Accessi Vascolari: *Epidemiologia* e *Appropriatezza*

Daniele G. Biasucci

Fondazione Policlinico Universitario "A. Gemelli" IRCCS, Roma

Indicazioni

Prelievo di campioni ematici

Terapia endovenosa di vario tipo e durata

Rimpiazzo volemico

Trasfusione di emoderivati

Nutrizione parenterale

Monitoraggio emodinamico

Tecniche dialitiche e/o feretiche

Pacing transvenoso

Tecniche di ossigenazione extra-corporee (ECMO V-V)

Altre tecniche di depurazione extra-corporea (ECCO2-R, Polimixina B, MARS)

Supporto emodinamico (ECMO V-A etc.)

Indicazioni a VAD centrale

Indicazioni all'accesso venoso centrale sono le seguenti:

- Necessità di dialisi o feresi
- Necessità di prelievi frequenti
- Monitoraggio emodinamico
- Soluzioni con pH <5 o pH>9
- Farmaci con osmolarità >600 mOsm/l
- Nutrizione Parenterale > 800 mOsm/l
- Farmaci vescicanti o comunque associati a danno intimale (cfr. Lista Farmaci per Infusione)

Mauro Pittiruti, Giancarlo Scoppettuolo

MANUALE GAVeCeLT DEI PICC E DEI MIDLINE

Indicazioni, impianto, gestione

edra

APPENDICE I

Principali farmaci per infusione endovenosa

pH, OSMOLARITÀ E RISCHIO DI FLEBITE IN CASO DI INFUSIONE PER VIA PERIFERICA				
Farmaco	**Diluizione**	**pH**	**mOsmol/L**	**Flebite**
Aciclovir	5 mg/mL in SF	10,5-11,6	316	Sì
Amfotericina B	0,1 mg/mL in SG5%	5,7	256	Sì
Amfotericina B	0,2-0,8 mg/mL in SG5%	5,0-6,0	280	Sì
Amfotericina B	1-2 mg/mL in SG5%	5,0-6,0	280	Sì
Amikacina	5 mg/mL in SF	3,5-5,5	349	
Aminofillina	5 mg/mL in SF	8,6-9	327	
Amiodarone	2 mg/mL in SG5%	4,1		Sì
Ampicillina	100 mL SF	9(8-10)	328-372	Sì
Ampicillina/Sulbactam	100 mL SF	9(8-10)	400	Sì
Amrinone	2,5 mg/mL in SF	3,2-4	300	Sì
Azitromicina 500 mg	2 mg/mL in SF	6,4-6,8	280	Sì
Aztreonam	100 mL SF	6(4,5-7,5)	315-352	
Bleomicina	3 unità/mL	4,5-6	300	
Carboplatino	0,2-2 mg/mL in SG5%	5,0-7,0	250	
Carmustina	250-500 mL SG5%	5,6-6		
Caspofungina	0,28-0,35 mg/mL in SF	6,6		Sì
Cefamandolo 1 g	10 mL SD	6-8,5	466	
Cefamandolo 1 g	100 mL SF	7(6-8,5)	314	
Cefazolina 1-2 g	10 mL SD	4,5-7	293	
Cefazolina 1-2 g	100 mL SF	4,5-7	317-351	

(segue)

NONCYTOTOXIC VESICANT MEDICATIONS and SOLUTIONS

RED LIST Well-recognized vesicants with multiple citations and reports of tissue damage upon extravasation	YELLOW LIST Vesicants associated with fewer published reports of extravasation; published drug information and infusate characteristics indicate caution and potential for tissue damage
Calcium chloride	**Acyclovir**
Calcium gluconate	**Amiodarone**
Contrast media - nonionic	**Arginine**
Dextrose concentration ≥ 12.5%	**Dextrose concentration ≥ 10% to 12.5%**
Dobutamine	**Mannitol ≥ 20%**
Dopamine	**Nafcillin**
Epinephrine	**Pentamidine**
Norepinephrine	**Pentobarbital sodium**
Parenteral nutrition solutions exceeding 900 mOsm/L	**Phenobarbital sodium**
Phenylephrine	**Potassium ≥ 60 mEq/L**
Phenytoin	**Vancomycin hydrochloride**
Promethazine	
Sodium bicarbonate	
Sodium chloride ≥ 3%	
Vasopressin	

Appropriatezza

In sanità il termine appropriatezza è la misura di quanto una scelta clinica sia adeguata rispetto alle esigenze del paziente e del contesto sanitario

Appropriatezza

-Procedura corretta e sicura

- Sul paziente giusto

- Al momento più opprtuno

- Nel setting più adatto e sicuro

Appropriatezza

… nella scelta del VAD

… della tecnica di impianto

… dei materiali

… nella gestione del sito di emergenza e del VAD

Scelta dell'accesso venoso

Le attuali evidenze scientifiche riassunte in quattro raccomandazioni

Prima raccomandazione

Inserire l'accesso venoso soltanto se realmente necessario

Esempio

Molti pazienti candidati a nutrizione artificiale vengono selezionati per una nutrizione parenterale mediante accesso venoso, laddove potrebbero giovarsi (con minori rischi e maggiore costo-efficacia) di una nutrizione enterale tramite sonda o stomia.

