Mollet, Mollet del Vallès, Barcelona, 23-12-2022 (dotación económica para invertir en otro proyecto social)



**MANUAL PARA LA
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RENAL**



**PROYECTO
SPROVEIN**

**HANDBOOK FOR
THE BLOOD
VESSELS
PROTECTION IN
PEOPLE WITH
KIDNEY DISEASE**

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HANDBOOK FOR
BLOOD VESSELS PROTECTION
IN PEOPLE WITH KIDNEY DISEASE

(Spanish PROtection VEssels INitiative, SPROVEIN)



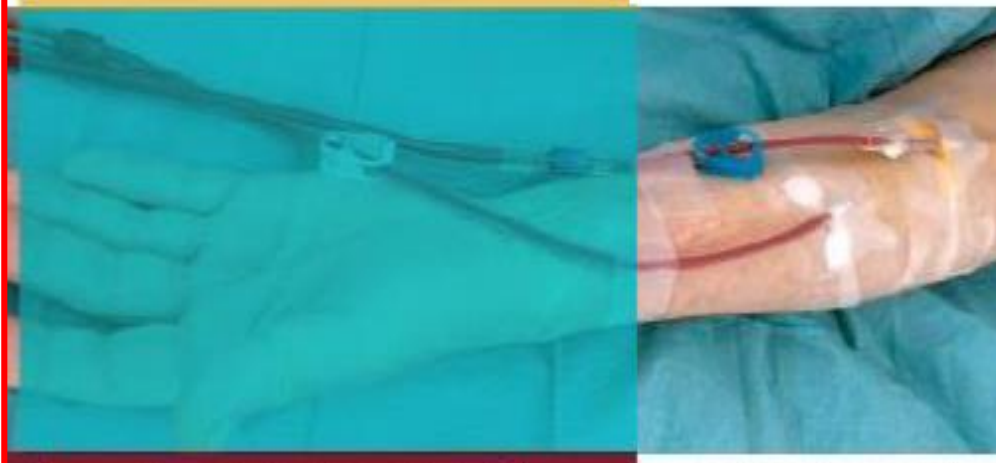
Ramón Roca-Tey
Presidente del Grupo Español
Multidisciplinar del Acceso Vascular
(GEMAV) 2019-2023



Antonio Tombas
Presidente de la Asociación de Enfermos
Renales de Catalunya (ADER)



Daniel Gallego
Presidente de la Federación Nacional de
Asociaciones para la Lucha Contra las
Enfermedades del Riñón (ALCER)



Con la colaboración de: Fundació Sanitària Mollet



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Pendiente

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Con la colaboración de: Fundació Sanitària Mollet



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DEDICATORIA

A la memoria del Sr. **ANTONIO TOMBAS NAVARRO** (1962-2023), Presidente de la Asociación de Enfermos Renales de Catalunya (ADER), por su implicación incondicional con el GEMAV como Sociedad y su apoyo para el desarrollo de este Manual.

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HANDBOOK FOR THE BLOOD VESSELS PROTECTION IN PEOPLE WITH KIDNEY DISEASE



EL ACCESO O CATÉTER VENOSO

Se distinguen dos grandes grupos de acceso o catéter venoso según la posición o localización de su punta: NO / SI está situada en la vena cava superior, vena cava inferior o aurícula derecha del corazón.

A) ACCESO O CATÉTER VENOSO PERIFÉRICO (CVP).

B) ACCESO O CATÉTER VENOSO CENTRAL:

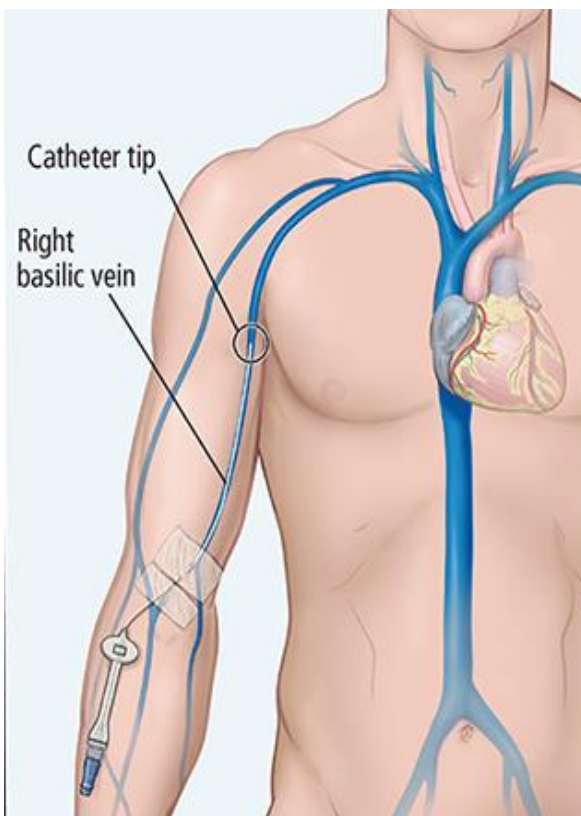
Insertión central (CVC)

Insertión periférica (PICC)

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Tipos de acceso o catéter venoso periférico (CVP) que pueden colocarse en la extremidad superior.

Acceso o catéter venoso periférico (CVP)	Longitud (cm)	Lugar de inserción	Localización de la punta en relación a la axila	Duración del tratamiento endovenoso
CVP corto	<6	Dorso de la mano o antebrazo o brazo	Distal	Corto plazo (≤ 5 días)
CVP largo	6-15	Antebrazo o brazo	Distal	Medio plazo (1-4 semanas)
CVP midline	16-25	Brazo	A la misma altura	Largo plazo (>4 semanas)

Vessel Health and Preservation: The Right Approach for Vascular Access

Nancy L. Moureau
Editor



 Springer Open

The Vessel Health and Preservation protocol provides a clinical pathway to drive a decision for the Right Line for the Right Patient at the Right Time



**PATIENT SAFETY AND
PRESERVATION OF VESSEL HEALTH
IS THE ULTIMATE GOAL**

Peripheral intravenous catheters in hospitalized patients: Practice, Dwell times, and factors impacting the dwell times: A single center retrospective study

Sandeep Tripathi¹  and Taylor Gladfelter²


The Journal of Vascular Access
2022, Vol. 23(4) 581–588
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DOI: 10.1177/11297298211000874
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Table 1. PIV dwell duration by age categories and number of PIV insertion by age categories.

	N (%)	Dwell duration Mean (SD)*	No of PIV per week of hospitalization*	Number of PIV placed during hospitalization [§]			
	44,198	Days	N	One (%)	2–4 (%)	5–9 (%)	10 or more (%)
Infant	3136 (7.0)	2.4 ± 2.3	1.3 ± 1.0	43.9	46.0	7.2	2.7
Child	1072 (2.4)	3.4 ± 2.6	1.9 ± 1.1	45.3	50.0	4.3	0.28
Adolescent	649 (1.4)	3.3 ± 2.3	2.1 ± 1.2	41.6	54.5	3.7	0.15
Adult	19,825 (44.8)	2.7 ± 1.6	2.7 ± 1.5	26.2	52.9	16.8	4.0
Senior	19,516 (44.1)	2.6 ± 1.7	2.7 ± 1.5	21.8	57.5	18.2	2.39

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GENERAL MEDICINE/BRIEF RESEARCH REPORT

Half of All Peripheral Intravenous Lines in an Australian Tertiary Emergency Department Are Unused: Pain With No Gain?

Ezra I. Limm, MBBS; Xin Fang, MBBS; Claire Dendle, MBBS, FRACP, GCHPE; Rhonda L. Stuart, MBBS, FRACP, PhD;
Diana Egerton Warburton, MBBS, FACEM, MCLinEpi

Ann Emerg Med. 2013;62:521-525

In this retrospective observational study of 570 ED patients, 50% of peripheral intravenous lines remained unused in the ED. In nearly half of patients admitted, intravenous lines were not used within 72 hours.



Peripheral Intravenous Cannula Insertion and Use in the Emergency Department: An Intervention Study

Tracey Hawkins, Grad Cert (ENurse), Jaimi H. Greenslade, PhD, Jessica Suna, MHLthSci, Julian Williams, MBBS, Claire M. Rickard, PhD, Matthew Jensen, Maria Donohue, BPharm(Hons), Elizabeth Cho, Christopher Van Hise, Diana Egerton-Warburton, PhD, and Louise Cullen, PhD

ACADEMIC EMERGENCY MEDICINE 2018;25:26–32



“PIVC are you sure?”

The **“80% sure” criteria** was adopted as a simple and effective trigger to prompt clinical decision making regarding the need for PIVC placement in the ED



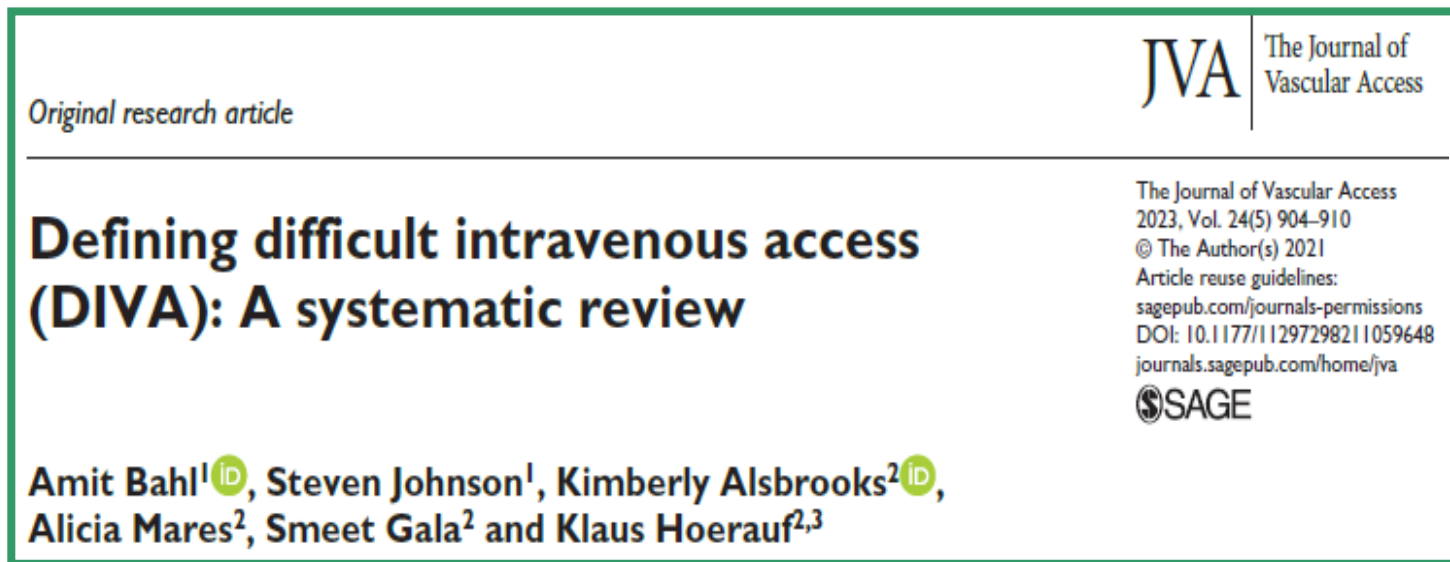
CONCLUSION

The intervention reduced PIVC placement in the ED and increased the percentage of PIVCs placed that were used

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A patient is considered to have DIVA if any of the following elements are present:

- A clinician has two or more failed attempts at PIV access using traditional techniques.
- Physical examination findings are suggestive of DIVA (e.g. no visible or palpable veins).
- The patient has a stated or documented history of DIVA

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A QUIÉN VA DIRIGIDO EL MANUAL



- Profesionales de la salud en activo, que pueden atender en un momento dado a las personas con enfermedad renal pero que no están familiarizados en el día a día del cuidado de las mismas (por ejemplo, en los Servicios de Urgencias o Unidades de Hospitalización no nefrológicas).
- Profesionales de la salud en formación:
 - 1) Estudiantes de Facultades de Medicina y Escuelas de Enfermería.
 - 2) Residentes de Medicina y Cirugía de cualquier especialidad.
- Personas con enfermedad renal y sus familiares y/o cuidadores

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**PERSONAS CON ENFERMEDAD RENAL QUE MÁS PUEDEN BENEFICIARSE DEL CONTENIDO DE
ESTE MANUAL YA QUE PRECISAN DE LA MÁXIMA PROTECCIÓN DE LOS VASOS SANGUÍNEOS**

ESTADÍOS ENFERMEDAD RENAL	TASA DE FILTRADO GLOMERULAR (ml/min/1.73m²)
G1	>90
G2	60-89
G3a	45-59
G3b	30-44
G4	15-29
G5	<15

Enfermedad renal crónica estadios G3b, G4 y G5

Tratamiento renal sustitutivo: HD / DP /TR

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HANDBOOK FOR THE BLOOD VESSELS PROTECTION IN PEOPLE WITH KIDNEY DISEASE