La nutrizione parenterale è un sicuro e rilevante fattore di rischio per infezioni e altre complicanze catetere-correlate

Seconda raccomandazione

Preferire un accesso venoso periferico: inserire un dispositivo per accesso venoso centrale soltanto se realmente indicato

Journal of Hospital Infection 94 (2016) 86–91

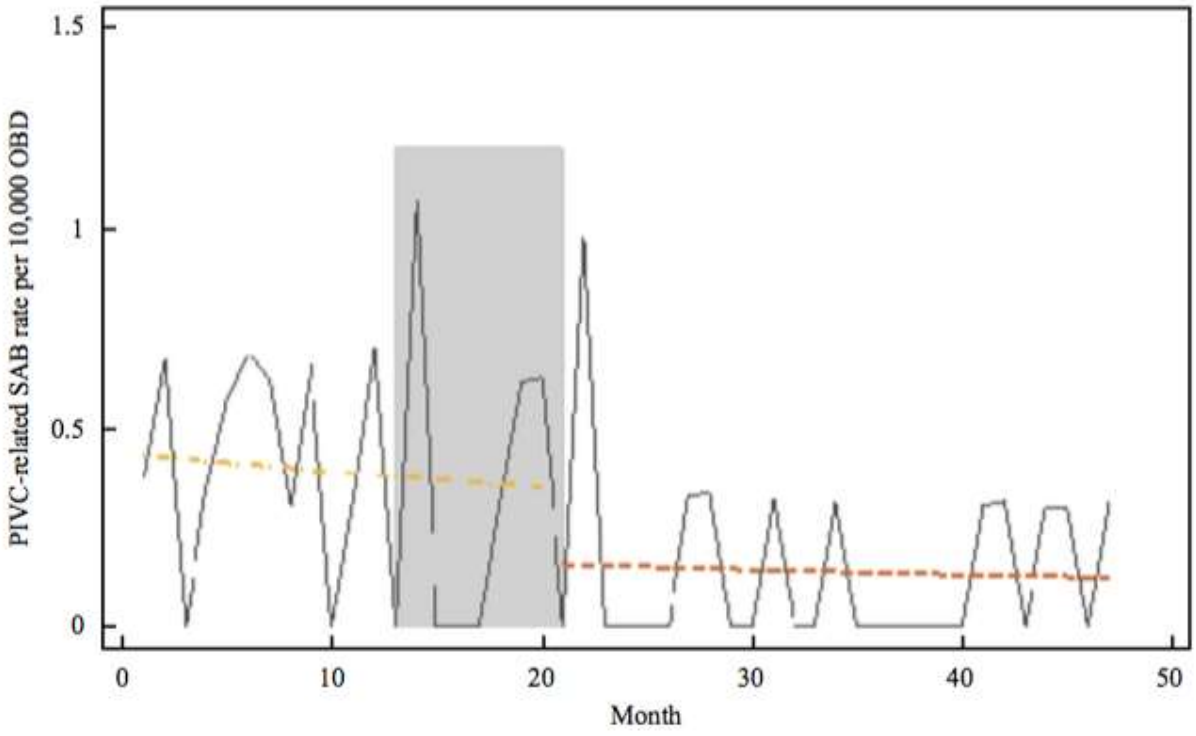
Available online at www.sciencedirect.com

Journal of Hospital Infection

journal homepage: www.elsevierhealth.com/journals/jhin

Reducing *Staphylococcus aureus* bloodstream infections associated with peripheral intravenous cannulae: successful implementation of a care bundle at a large Australian health service

D. Rhodes [a], A.C. Cheng [a,b], S. McLellan [a], P. Guerra [a], D. Karanfilovska [a], S. Aitchison [a], K. Watson [a], P. Bass [a], L.J. Worth [a,c,*]



Dispositivi per accesso venoso

VAD = venous access devices

Un mondo complesso e variegato: molteplici dispositivi differenti tra loro in termini di:

- Durata
- Performance di utilizzo
- Rischio di complicanze
- Costi

Una nuova impostazione

Ogni VAD è definito da quattro caratteristiche:

1. **Posizione della punta**
2. **Tecnica di inserzione**
3. **Vena incannulata**
4. **Sito di emergenza**

Sulla base di queste caratteristiche, è possibile prevedere la futura 'performance' del VAD e il rischio di complicanze

- Le complicanze alla inserzione dipendono da **2** e **3**
- Le complicanze infettive, le tromboflebiti e le dislocazioni dipendono principalmente da **4**
- Le trombosi venose centrale dipendono da **1, 2** e **3**

Scelta del dispositivo per accesso venoso

Le procedure aziendali e i protocolli operativi devono prevedere *un algoritmo di scelta* , basato su una valutazione preventiva delle necessità vascolari del paziente

Occorre una via centrale o periferica ?
Solo in ambito intra-ospedaliero o anche extra ?
Per quanto tempo ?
Quali vene sono disponibili ?
Quale VAD assicura la performance richiesta ?

Linee guida di riferimento

Linee guida BCSH 2006
Linee guida ESPEN 2009
Standards RCN 2010
Linee guida CDC Atlanta 2011
Consensus WoCoVA 2012
Linee guida EPIC 2014
Linee guida SHEA/IDSA 2014
Standards INS 2016


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]

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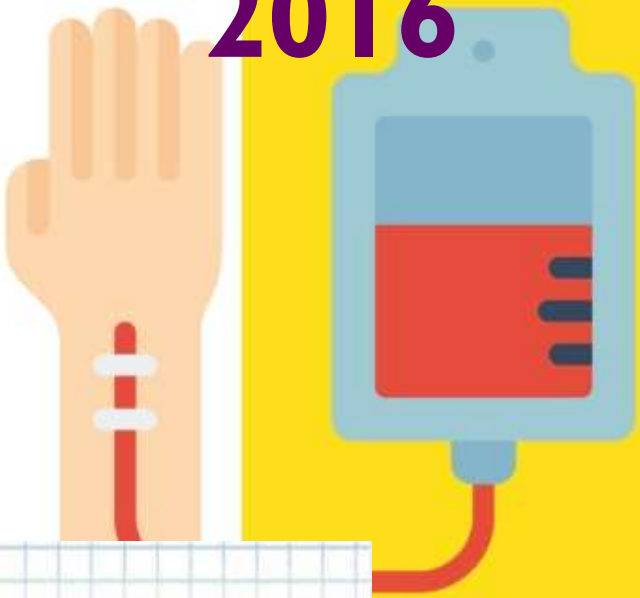

Infusion Therapy Standards of Practice

The Art and Science of Infusion Nursing

INS
INFUSION NURSES SOCIETY
Setting the Standard for Infusion Care

Section Five: Vascular Access Device (VAD) Selection and Placement

Lingua / Language / Idioma

Adulto- Elezione

Uso extraospedaliero

<4-6 mesi

- Sufficiente accesso periferico →
  - < 3-4 sett.: mini-midline
  - > 3-4 sett.: midline
- Necessità accesso centrale
  - Vene braccio disponibili : PICC non cuffiato, tunnellizzato o no
  - Vene braccio indisponibili: CICC non cuffiato, tunnellizzato
  - Ostruzione vena cava sup.: FICC non cuffiato, tunnellizzato

>4-6 mesi

- Uso frequente
  - Vene braccio disponibili : PICC cuffiato opp. tunnellizzato con SAS
  - Vene braccio indisponibili: CICC cuffiato opp. tunnellizzato con SAS
  - Ostruzione vena cava sup.: FICC cuffiato opp. tunnellizzato con SAS
- Uso infrequente
  - Vene braccio disponibili : PICC- port
  - Vene braccio indisponibili: port toracico
  - Ostruzione vena cava sup.: port femorale oppure FICC cuffiato opp. tunnellizzato con SAS

Adulto- Elezione

Uso intraospedaliero

Sufficiente accesso periferico

- **< 48 ore**
  - Non-DIVA → cannula periferica corta 'standard'
  - DIVA → accesso periferico ecoguidato (mini-midline)
- **2-7 giorni**
  - Non-DIVA → cannula periferica corta a lunga permanenza
  - DIVA → accesso periferico ecoguidato (mini-midline)
- **>7 giorni**
  - accesso periferico ecoguidato (mini-midline)

Necessità accesso centrale

- Vene braccio disponibili (zona verde) → PICC non tunnellizzato
- Vene braccio disponibili (zona gialla) → PICC tunnellizzato
- Vene braccio indisponibili
  - Vena ascellare agibile → CICC sottoclaveare
  - Vena ascellare inagibile → CICC sopraclaveare, tunnellizzato o no
- Ostruzione vena cava superiore → FICC tunnellizzato

DIVA

Academic Emergency Medicine
Official Journal of the Society for Academic Emergency Medicine

ORIGINAL RESEARCH CONTRIBUTION

Validation and Refinement of the Difficult Intravenous Access Score: A Clinical Prediction Rule for Identifying Children With Difficult Intravenous Access

Michael W. Riker, MD, Chris Kennedy, MD, Brad S. Winfrey, RN, Kenneth Yen, MD, MS, and M. Denise Dowd, MD, MPH

Predictor Variable	Scores		
Visibility	Visible = 0		Not visible = 2
Palpability	Palpable = 0		Not palpable = 2
Age	≥36 months = 0	12–35 months = 1	< 12 months = 3
Prematurity	Not premature = 0		Premature = 3
Skin shade	Light = 0	Dark = 1	

Academic Emergency Medicine
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ORIGINAL RESEARCH CONTRIBUTION

Validation and Refinement of the Difficult Intravenous Access Score: A Clinical Prediction Rule for Identifying Children With Difficult Intravenous Access

Michael W. Riker, MD, Chris Kennedy, MD, Brad S. Winfrey, RN, Kenneth Yen, MD, MS, and M. Denise Dowd, MD, MPH

Model	% Correctly Identified as IV Failure (*n*)/118	% Incorrectly Identified as IV Failure (*n*)/248
DIVA 4 (Yen)	61.0 (72)	27.8 (69)
DIVA 5 (Yen)	66.1 (78)	36.7 (91)
DIVA 4 (Riker)	62.7 (74)	28.2 (70)
DIVA 3 (Riker)	56.8 (67)	22.2 (55)

*Using scoring system in Table 1, with score ≥ 4 as cutoff value for predicting failure.