INDIVIDUALIZACIÓN DEL MEJOR ACCESO VENOSO CASO POR CASO

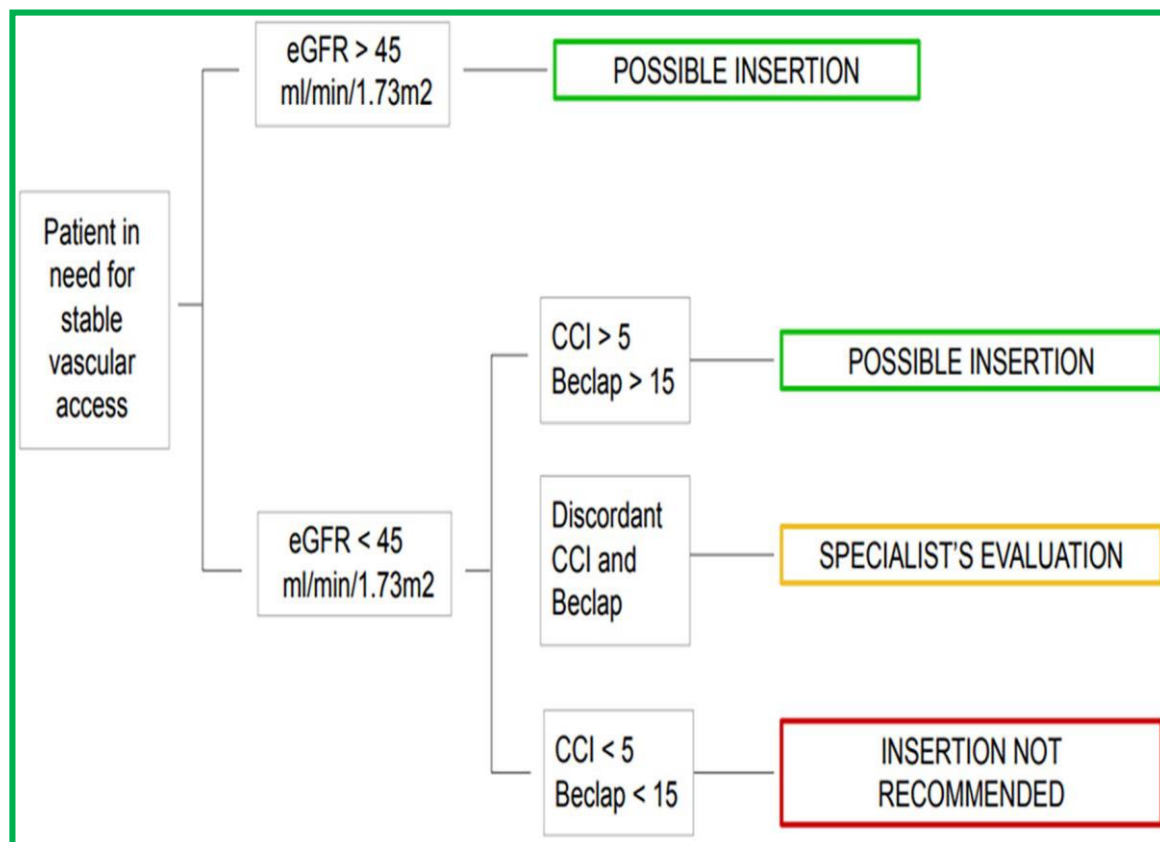
Original research article

A decision-making algorithm proposal for PICCs and midlines insertion in patients with advanced kidney disease: A pilot study

Arianna Bartoli¹, Maurizio Gallieni^{1,2}, Chiara Cogliati¹, Francesco Casella¹, Maria Calloni¹, Chiara Melchionda¹, Marco Heidempergher², Antonella Foschi³, Antonio Luca Brucato¹, Giulia Rizzi¹, Massimiliano Quici¹ and Antonio Gidaro¹

JVA | The Journal of Vascular Access
The Journal of Vascular Access
1-7
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DOI: 10.1177/11297298231152499
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SAGE

The proposed algorithm tries to determine the possibility to place a vascular access line (PICC or Midline) given the patient's renal function, Beclap score, and Charlson Comorbidity Index (CCI).



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**CONCENCIACIÓN E IDENTIFICACIÓN DE LAS PERSONAS CON ENFERMEDAD RENAL
QUE NECESITAN UNA PRESERVACIÓN ESPECIAL DEL ÁRBOL VASCULAR**

INFORMAR

EDUCAR

EMPODERAR

CARNÉS

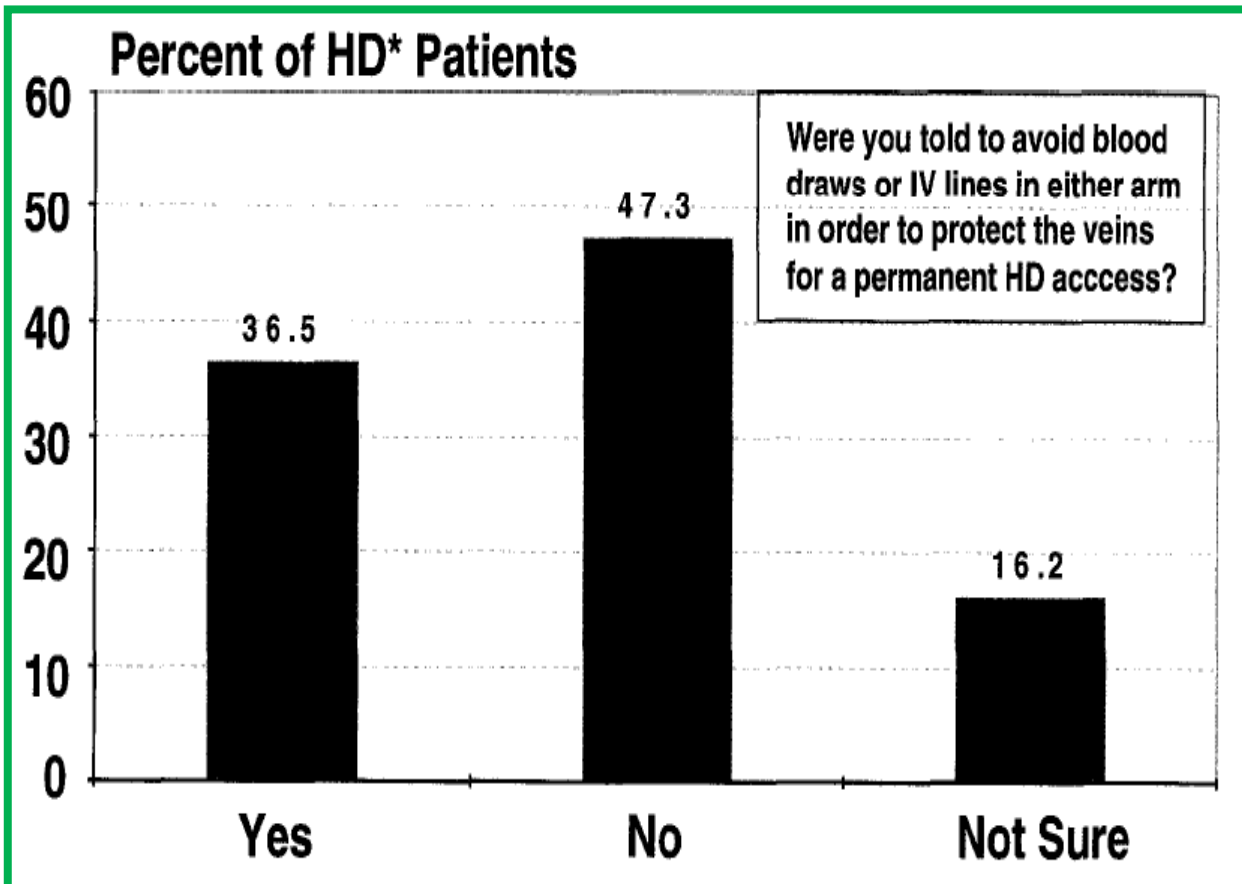
PULSERAS

INFORMÁTICA

SEÑALÉTICA

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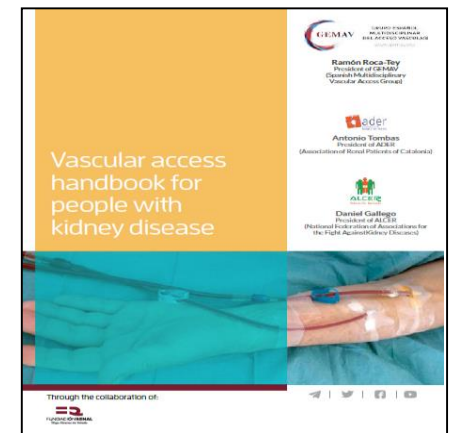
**INFORMAR A LAS PERSONAS CON ENFERMEDAD
RENAL Y FAMILIARES/CUIDADORES RESPECTO A LA
IMPORTANCIA DE PROTEGER EL ÁRBOL VASCULAR**



Distribution of patients preserving forearm veins for a permanent HD access by avoiding blood draws or intravenous lines, DMMS Wave 2 Quality-of-Life Special Study, 1996. Patients are incident, on HD on about day 60 of ESRD. Results are preliminary, based on about 2,400 questionnaires.

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EDUCAR A LAS PERSONAS CON ENFERMEDAD RENAL Y FAMILIARES/CUIDADORES RESPECTO A LA IMPORTANCIA DE PROTEGER EL ÁRBOL VASCULAR



1.10. La conservación de las venas

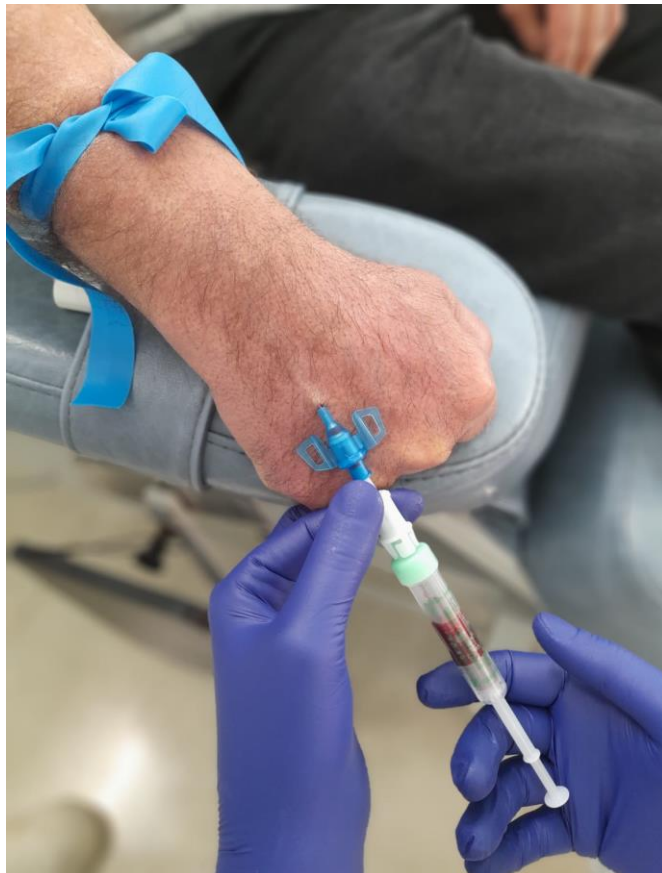
Las venas del brazo que se usan para realizar la fístula son las que también se utilizan cuando se hace un análisis de sangre o cuando se coloca una vía periférica. Al hacer esto, siempre existe el riesgo de dañar estas venas y que después ya no sirvan para hacer la fístula. Por tanto, es muy importante evitar las punciones de las venas del brazo donde se efectuará la fístula y, siempre que se pueda, se deben usar las venas de la mano como en las imágenes siguientes.

Si usted ya ha empezado el tratamiento de hemodiálisis mediante un catéter y está pendiente de la creación de una fístula, ya no es necesario que le pinchen venas para un análisis de sangre o para administrar medicamentos ya que, en general, puede hacerse a través del mismo catéter durante la sesión de diálisis.



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**EMPODERAMIENTO DE LAS PERSONAS CON
ENFERMEDAD RENAL Y FAMILIARES/CUIDADORES
PARA LA PROTECCIÓN DE SUS ARTERIAS Y VENAS
MEDIANTE LA EDUCACIÓN DE LAS MISMAS.**

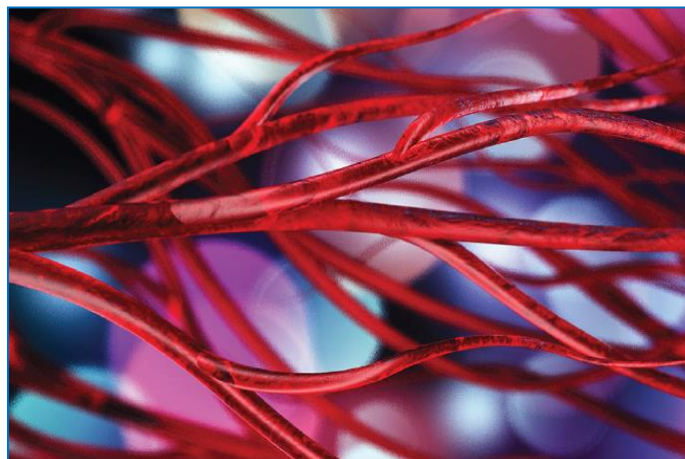


OCTUBRE 2030						
30	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31	1	2	3

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PROPORCIONAR CARNÉS IDENTIFICATIVOS DE BOLSILLO

Vein preservation wallet card (front)



PROVINCIAL STANDARDS & GUIDELINES



**Chronic Kidney Disease:
Vein Preservation**

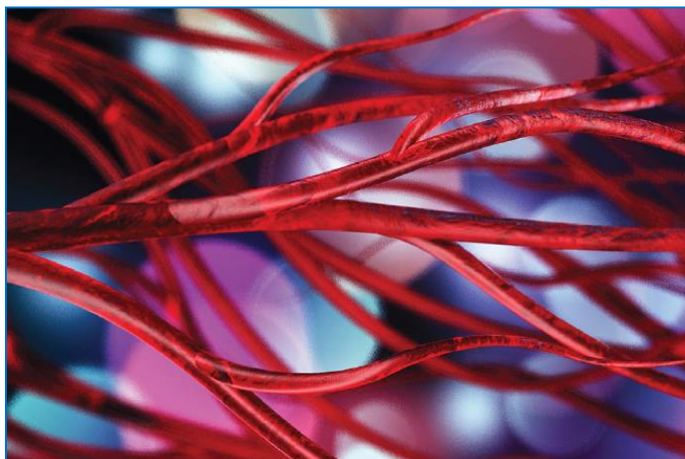
Updated December 2020
Approved by the BC Renal Hemodialysis Committee

- For IVs and blood draws, use:
 - ☐ Right side
 - ☐ Left side
- Hand veins best. Avoid ACF.
- For BPs, use non-fistula/graft arm.
- If long-term access is required, **USE** internal jugular line.



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PROPORCIONAR PULSERAS IDENTIFICATIVAS



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Si el sistema informático del Hospital lo permite, activación automática de alertas en la historia clínica electrónica para identificar correctamente a estos pacientes en el momento de su ingreso hospitalario.



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Si el sistema informático del Hospital lo permite, activación automática de alertas en las peticiones de análisis de sangre del Laboratorio durante el ingreso hospitalario



Nº Història Clínica:
Cognoms, Nom:
CIP:
Servei:
Sol·licitant:
Usuari sol·licitant:
Petició:
Nº Petició SAP:

NEFROLOGIA
ROCA TEY, RAMON
ROCA TEY, RAMON
4099613
06668816

Data Petició: **19.02.2024**
Data naixement:
Localització:
Unitat Tractament: **Unitat Hosp. 04**
Data Extracció: **20.02.2024 - 08:30:0**

Anamnesi breu

OBTENCION DE LA MUESTRA DE SANGRE EN LA SALA DE DIÁLISIS



Proves

Alanin Amino Transferasa (ALTI) ; Aspartat Amino Transferasa (ASAT) ; Bilirubina ; Creatinini ; Glucosa ; Hemograma ; Ionograma ; Procalcitonina ; Proteïna C Reactiva ; T. parcial tromboplastina act. ; Temps de protrombina (INR) ; Urea ; Àcid Làctic

Contenidors a recollir

01 x Xeringa de 2 mL amb HEPARINA DE LITI (GASO VENOSA) - tap taronja
01 x Tub de 2.9 mL amb CITRAT SODI - tap verd
01 x Tub de 7,5 mL sense aditiu (SERUM) - tap marro
01 x Tub de 2.6 mL amd EDTA K3 - tap rosa



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**DURANTE EL INGRESO HOSPITALARIO,
COLOCAR LETREROS INDIVIDUALES EN
LA CAMA O EN LA PUERTA DE
HABITACIÓN PARA EVITAR LAS
VENOPUNCIONES O LA INSERCIÓN DE
ACCESOS INTRAVENOSOS DE FORMA
INDISCRIMINADA**



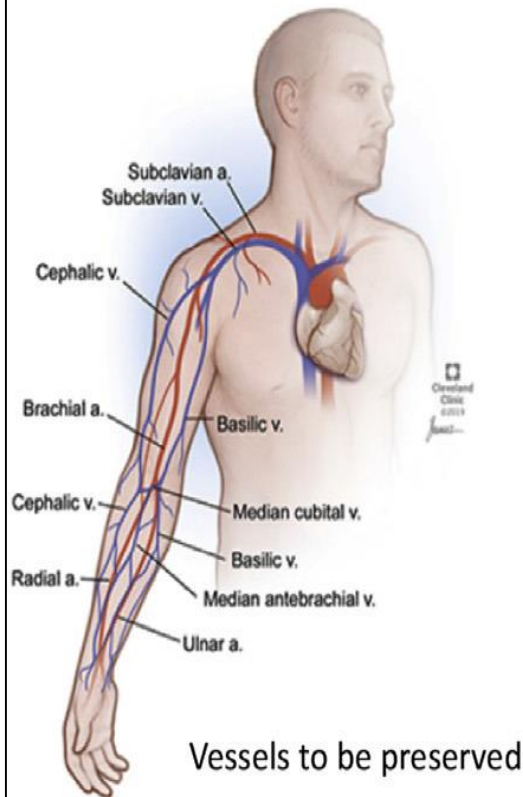
Vessel Preservation in Chronic Kidney Disease



Tushar J. Vachharajani, Mohamed Hassanein, Aimen Liaqat, and Nabil Haddad

Adv Chronic Kidney Dis. 2020;27(3):177-182

What does preserving vessels mean?



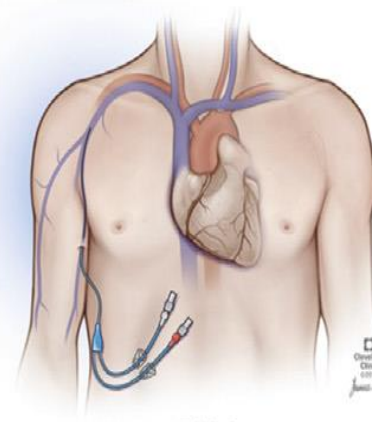
Preserve
Peripheral
Veins

Preserve
Central
Veins

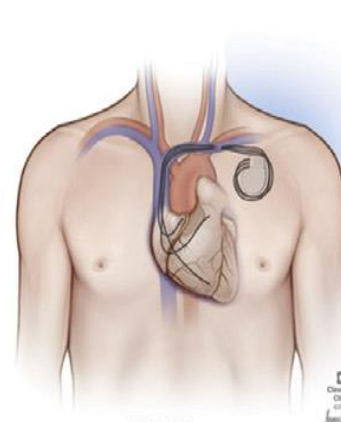
Preserve
peripheral
arteries



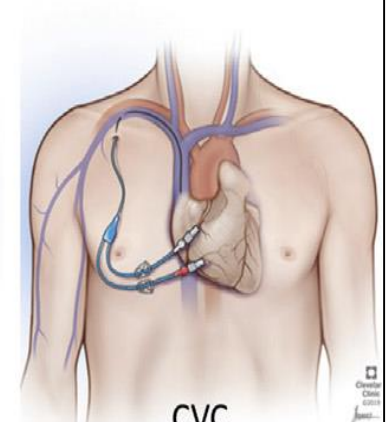
TRA



PICC



CIED



CVC

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HANDBOOK FOR THE BLOOD VESSELS PROTECTION IN PEOPLE WITH KIDNEY DISEASE



Volumen 37, Suplemento 1, Noviembre 2017

Volume 37, Supplement 1, November 2017

Guía Clínica Española del Acceso Vascular para Hemodiálisis

Spanish Clinical Guidelines on Vascular Access
for Haemodialysis

Coordinadores/coordinators: José Ibeas y Ramón Roca-Tey

Editores/editors: José Ibeas, Ramón Roca-Tey, Joaquín Vallespín y Carlos Quereda

Pregunta clínica I. Recomendaciones

R 1.1.3) Se recomienda que para facilitar la creación de la fístula arteriovenosa en los pacientes con enfermedad renal crónica avanzada se extirpe la conservación de la red venosa superficial de ambas extremidades superiores, que deben preservarse libres de punciones y canulaciones. Para ello es preciso instruir al personal sanitario e informar al paciente

Tabla 4 – Recomendaciones para la preservación de la red venosa en el paciente candidato a hemodiálisis^{10,13-16}

- Evitar venopunciones innecesarias y accesos venosos periféricos en la extremidad superior destinada a la creación del AV
- Favorecer el uso de las venas del dorso de la mano para muestras de sangre, inyecciones y transfusiones
- Evitar la inserción de CVC en venas subclavias, planteando como alternativa su colocación en venas yugulares o femorales
- Evitar la colocación de CVC de inserción periférica (PICC, del inglés *peripheric insertion central catheter*)
- Evitar en todo caso la punción de la vena cefálica del brazo y antebrazo no dominante

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**HANDBOOK FOR THE
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PEOPLE WITH
KIDNEY DISEASE**



Position Statement

Vascular Access for Hemodialysis

Adopted by the ANNA Board of Directors in February 2003.

Revised and/or reaffirmed biennially: 2005-2017

Most recently revised: August 2021

- Vein preservation of both peripheral and central vessels should be incorporated into patient teaching and care.
- Blood draws and IV placement should be from/in the dorsum of the hands whenever possible, regardless of arm dominance.
- Forearm and upper-arm veins suitable for future vascular access should not be used for venipuncture or for placement of intravenous catheters.
- Subclavian catheters or peripherally inserted central catheter (PICC) lines should be avoided due to the risks of central vein stenosis and occlusion.

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Guidelines for Venous Access in Patients with Chronic Kidney Disease

A Position Statement from the American Society of
Diagnostic and Interventional Nephrology¹
Clinical Practice Committee and the Association for
Vascular Access²

Jeffrey Hoggard,* Theodore Saad,† Don Schon,‡ Thomas M. Vesely,§ and Tim Royer¶

*Eastern Nephrology Associates, P.L.L.C., Greenville, North Carolina, †Nephrology Associates, P.A.,
Department of Medicine, Nephrology Christiana Care Health System, Newark, Delaware, ‡Arizona Kidney
Disease and Hypertension Surgery Center, Phoenix, Arizona, §Vascular Access Center, Frontenac, Missouri,
and ¶VA Puget Sound Health Care System, Seattle, Washington

Seminars in Dialysis—Vol 21, No 2 (March–April) 2008. 186–191

A. Identify CKD patients who may need hemodialysis treatment in the future.

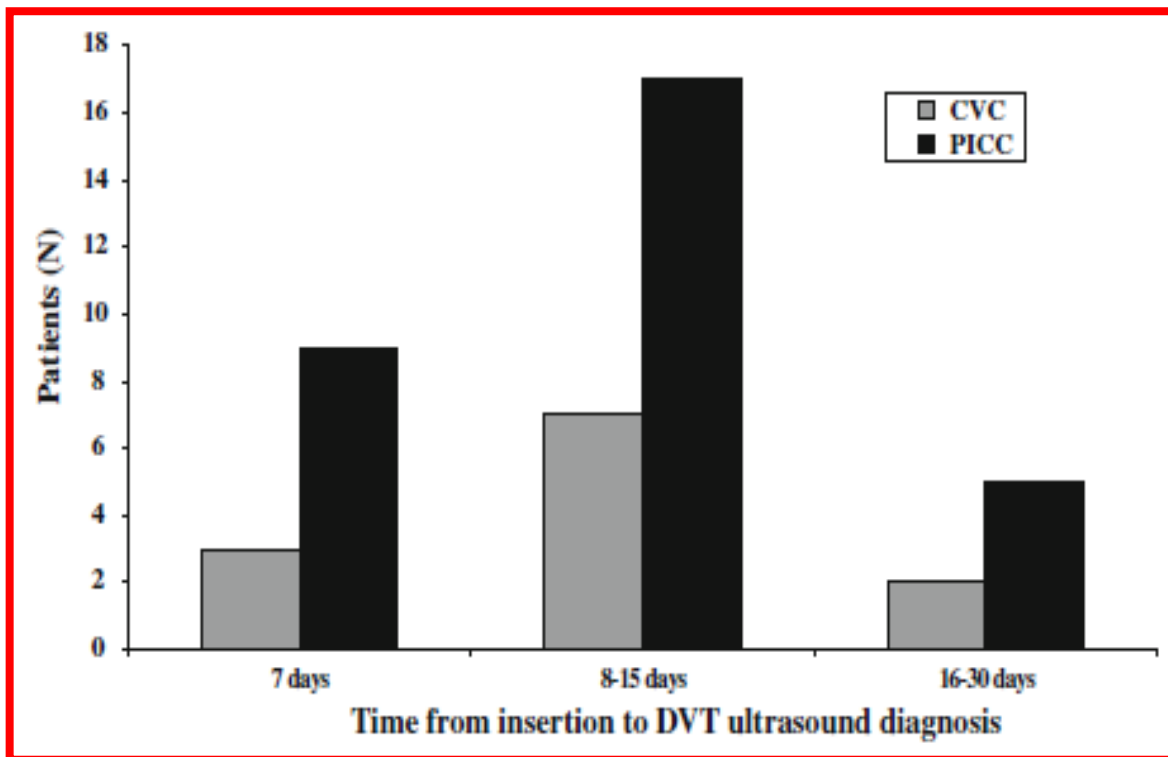
- 1. Patients with CKD Stages-3, 4 or 5. This includes stage 5 CKD patients currently receiving hemodialysis or peritoneal dialysis.**
- 2. Patients with a functional kidney transplant.**