Original research article

JVA The Journal of Vascular Access

EA-DIVA score (Enhanced Adult DIVA score): A new scale to predict difficult preoperative venous cannulation in adult surgical patients

The Journal of Vascular Access
1–9

DOI: 10.1177/1129729818804994
journals.sagepub.com/home/jva
SAGE

Giuseppe Civetta[1], Sergio Cortesi[1,2], Mattia Mancardi[1,2], Antonella De Pirro[1,2], Marta Vischio[1,2], Marco Mazzocchi[1,2], Luigia Scudeller[3], Andrea Bottazzi[1], Giorgio A Iotti[1,2] and Alessandra Palo[1,4]

Table 3. Operative EA-DIVA score.

EA-DIVA	SCORE
Past history of difficult peripheral venous cannulation	
Present = 3	
Absent = 0	
Vascular depletion	
Previous use of chemotherapeutic agents or intravenous drug abuse, previous venipunctures = 2	
Absent = 0	
Coagulative disorder and/or intake of anticoagulant or antiplatelet drugs	
Present = 1	
Absent = 0	
Neurovascular disease	
Peripheral neuropathy and/or vasculopathy = 1	
Absent = 0	
Clinical examination of skin	
Dark, thick, or fragile skin = 1	
Absent = 0	
Overweight (BMI > 25)	
Present = 1	
Absent = 0	
Vein evaluation	
Not visible, not palpable, rolling, or winding vein = 2	
Absent = 0	
One-side only availability	
One side = 1	
Two sides = 0	
Total	
Sum all scores	
IF TOTAL > 8, PLEASE USE ADVANCED TECHNIQUES OR REFER TO SPECIALISTIC EVALUATION	

Tecniche di visualizzazione

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Infusion Therapy Standards of Practice

22. VASCULAR VISUALIZATION

Standard

22.1 To ensure patient safety, the clinician is competent in the use of vascular visualization technology for vascular access device (VAD) insertion. This knowledge includes, but is not limited to, appropriate vessels, size, depth, location, and potential complications.

22.2 Vascular visualization technology is used in patients with difficult venous access and/or after failed venipuncture attempts.

22.3 Vascular visualization technology is employed to increase the success with peripheral cannulation and decrease the need for central vascular access device (CVAD) insertion, when other factors do not require a CVAD.

ULTRASOUND

- ✧ Vene con profondità > 7-8 mm
- ✧ **Vasi venosi centrali o inguinali**
- ✧ **CICC – PICC – FICC – Midline - Minimidline**

Intensive Care Med
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
Susan T. Verghese

International evidence-based recommendations on ultrasound-guided vascular access

NIR TECHNOLOGY

- ✧ Vene superficiali con profondità < 7 mm
- ✧ **Agocannule oppure Cateteri Epicutaneo-Cavali**