B. Venous Access for stage 3–5 CKD patients.

- 1. The dorsal veins of the hand are the preferred location for phlebotomy and peripheral venous access.**
- 2. The internal jugular veins are the preferred location for central venous access.**
- 3. The external jugular veins are an acceptable alternative for venous access.**
- 4. The subclavian veins should not be used for central venous access.**
- 5. Placement of a PICC should be avoided.**

Manuela Bonizzoli
Stefano Batacchi
Giovanni Cianchi
Giovanni Zagli
Francesco Lapi
Valentina Tucci
Giacomo Martini
Simona Di Valvasone
Adriano Peris

Peripherally inserted central venous catheters and central venous catheters related thrombosis in post-critical patients



Time distribution of deep venous thrombosis occurrences after catheter insertion

Original Investigation

**Association Between Prior Peripherally Inserted Central Catheters and Lack of Functioning Arteriovenous Fistulas:
A Case-Control Study in Hemodialysis Patients**

*Mireille El Ters, MD,¹ Gregory J. Schears, MD,² Sandra J. Taler, MD,¹
Amy W. Williams, MD,¹ Robert C. Albright, DO,¹ Bernice M. Jenson, RN,¹
Amy L. Mahon, RN,³ Andrew H. Stockland, MD,⁴ Sanjay Misra, MD,⁴
Scott L. Nyberg, MD, PhD,⁵ Andrew D. Rule, MD,^{1,6} and Marie C. Hogan, MD, PhD¹*

CASE-CONTROL STUDY (282 prevalent HD patients)

- Cases (120, 42.5%) were without functioning AVFs dialyzed through a tunneled CVC or AVG
- Controls (162, 57.5%) were with functioning AVFs



- Prior PICC use was evaluated in both groups and identified in 30% of HD patients, with 54% of these placed after HD therapy initiation.
- A PICC was identified in 53 (44.2%) cases, but only 32 (19.7%) controls ($p < 0.001$)

Original Investigation

**Association Between Prior Peripherally Inserted Central Catheters and Lack of Functioning Arteriovenous Fistulas:
A Case-Control Study in Hemodialysis Patients**

*Mireille El Ters, MD,¹ Gregory J. Schears, MD,² Sandra J. Taler, MD,¹
Amy W. Williams, MD,¹ Robert C. Albright, DO,¹ Bernice M. Jenson, RN,¹
Amy L. Mahon, RN,³ Andrew H. Stockland, MD,⁴ Sanjay Misra, MD,⁴
Scott L. Nyberg, MD, PhD,⁵ Andrew D. Rule, MD,^{1,6} and Marie C. Hogan, MD, PhD¹*

We found a strong and independent association between prior PICC use and a subsequent lower frequency of AVF use even after adjustment for patient sex, artery and vein diameters, and prior CVC insertion (OR, 2.8; 95% CI, 1.5-5.5; P 0.002).

**CONCLUSION**

PICCs are commonly placed in patients with end-stage renal disease and are a strong independent risk factor for lack of functioning AVFs.

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Of note, we have reviewed PICC lines extensively however one should bear in mind that **midline catheters** pose the similar risks to CKD patients and therefore the same guidelines should be applied

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Original Article

Comparison of Venous Thrombosis Complications in Midlines Versus Peripherally Inserted Central Catheters: Are Midlines the Safer Option?

Clinical and Applied
Thrombosis/Hemostasis
Volume 25: 1-8
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DOI: 10.1177/1076029619839150
journals.sagepub.com/home/cat
SAGE

Amit Bahl, MD, MPH, RDMS, FACEP¹, Patrick Karabon, MS², and David Chu, BS²

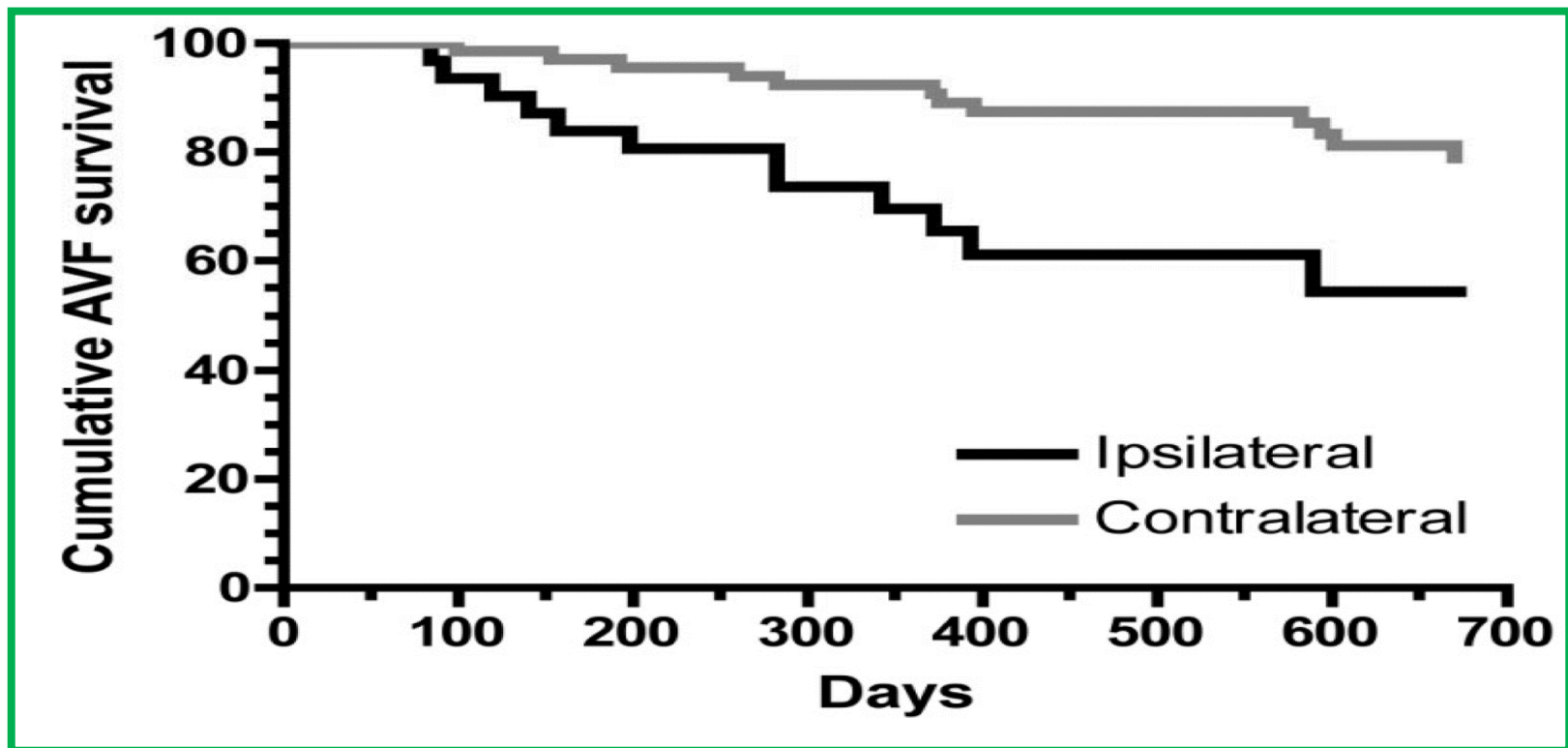
Table 4. Multivariate/Adjusted Analysis for Effect of Line Type on Thrombosis Events.

	MC Adjusted ^a	PICC Adjusted ^a	AOR (95% CI) ^b	P Value
Catheter-related events				
Thrombosis (DVT or SVT)	22.30%	12.34%	2.04 (1.46-2.86)	<.0001
DVT	12.53%	6.85%	1.95 (1.28-2.97)	.0019
SVT	5.56%	2.91%	1.96 (1.18-3.25)	.0090

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Shingarev R, Barker-Finkel J, Allon M. *Am J Kidney Dis.* 2012 December ; 60(6): 983–989

Histologic Changes in the Human Vein Wall Adjacent to Indwelling Central Venous Catheters

Andrew R. Forauer, MD, and Constantine Theoharis, MD

J Vasc Interv Radiol 2003; 14:1163–1168



Gross specimen from the superior vena cava with a long-term (501 days) tunneled catheter in place. Note the thickened vein wall (arrows) and pedicle-like attachment (white arrowhead) between the catheter and vein wall. There is also a prominent fibrin sheath surrounding the catheter.

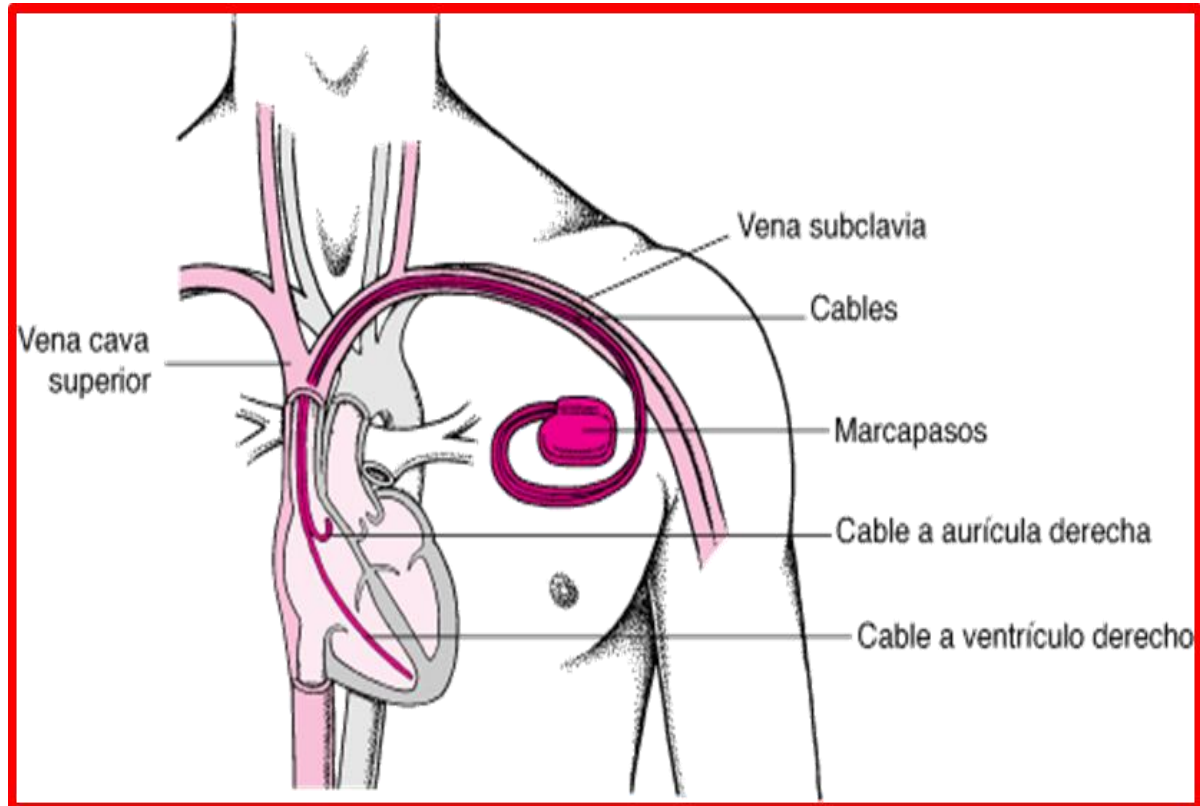
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DISPOSITIVOS ELECTRÓNICOS CARDÍACOS IMPLANTABLES (DECI):