British Journal of Anaesthesia **110** (6): 888–91 (2013)
doi:10.1093/bja/aet078

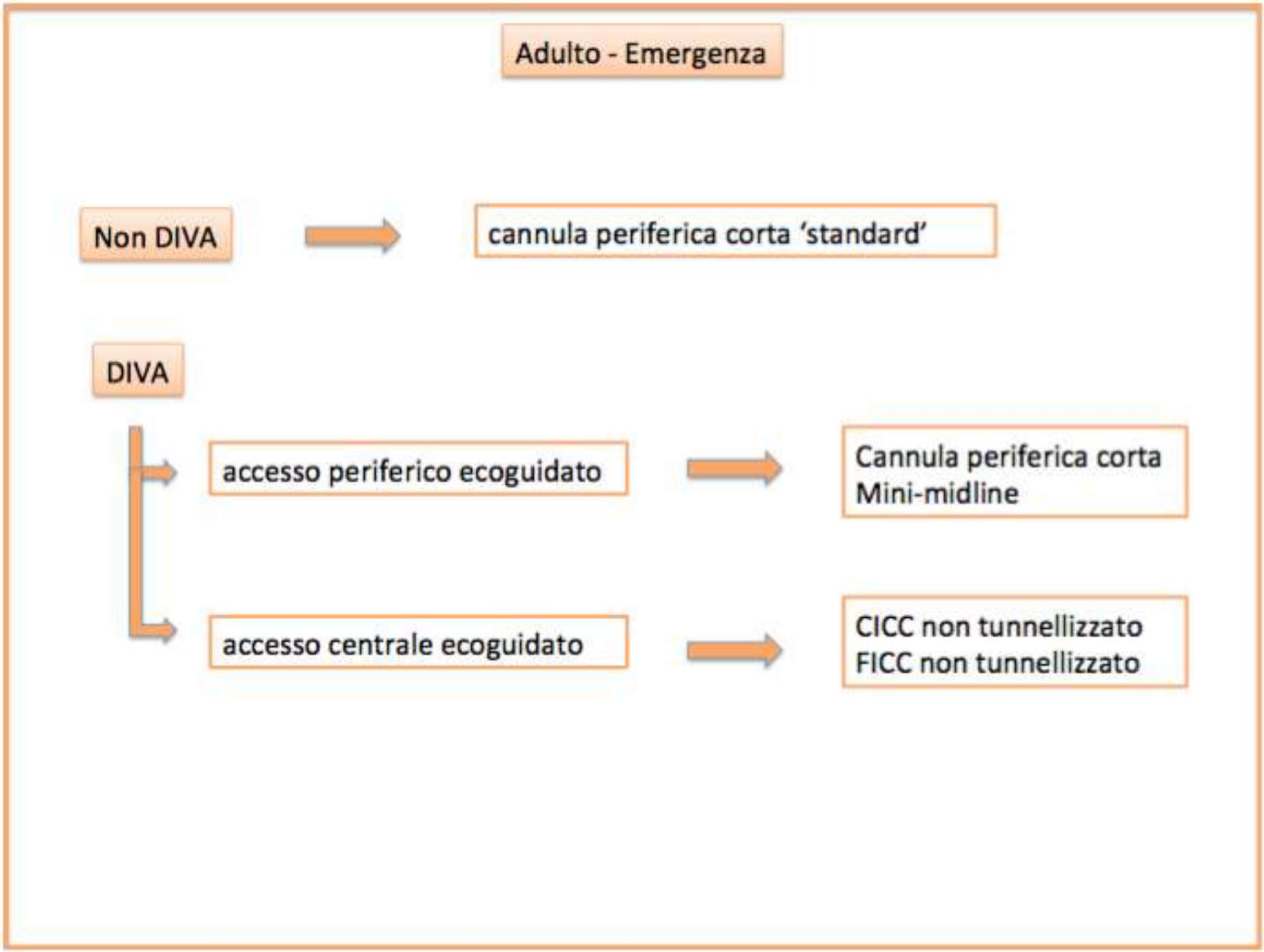
EDITORIAL II

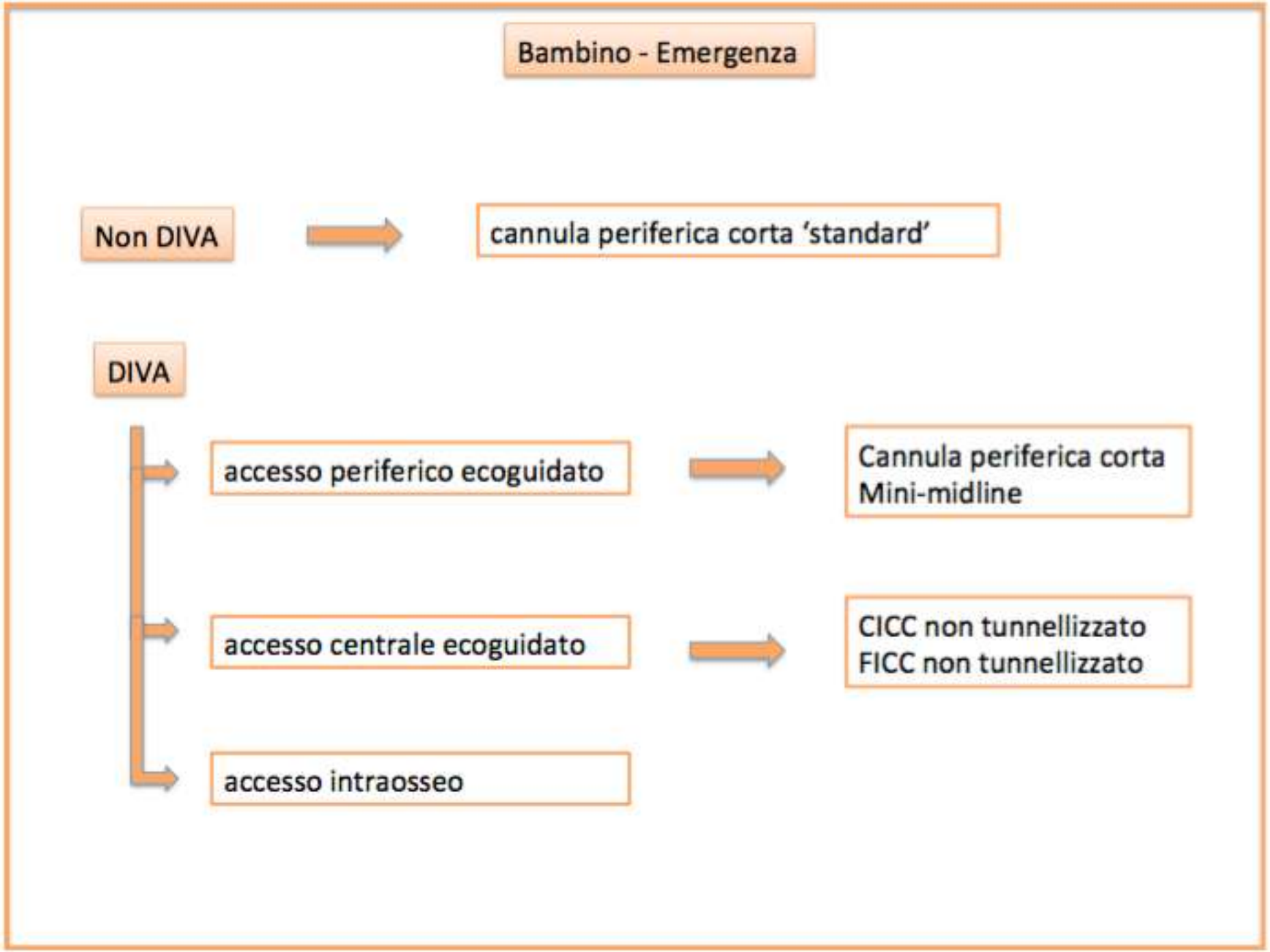
Difficult peripheral veins: turn on the lights

M. Lamperti[1*] and M. Pittiruti[2]

[1] Department of Neuroanaesthesia, National Neurological Institute Besta, Via Celoria, 11, 20136 Milan, Italy
[2] Department of Surgery, Catholic University, Rome, Italy

* Corresponding author. E-mail: doclampmd@gmail.com


Adulto - 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


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

Bambino- Elezione

Uso intraospedaliero

Sufficiente accesso periferico

- < 48 ore
  - Non-DIVA → cannula periferica corta 'standard'
  - DIVA → accesso periferico ecoguidato (mini-midline)
- 2-7 giorni
  - Non-DIVA → cannula periferica corta a lunga permanenza
  - DIVA → accesso periferico ecoguidato (mini-midline)
- >7 giorni
  - accesso periferico ecoguidato (mini-midline)

Necessità accesso centrale

- Vene braccio disponibili (zona verde) → PICC non tunnellizzato
- Vene braccio disponibili (zona gialla) → PICC tunnellizzato
- Vene braccio indisponibili → CICC tunnellizzato o no

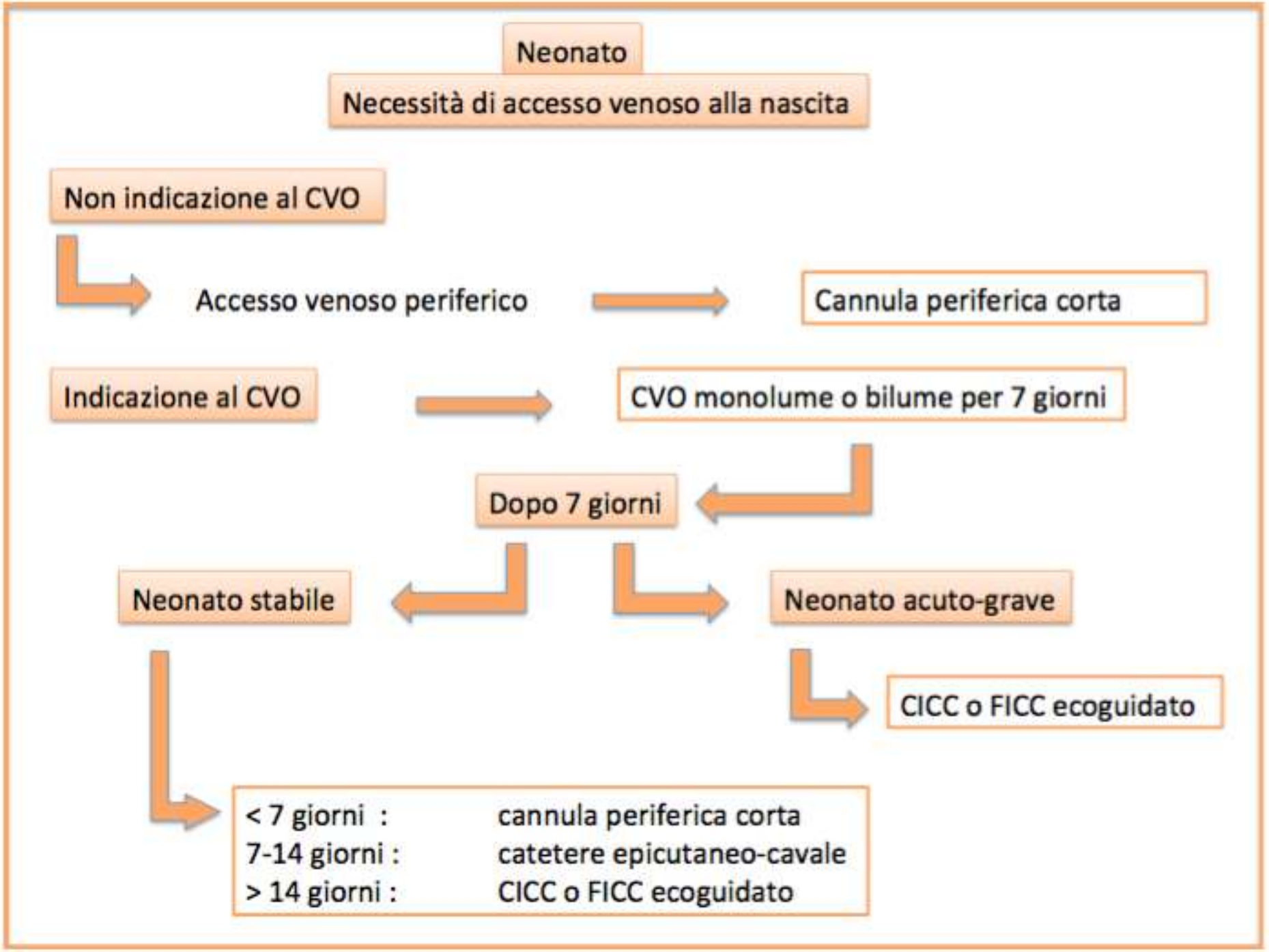
Bambino - Elezione
Uso extraospedaliero

<4-6 mesi

- Sufficiente accesso periferico → mini-midline opp. midline
- Necessità accesso centrale
  - Vene braccio disponibili : PICC non cuffiato, tunnellizzato o no
    Vene braccio indisponibili: CICC non cuffiato, tunnellizzato