- MARCAPASOS
- DESFIBRILADOR AUTOMÁTICO
IMPLANTABLE (DAI)
- RESINCRONIZADOR CARDÍACO

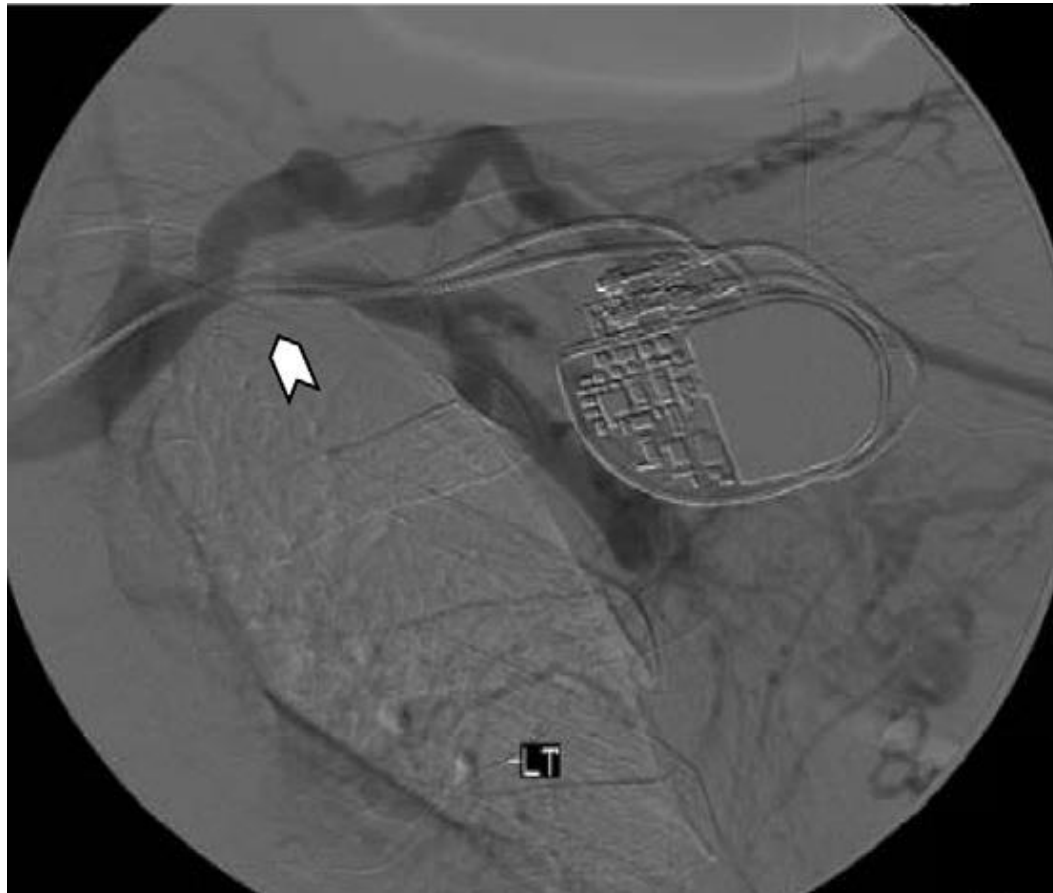


AJKD

Am J Kidney Dis. 2013; 61:1001-1015

Central Vein Stenosis

Anil K. Agarwal, MD



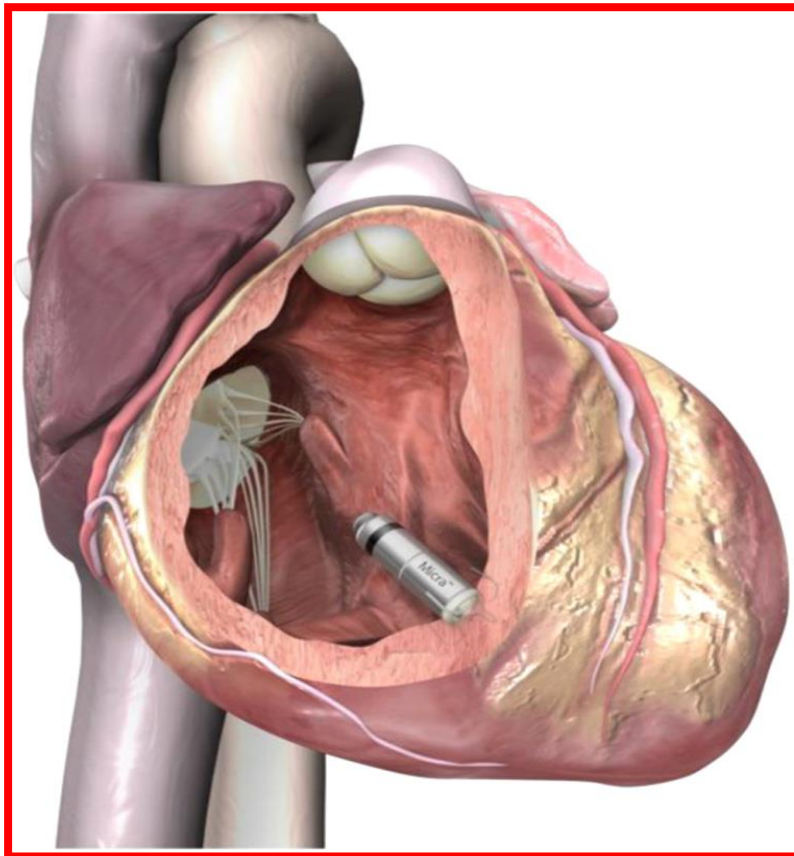
Stenosis of the left subclavian vein (arrow) due to the presence of pacemaker wires. Note the presence of collateralization in the upper arm and retrograde filling of the cephalic vein



Review

New horizon for infection prevention technology and implantable device

Yusuke Kondo, MD, PhD^{a,b,*}, Marehiko Ueda, MD, PhD^b, Yoshio Kobayashi, MD, PhD^b, Joerg O. Schwab, MD, PhD^a



MARCAPASOS SIN CABLES

Micra inside the right ventricle

The subcutaneous ICD – current evidence and challenges

Cardiovasc Diagn Ther 2014;4(6):449-459

Kiran Haresh Kumar Patel, Pier D. Lambiase

Table 1 S-ICD *vs.* T-ICD

Advantages

Extra-vascular

Disadvantages

No pacing capability

No advanced diagnostics

Time to defibrillation

Equivalents

Pocket infections

Pulse generator complications

Inappropriate shocks

Unknowns

Device longevity


Long-term safety profile

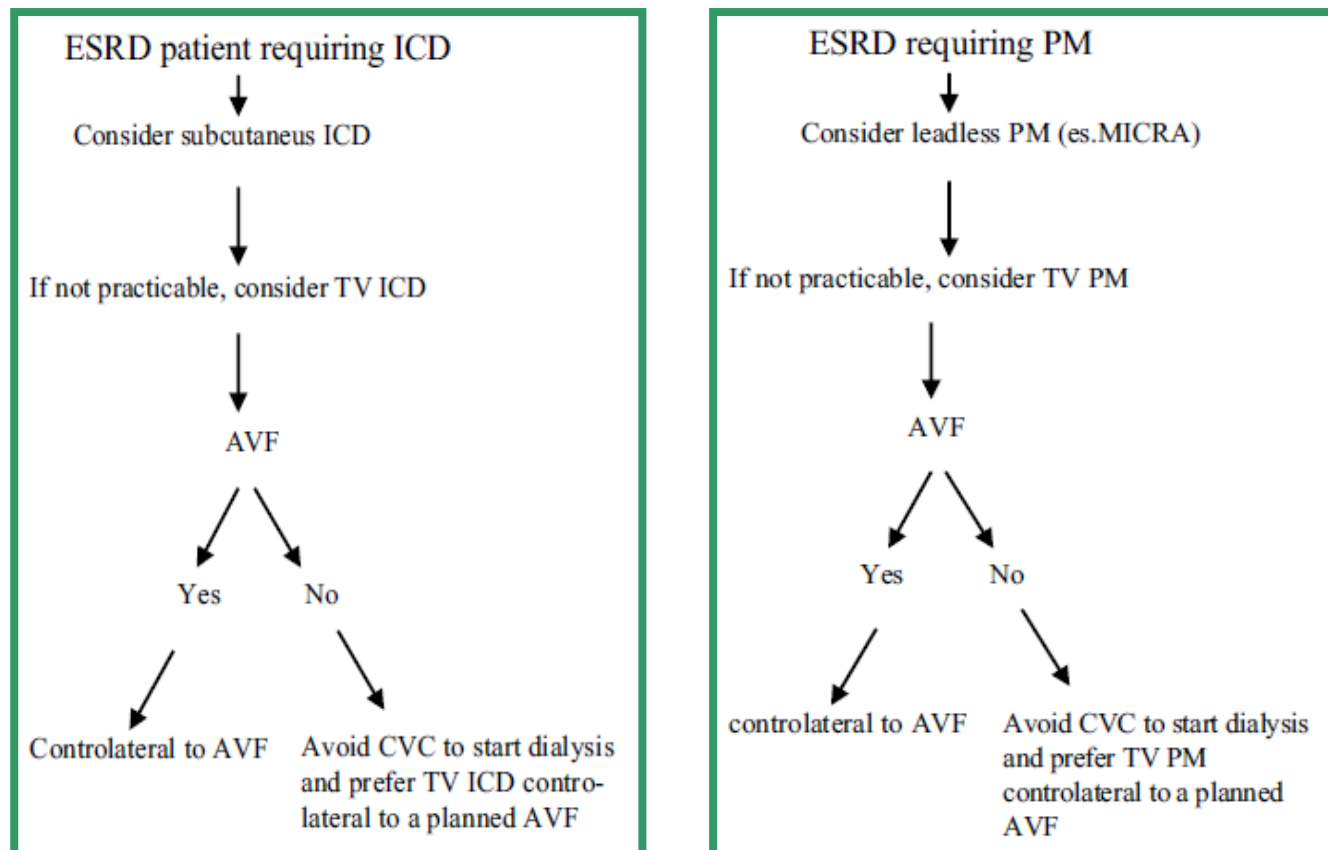


DESFIBRILADOR SUBCUTÁNEO

The S-ICD *in vivo* and *ex vivo*. The device is implanted in a lateral pocket on the left hand side of the chest, with the lead coursing anteriorly over the chest wall and sternum

Cardiovascular implantable electronic devices and native arteriovenous fistula in hemodialysis patients: novel perspectives

Leonardo Spatola¹  · Rodolfo Fernando Rivera² · Giacomo Mugnai³

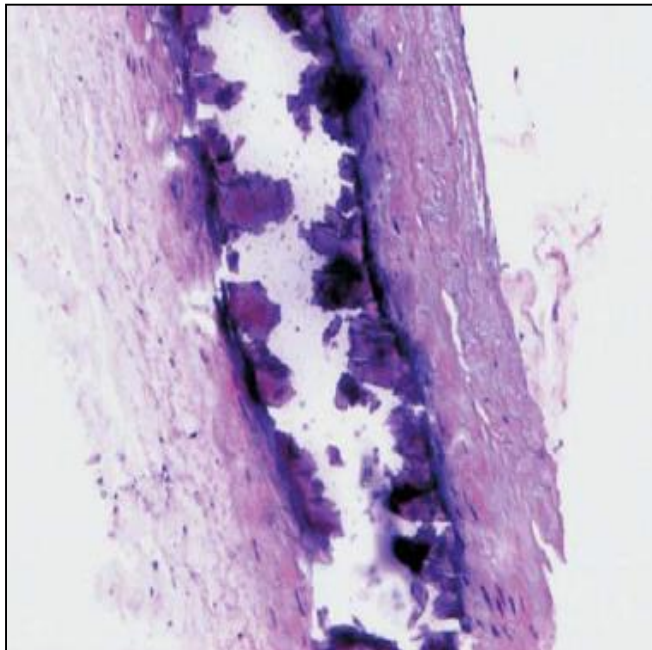


Flowchart of ICD or PM implantation in ESRD patients

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Online version at <http://www.minervamedica.it>

International Angiology 2019 June;38(3):239-49
DOI: 10.23736/S0392-9590.19.04132-4

ORIGINAL ARTICLE VASCULAR ACCESS

The impact of pre-existing radial artery pathology by histological assessment on the maturation, function and patency of the radiocephalic fistula for hemodialysis

Ramon ROCA-TEY ¹ *, Ramon BORDES ², Román MARTÍNEZ-CERCÓS ³, Amelia RIVAS ⁴, Amparo RODA ¹,
Omar IBRIK ¹, Rosa SAMON ¹, Juan C. GONZÁLEZ-OLIVA ¹, Jordi VILADOMS ¹, Jordi CALLS ¹

TABLE III.—Analysis of both data obtained from the radial artery by gross examination during the procedure and data recorded by microscopic evaluation from the radial artery specimens.

Radial artery	Radial artery without lesions on gross examination	Radial artery with lesions on gross examination	Total
Normal radial artery on microscopic evaluation	25 (96.2%)	1 (3.8%)	26 (100%)
Pathologic radial artery on microscopic evaluation	2 (18.2%)	9 (81.8%)	11 (100%)
Total	27 (73%)	10 (27%)	37 (100%)

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DIAGNOSIS, EVALUATION, PREVENTION, AND TREATMENT OF CHRONIC KIDNEY DISEASE—MINERAL AND BONE DISORDER: SYNOPSIS OF THE KIDNEY DISEASE: IMPROVING GLOBAL OUTCOMES 2017 CLINICAL PRACTICE GUIDELINE UPDATE.

Ketteler M, Block GA, Evenepoel P et al.

Ann Intern Med. 2018 Mar 20;168(6):422-430



In adult patients with CKD G3a to G5D receiving phosphate-lowering treatment, we suggest restricting the dose of calcium-based phosphate binders.

Transradial Arterial Access for Coronary and Peripheral Procedures: Executive Summary by the Transradial Committee of the SCAI

Catheterization and Cardiovascular Interventions 78:823–839 (2011)

Ronald P. Caputo,^{1*} MD, FSCAI, Jennifer A. Tremmel,² MD, MS, Sunil Rao,³ MD, FSCAI, Ian C. Gilchrist,⁴ MD, FSCAI, Christopher Pyne,⁵ MD, FSCAI, Samir Pancholy,⁶ MD, FSCAI, Douglas Frasier,⁷ MD, Rajiv Gulati,⁸ MD, FSCAI, Kimberly Skelding,⁹ MD, FSCAI, Olivier Bertrand,¹⁰ MD, and Tejas Patel,¹¹ MD

TABLE III. Vascular Complications Associated With Transradial Catheterization

Spasm
Bleeding
Hematoma
Compartment syndrome
Perforation, laceration, dissection
Evulsion of artery
Arterio-venous fistula
Pseudo-aneurysm
Subcutaneous granulomatous reaction (hydrophilic coating)
Cutaneous infection
Subacute and delayed occlusion
Digital ischemia
Accelerated atherosclerosis
Transient vocal cord paralysis
Mediastinal hematoma
Delayed reflex sympathetic dystrophy

**SCAI: Society for
Cardiovascular Angiography
and Interventions**

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ORIGINAL RESEARCH

J Am Heart Assoc. 2016;5:e002686



Radial Artery Occlusion After Transradial Interventions: A Systematic Review and Meta-Analysis

Muhammad Rashid, MBBS*; Chun Shing Kwok, MBBS*; Samir Pancholy, MD; Sanjay Chugh, MD; Sasko A. Kedev, MD, PhD; Ivo Bernat, MD; Karim Ratib, MBChB; Adrian Large, MD; Doug Fraser, MBChB; James Nolan, MBChB; Mamas A. Mamas, BMBCh, PhD

SYSTEMATIC REVIEW AND META-ANALYSIS

A total of 66 studies with 31345 participants were included in the analysis. Regarding to radial artery access for cardiac interventions, radial artery occlusion is a common complication of posttransradial intervention and limits the radial artery as a future vascular access site

KDOQI 2019 suggestion: “Given the fact that radial artery patency is integral to future radiocephalic AVF creation, femoral arterial access for coronary interventions should be strongly considered”

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ALTERNATIVAS A LA INSERCIÓN DE PICC, CVP LARGO Y MIDLINE (pacientes con acceso intravenoso dificultoso (patients with Difficult Intravenous Access or DIVA patients))

- 1) CALENTAMIENTO LOCAL
- 2) UTILIZACIÓN DE LA VENA YUGULAR EXTERNA
- 3) CATÉTER VENOSO CENTRAL DE PEQUEÑO CALIBRE O SBCC (del inglés, “small-bore central catheter”)
- 4) TECNOLOGÍA DE VISUALIZACIÓN VASCULAR:
 - 4.1. ECOGRAFIA DOPPLER.
 - 4.2. DISPOSITIVOS BASADOS EN LA TECNOLOGÍA DE INFRAROJOS
- 5) CATÉTER VENOSO CENTRAL PARA HEMODIÁLISIS DE TRIPLE LUZ: PARA UN SUBGRUPO DE PACIENTES INCIDENTES EN HD POR ERC REAGUDIZADA (del inglés, acute-on-chronic renal disease).

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HANDBOOK FOR THE BLOOD VESSELS PROTECTION IN PEOPLE WITH KIDNEY DISEASE

Local warming and insertion of peripheral venous cannulas: single blinded prospective randomised controlled trial and single blinded randomised crossover trial

Rainer Lenhardt, Tanja Seybold, Oliver Kimberger, Brigitte Stoiser, Daniel I Sessler

British Medical Journal 2002, 325, 1-4



What is already known on this topic

Insertion of peripheral venous cannulas may be difficult because of severe vasoconstriction

Vasoconstriction can be overcome by local heating

What this study adds

Active local warming facilitates the insertion of peripheral venous cannulas, reducing both the time and number of attempts required

Local warming will decrease the amount of time staff spend inserting cannulas, reduce supply costs, and improve patient satisfaction

Retrospective analysis of the feasibility and safety of external jugular vein cannulation in surgical patients

Jae-Woo Ju, Yoonbin Hwang, and Ho-Jin Lee

Department of Anesthesiology and Pain Medicine, Seoul National University Hospital, Seoul, Korea



Experiencia clínica de enfermería: canalización de vena yugular externa

*Nursing clinical experience:
catheterization of external jugular vein*

*Experiência clínica de enfermagem:
cateterização da veia jugular externa*

JOSÉ MANUEL FLÓREZ RAMOS*
MARÍA MORAIMA ARIAS RESTREPO**
ANDRÉS FELIPE TIRADO OTÁLVARO***

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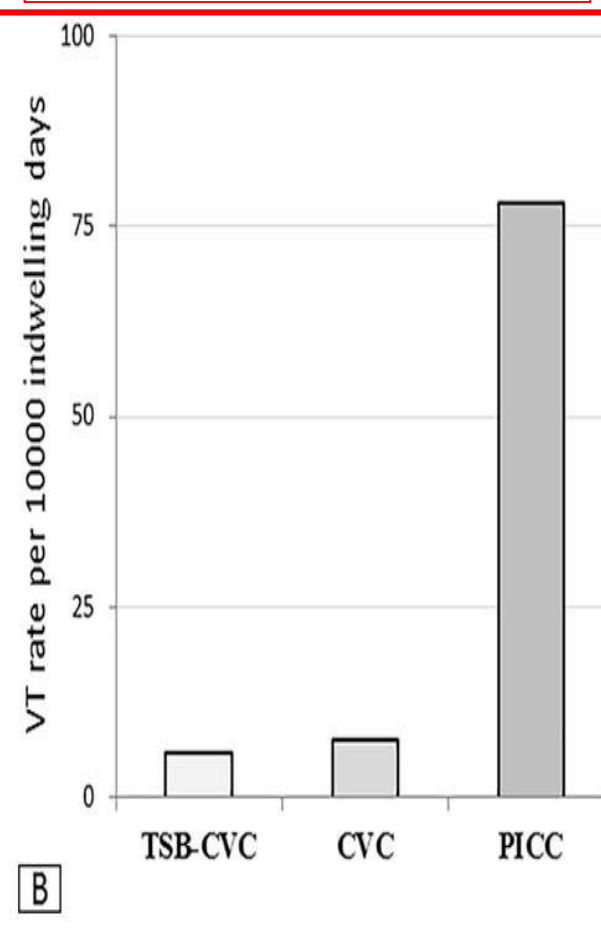
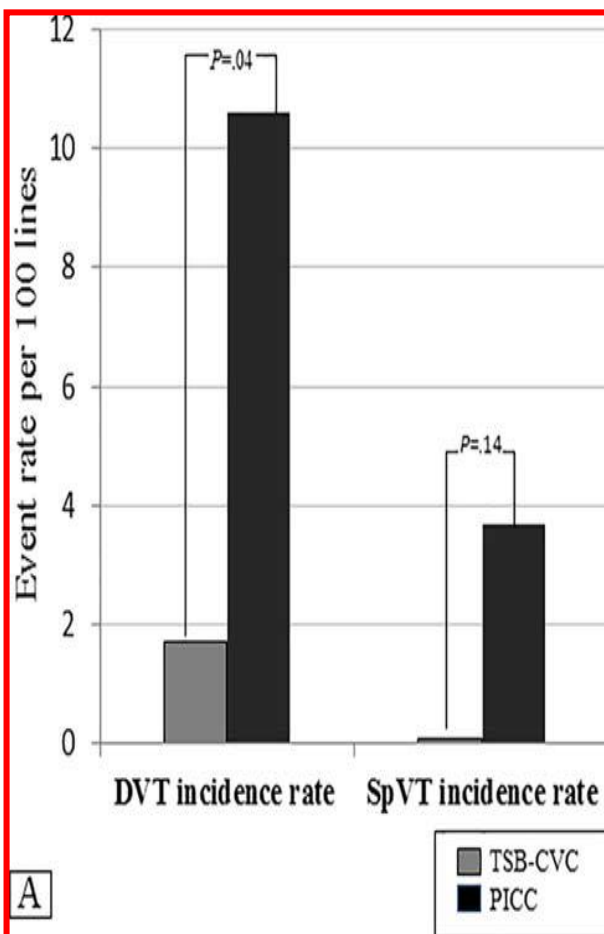
Hemodialysis International 2017; 21:284-293

Original Article

Vascular Access

Evaluating safety of tunneled small bore central venous catheters in chronic kidney disease population: A quality improvement initiative

Gauri BHUTANI,¹ Mireille EL TERS,² Walter K KREMERS,⁵ Joe L KLUNDER,⁴
Sandra J. TALER,³ Amy W. WILLIAMS,³ Andrew H. STOCKLAND,⁴ Marie C. HOGAN³



POSITION PAPER

The Use of Visualization Technology for the Insertion of Peripheral Intravenous Catheters

Stephanie Pitts, MSN, RN, CPN, VA-BC™

Matt Ostroff, ARNP-C, VA-BC™



**Association for Vascular Access
(2019)**

In an effort to prevent vessel depletion and improve patient comfort, the use of **IR/NIR visualization technology or ultrasound guidance** should be considered for PIVC insertion as a first intervention when used by trained health care providers.

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ONLINE ONLY SEPTEMBER 6, 2019—POSITION STATEMENT

Journal of Hospital Medicine. 2019;14:E1-E22

**Recommendations on the Use of Ultrasound Guidance
for Central and Peripheral Vascular Access in Adults:
A Position Statement of the Society of Hospital Medicine**

Ricardo Franco-Sadud, MD^{1*}, Daniel Schnobrich, MD², Benji K. Mathews, MD³, Carolina Candotti, MD⁴, Saaïd Abdel-Ghani, MD⁵, Martin G Perez, MD⁶, Sophia Chu Rodgers, DNP, ACNP⁷, Michael J Mader, MS^{8,9}, Elizabeth K Haro, MPH^{8,9}, Ria Dancel, MD^{10,11}, Joel Cho, MD, RDMS, RDCS¹², Loretta Grikis, MLS¹³, Brian P Lucas, MD, MS^{13,14}, the SHM Point-of-care Ultrasound Task Force^{**}, and Nilam J Soni, MD, MS^{8,9}

16) We recommend that providers should use real-time ultrasound guidance for the placement of peripheral intravenous lines (PIV) in patients with difficult peripheral venous access to reduce the total procedure time, needle insertion attempts, and needle redirections. Ultrasound-guided PIV insertion is also an effective alternative to CVC insertion in patients with difficult venous access.

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Cochrane Database of Systematic Reviews

Ultrasound guidance versus landmark method for peripheral venous cannulation in adults (Review)

Tada M, Yamada N, Matsumoto T, Takeda C, Furukawa TA, Watanabe N

Tada M, Yamada N, Matsumoto T, Takeda C, Furukawa TA, Watanabe N.
Ultrasound guidance versus landmark method for peripheral venous cannulation in adults.
Cochrane Database of Systematic Reviews 2022, Issue 12. Art. No.: CD013434.
DOI: [10.1002/14651858.CD013434.pub2](https://doi.org/10.1002/14651858.CD013434.pub2)

www.cochranelibrary.com

Ultrasound guidance versus landmark method for peripheral venous cannulation in adults (Review)
Copyright © 2022 The Cochrane Collaboration. Published by John Wiley & Sons, Ltd.

WILEY

In difficult participants, ultrasound guidance increased the first-pass success of cannulation (risk ratio (RR) 1.50, 95% confidence interval (95% CI) 1.15 to 1.95; 10 studies, 815 participants), and the overall success of cannulation (RR 1.40, 95% CI 1.10 to 1.77; 10 studies, 670 participants).