>4-6 mesi

- CVC tunnellizzato con SAS (PICC, CICC o FICC)
- CVC tunnellizzato cuffiato (PICC, CICC o FICC)
- Port toracico o brachiale


Neonato
Necessità di accesso venoso alla nascita
Non indicazione al CVO
Accesso venoso periferico
Cannula periferica corta
Indicazione al CVO
CVO monolume o bilume per 7 giorni
Dopo 7 giorni
Neonato stabile
Neonato acuto-grave
CICC o FICC ecoguidato
< 7 giorni : cannula periferica corta
7-14 giorni : catetere epicutaneo-cavale
> 14 giorni : CICC o FICC ecoguidato

Neonato

Necessità di accesso venoso dopo la nascita (> 24h)

Neonato stabile a termine

→

< 7 giorni : cannula periferica corta
> 7 giorni : catetere epicutaneo-cavale

Neonato stabile prematuro

→

< 7 giorni : cannula periferica corta
7-14 giorni : catetere epicutaneo-cavale
> 14 giorni : CICC o FICC ecoguidato

Neonato acuto-grave

→

CICC o FICC ecoguidato

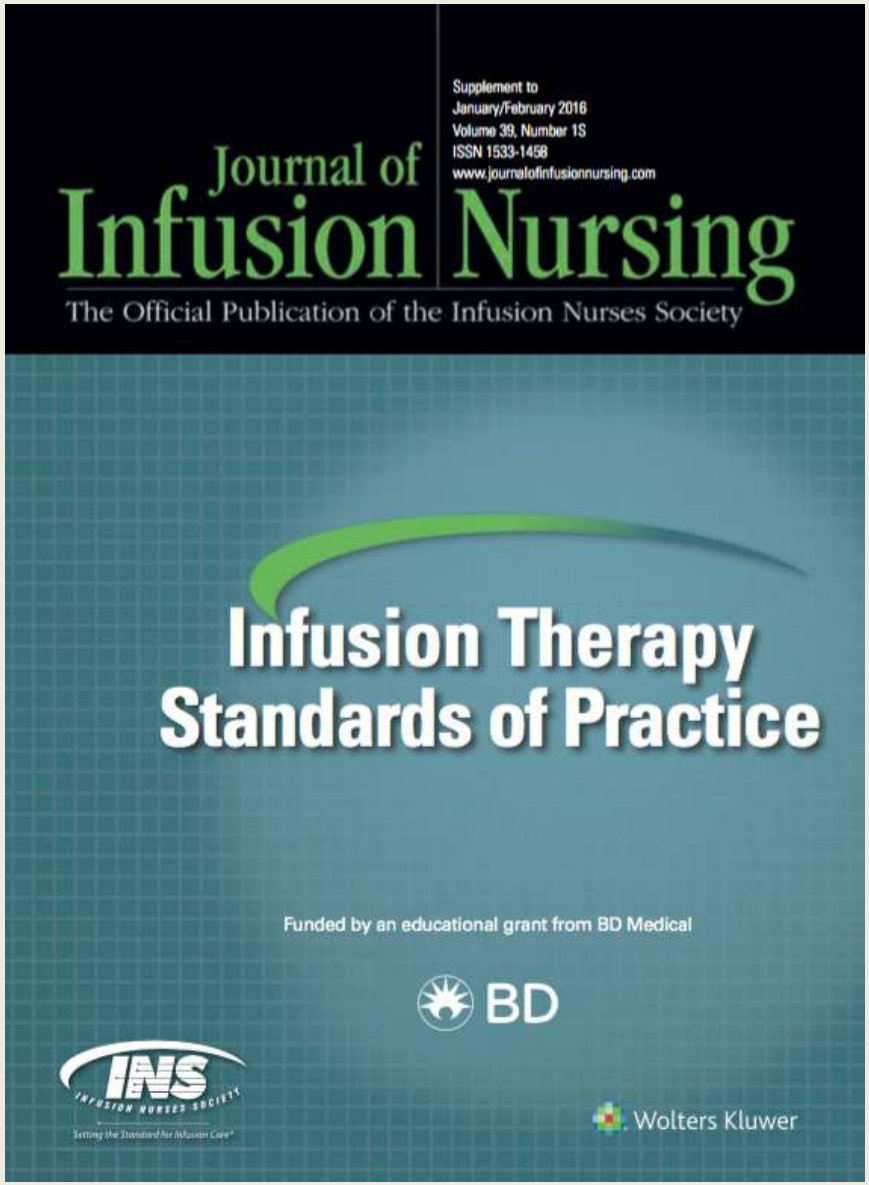
Vantaggi delle agocannule

Basso rischio di CRBSI (0.5 infez./1000 gg catetere)

Basso costo

Però:

- A volte non posizionabili se il patrimonio venoso superficiale degli arti superiori è esaurito (DIVA)
- Durata limitata (giorni)
- Impegno infermieristico elevato, legato alla sorveglianza e alla necessità di ripetuti riposizionamenti
- Non indicate per il paziente non ospedalizzato



INS 2016

INS – 44.B

Rimuovere i cateteri venosi periferici, sia nei pazienti pediatrici che adulti, solo se clinicamente indicato, sulla base della valutazione del sito di emergenza e/o in presenza di segni o sintomi di complicanze.