Compared to the landmark method, ultrasound guidance may benefit difficult participants for increased first-pass and overall success of cannulation



Original Contribution

A randomized controlled trial assessing the use of ultrasound for nurse-performed IV placement in difficult access ED patients☆☆☆★



Amit Bahl, MD, MPH*, Ananda Vishnu Pandurangadu, MD, Jared Tucker, MD, Michael Bagan, MD

Table 2

Patient characteristics in experimental and SOC groups

	USGPIV (n = 63)	SOC (n = 59)	P value (for overall group)
Age (median years)	61	62	.96 ^a
18-35	6 (9.5%)	9 (15.3%)	
36-50	12 (19.0%)	11 (18.6%)	
51-65	25 (39.7%)	17 (28.8%)	
65+	20 (31.7%)	22 (37.3%)	
Sex			.83 ^b
Male	16 (25.4%)	16 (27.1%)	
Female	47 (74.6%)	43 (72.9%)	
Medical history			
Obesity (BMI ≥30)	36	30	.49 ^b
IVDA	3	1	.62 ^c
ESRD	16	12	.37 ^b
Sickle cell	1	1	1.00 ^c
HR (median)	84	88	.46 ^a
MAP (median)	91	95	.28 ^a
50-70	4 (6.4%)	3 (5.3%)	
71-100	41 (65.1%)	32 (56.1%)	
101-130	17 (27.0%)	21 (36.8%)	
>130	1 (1.6%)	1 (1.8%)	

In difficult access patients, nurses were more successful in obtaining IV access using US guidance than palpation SOC technique

Nurse-Performed Ultrasound-Guided Technique for Difficult Peripheral Intravenous Access in Critically Ill Patients: A Randomized Controlled Trial

Takuya Nishizawa, MD
Takashi Matsumoto, MD
Takafumi Todaka, MD
Mikio Sasano, MD
Hironobu Kitagawa, RN
Ayano Shimabuku, RN

Department of Intensive Care Medicine, Nakagami Hospital, Okinawa (city), Okinawa, Japan



JAVA, 2020

CONCLUSION

Among ICU patients with difficult PIV access, US-guided PIV access placement by nurses who underwent standardized training was more successful than placement with SOC technique

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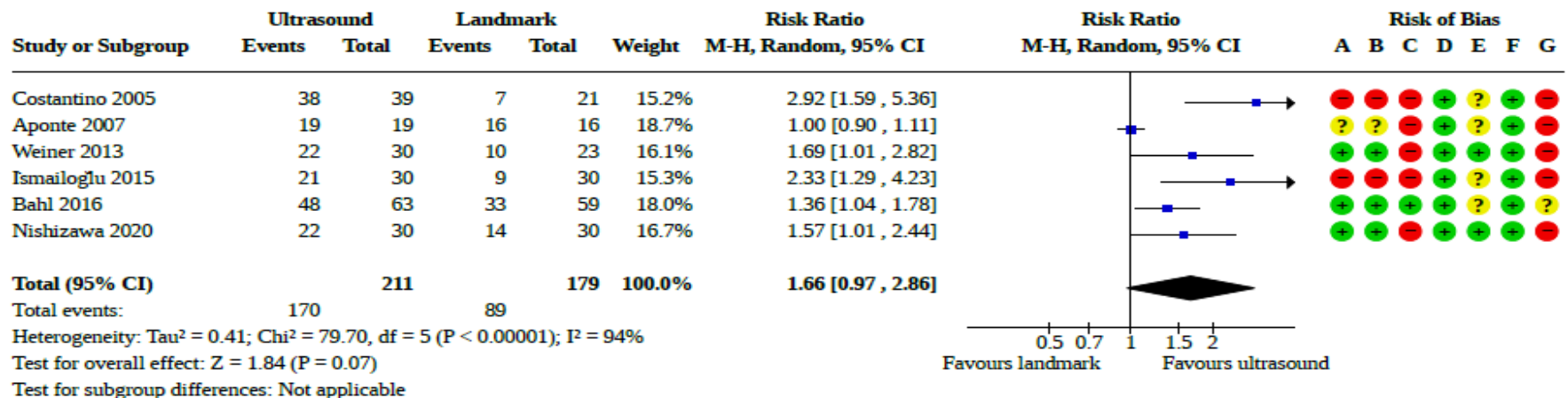
HANDBOOK FOR THE BLOOD VESSELS PROTECTION IN PEOPLE WITH KIDNEY DISEASE



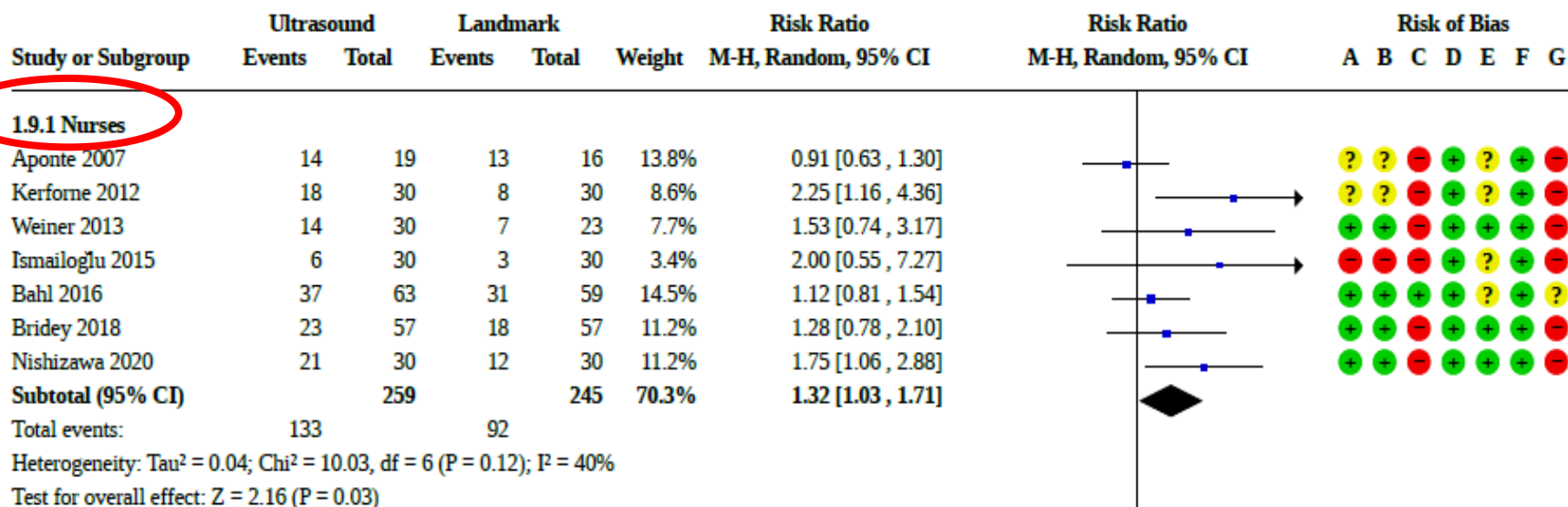
Ultrasound guidance versus landmark method for peripheral venous cannulation in adults (Review)

Tada M, Yamada N, Matsumoto T, Takeda C, Furukawa TA, Watanabe N

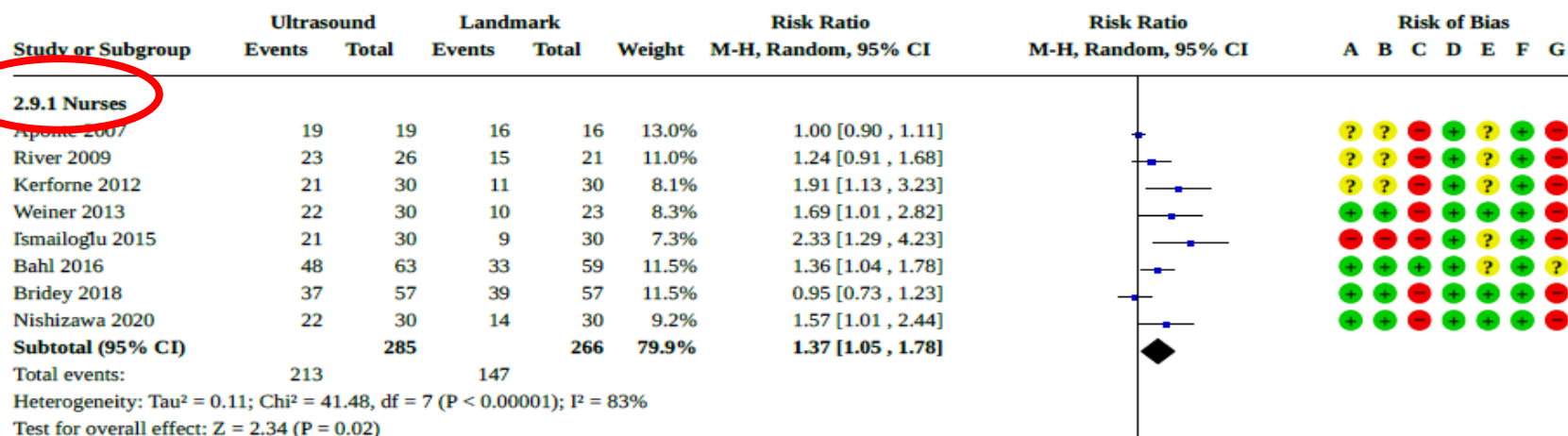
Analysis 2.4. Comparison 2: Overall success of cannulation, Outcome 4: Participants had a history of difficult intravenous access



Analysis 1.9. Comparison 1: First-pass success of cannulation, Outcome 9: Types of operators



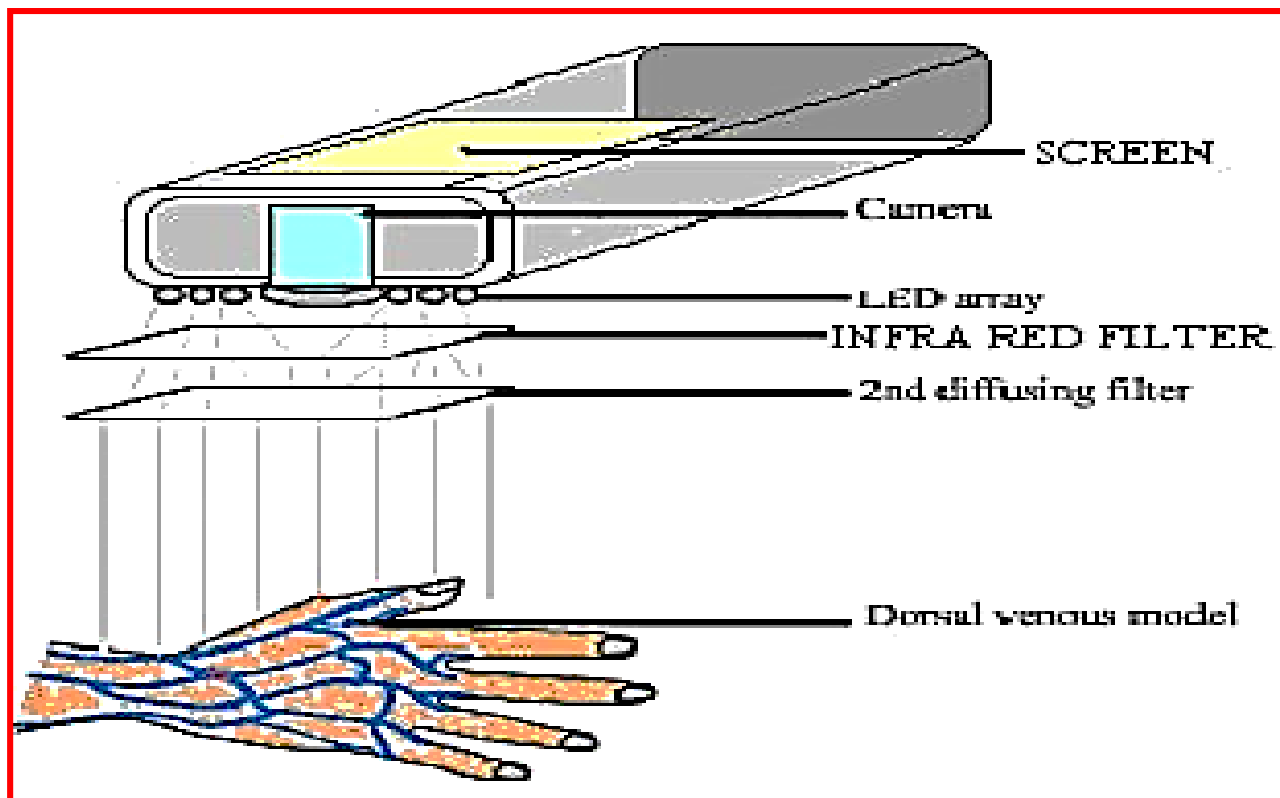
Analysis 2.9. Comparison 2: Overall success of cannulation, Outcome 9: Types of operators

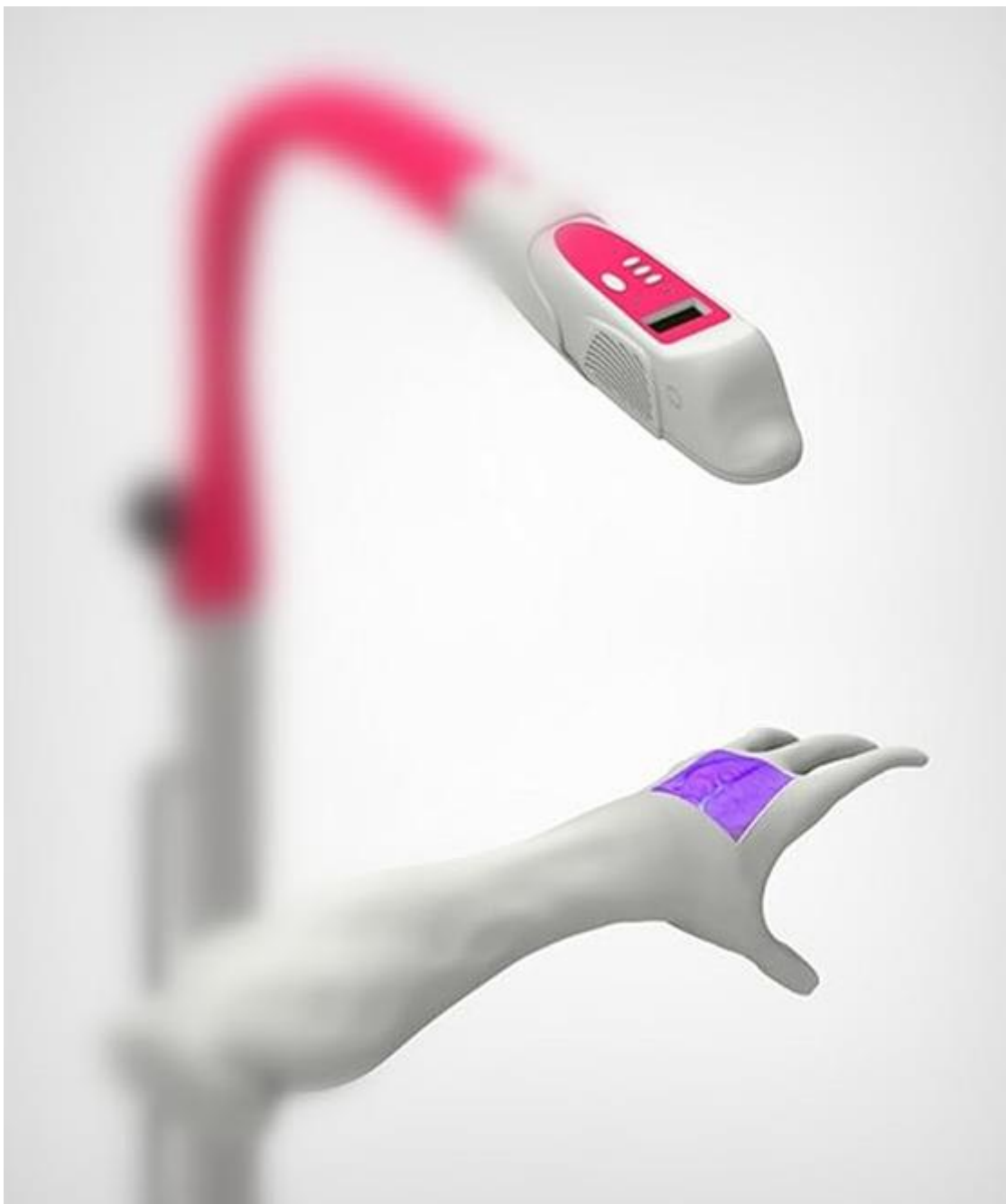




Vein Visualization Using Near Infrared (NIR) Vein Finder Technology in Nursing Care: A Review of the Benefits and Shortcomings

Saeb Fadhil Al-Saadi ^{1, 2}, *Hossein Karimi Moonaghi ³, Sadegh Al-Fayyadh ⁴, Mahmoud Bakhshi ⁵





<http://medicaleducation-bulletin.ir>

Review Article (Pages: 213-220)

Vein Visualization Using Near Infrared (NIR) Vein Finder Technology in Nursing Care: A Review of the Benefits and Shortcomings

Saeb Fadhil Al-Saadi ^{1, 2}, *Hossein Karimi Moonaghi ³, Sadegh Al-Fayyadh ⁴, Mahmoud Bakhshi ⁵



Chiano FB et al. British Journal of Anaesthesia 110 (6): 966–71 (2013)



Vein Visualization Using Near Infrared (NIR) Vein Finder Technology in Nursing Care: A Review of the Benefits and Shortcomings

Saeb Fadhil Al-Saadi ^{1, 2}, *Hossein Karimi Moonaghi ³, Sadegh Al-Fayyadh ⁴, Mahmoud Bakhshi ⁵



Portable Vein Viewer Locator Detector Trans-illuminator Visualization Lights for Clinic

CLINICAL PRACTICE

Vein visualization: patient characteristic factors and efficacy of a new infrared vein finder technology†

F. B. Chiao*, F. Resta-Flarer, J. Lesser, J. Ng, A. Ganz, D. Pino-Luey, H. Bennett, C. Perkins Jr and B. Witek

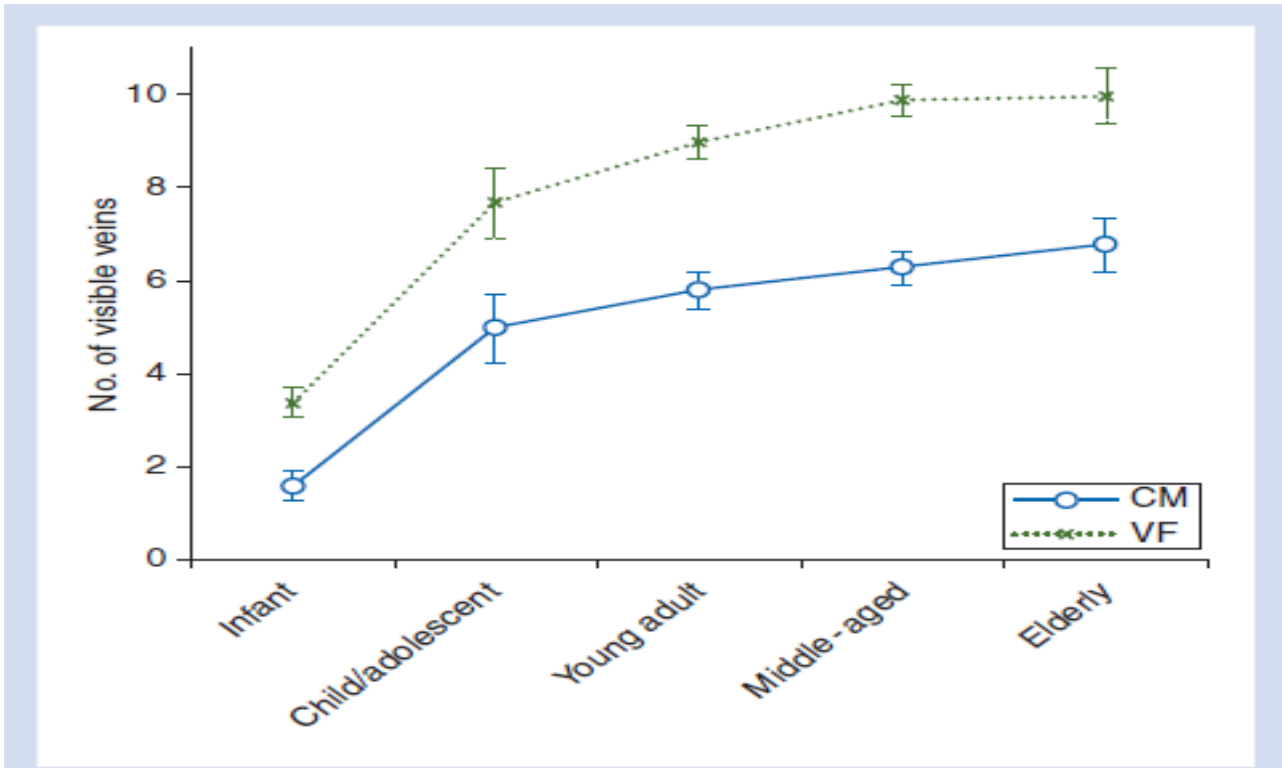


Fig 4 Comparison of VF and CM visible sites [mean (SE)] across age groups.

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- The VF technology identified an average of 9.1 (95% CI 8.6–9.5) possible cannulation sites. Compared with CM, the overall average of additional veins found with VF was 3.3 (95% CI 3.0–3.5) veins.
- **In 353 of 384 (92%) observations, the VF technology located at least one additional vein.**
- Seventy-six (19.8%) obese subjects had an average of 4.5 (95% CI 3.8–5.3) and 8.2 (95% CI 7.4–9.1) veins viewable by CM and VF, respectively.
- Also, the morbidly obese visible vein count improved to 6.6 (95%CI 5.9–7.3) veins with VF from 3.6 (95% CI 1.5–5.8) with CM.

MANUAL PARA LA PROTECCION DE LOS VASOS SANGUÍNEOS EN PERSONAS CON ENFERMEDAD RENAL



HANDBOOK FOR THE BLOOD VESSELS PROTECTION IN PEOPLE WITH KIDNEY DISEASE

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ORIGINAL ARTICLE

**Vascular access for incident hemodialysis patients
in Catalonia: analysis of data from the Catalan Renal
Registry (2000-2011)**

Ramon Roca-Tey^{1,2}, Emma Arcos³, Jordi Comas³, Higinio Cao^{3,4}, Jaume Tort³; Catalan Renal Registry Committee³

AVF



Predictable CKD
progression to ESRD
(steady loss of GFR)

Modified from: Dear JW, Yuen PST. Setting the stage for acute-on-chronic kidney injury. *Kidney International* (2008) 74, 7–9.



Unanticipated event
precipitating ESRD

Asymptomatic CKD
patients presenting
with ESRD



CVC

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A Multicenter, Prospective, Randomized, Comparative Evaluation of Dual- Versus Triple-Lumen Catheters for Hemodialysis and Apheresis in 485 Patients

Gabriel Contreras, MD, Ping-Yu Liu, PhD, Lawrence Elzinga, MD, Michael S. Anger, MD, Jean Lee, MD, Nurian Robert, RN, Robert Chvala, MD, Ronald L. Mars, MD, Thomas Vesely, MD, Tim E. Taber, MD, Douglas Shemin, MD, Randy Shafritz, MD, and Joseph Pulliam, MD

Am J Kidney Dis 2003; 42:315-324

Table 4. Noninfectious Catheter-Related Complications, Adverse Events per 1,000 Catheter-Days

Adverse Event	All (3,330 d)		DLC (1,588 d)		TLC (1,742 d)		P
	Count	Rate*	Count	Rate*	Count	Rate*	
Catheter-related mechanical complications							
Flow problems†	444	133.3	215	135.4	229	131.5	0.76
Limb reversal	61	18.3	26	16.4	35	20.1	0.43
Excessive positive venous pressure	58	17.4	34	21.4	24	13.8	0.10
Excessive negative arterial pressure	23	6.9	11	6.9	12	6.9	0.99
Port aspiration difficulty	23	6.9	11	6.9	12	6.9	0.99
Kinking	13	3.9	8	5.0	5	2.9	0.32
Hematoma	12	3.6	5	3.1	7	4.0	0.68
Others‡	68	20.4	31	19.5	37	21.2	0.73
Major mechanical complications§	12	3.6	5	3.1	7	4.0	0.68
Sum of all mechanical complications	714	214.3	346	217.7	368	211.3	0.68
Catheter-related thrombotic complications							
DVT	1	0.3	1	0.6	0	0.0	1.00
Sum of all thrombotic complications	76	22.8	43	27.1	33	18.9	0.12

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Table 2. Incidence Densities of the Primary End Point: CRBSI in Evaluated Patients

Organism	All (2,760 d)		DLC (1,291 d)		TLC (1,469 d)		P
	Count	Rate*	Count	Rate*	Count	Rate*	
All organisms	31	11.2	16	12.4	15	10.2	0.59
Coagulase-negative <i>Staphylococcus</i>	12	4.3	7	5.4	5	3.4	0.43
<i>S aureus</i> †	11	4.0	7	5.4	4	2.7	0.27
Gram-negative bacteria	6	2.2	1	0.8	5	3.4	0.18
Other gram-positive cocci	2	0.7	1	0.8	1	0.7	0.93

Changes in vascular access profile for pediatric hemodialysis patients over time: A registry-based study from Catalonia

The Journal of Vascular Access
1–7

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the Catalan Renal Registry Committee



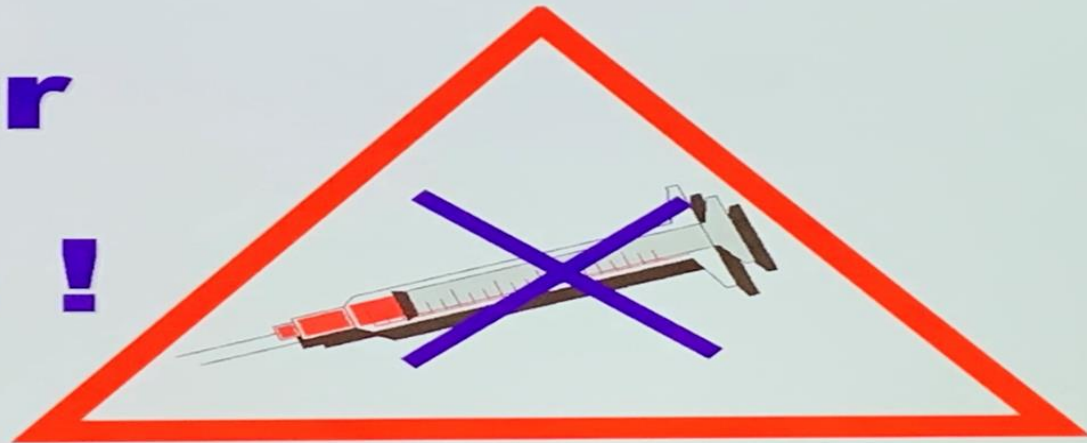
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**HANDBOOK FOR THE
BLOOD VESSELS
PROTECTION IN
PEOPLE WITH
KIDNEY DISEASE**

Venous preservation is key

**Save Your Veins
Your
Life !**



No to Needling

Shroff R. What adult nephrologists need to know about paediatric dialysis.
59TH ERA CONGRESS, Paris, May 19, 2022.

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IX JORNADA SOBRE EL ACCESO VASCULAR
PARA HEMODIÁLISIS EN EL VALLÈS ORIENTAL

I REUNIÓ ANUAL GRUP TREBALL ACCÉS VASCULAR
SOCIETAT CATALANA DE NEFROLOGIA



29 de febrero de 2024

Servicio de Nefrología Hospital Universitari Mollet

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honestas, cercanas, profesionales e innovadoras*

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