Due tipi di cannule periferiche corte

	Agocannule semplici	Agocannule con aletta e prolunga
Materiale	Teflon o poliuretano	Poliuretano
Luogo di utilizzo	Pronto soccorso, sala operatoria, radiologia	Reparto di cura
Protezione	Medicazione trasparente	Medicazione trasparente
Stabilizzazione	Medicazione trasparente (preferibilmente bordata)	Sutureless device (separato oppure integrato nella medicazione trasp.)
Durata prevista	24-48h	Fino a 7gg
Utilizzo	Accesso venoso in urgenza	Terapie endovenose protratte (<7gg) compatibili con via periferica

Oltre alle agocannule (<6cm)

Mini-midline (cannule periferiche lunghe) 6-15 cm

Midline ('midclavicular')

15-25 cm

Vantaggi dei Midline

Basso rischio di CRBSI (0.2 infez./1000 gg catetere), come le agocannule

Però:

- Posizionabili con ecoguida anche in pazienti con patrimonio venoso superficiale esaurito (DIVA)
- Durata protratta (settimane o mesi): rimozione solo in caso di complicanza o di fine uso
- Risparmio tempo infermieristico
- Il paziente può essere dimesso con il Midline
- Basso rischio di complicanze meccaniche
- Basso rischio di complicanze trombotiche (se ben usati)
- Inserzione mediante tecnica di Seldinger modificata

Un nuovo VAD periferico: i 'mini-midline'

Cannule periferiche lunghe (mini-midline)

- 6-15 cm di lunghezza
- Inserite per via ecoguidata in vene dell'arto superiore
- Tecnica di Seldinger 'semplice'
- VAD specifici (Leaderflex, Leadercath, The Wand, Flexicath, Endurance, PowerGlide, etc.: alcuni non sono ancora in commercio in Europa) oppure utilizzo 'off label' di VAD già in commercio
- Costo intermedio tra agocannule e Midline
- Posizionamento più semplice e più rapido rispetto ai Midline (utili in emergenza/urgenza)
- Durata fino ad un max. di 3-4 settimane

pexels

Indicazioni dei mini-midline

Emergenza

DIVA

Elezione

DIVA

Accesso periferico previsto > 1 settimana

	Agocannule semplici	Agocannule con prolunga	Cannule lunghe	Midline
lunghezza	2-6 cm	2-6 cm	6-15 cm	>15cm
Materiale	Teflon/PUR	PUR	PUR	Silicone/PUR
Inserzione	a vista	A vista	anche ecoguida	anche ecoguida
Tecnica	dire9 a	dire9 a	Seldinger semplice	Seldinger modif.
Posiz.in urgenza	Si	Si	Si	No
Durata	24-48h	Fino a 7gg	1-3 sex mane	mesi
Power injectable	SI (per 14-20G)	SI (per 14-22G)	Si	Non sempre
Uso extra-osped.	No	No	Per brevi periodi	SI

Scelta dell'accesso venoso: EBM

Se indicato un dispositivo per accesso venoso centrale, scegliere con attenzione il sito di emergenza!

Nuova terminologia (WoCoVA)

CVC = cateteri venosi centrali (punta in VCS, VCI, atrio destro)

CICC – centrally inserted central catheters

Puntura e incannulamento di vene della regione cervico-toracica

(anonima, succlavia, ascellare, giug.int., giug.est., cefalica)

PICC – peripherally inserted central catheters

Puntura e incannulamento di vene del braccio

(basilica, brachiale, cefalica, ascellare)

FICC – femorally inserted central catheters

Puntura e incannulamento di vene della regione inguinale

(femorale com., femorale supf., safena)

Vantaggi dei PICC

Inserzione priva di rischi significativi, fattibile anche in pazienti 'fragili' dal punto di vista cardiorespiratorio e/o con gravi problemi coagulativi e/o con trachestomia o altre alterazioni del collo e del torace

Inserzione a basso costo poiché (a) infermieristica; (b)'bedside'

Bassa incidenza di CRBSI (0-1 infezioni/1000 gg catetere), anche in pazienti immunodepressi o a rischio infettivo

Migliore nursing dell'exit site

Maggior gradimento da parte del paziente

Il paziente può essere dimesso con il PICC

PICC = basso rischio di CRBSI

Possibili spiegazioni:

- Lontananza da secrezioni nasali/orali/tracheali
- Bassa contaminazione della cute del braccio
- Caratteristiche fisiche della cute del braccio
- Medicazione stabile e pulita

Dati della letteratura:

- Senza ECO
  - 1 – 2 /1000 gg (Meta-analisi Maki 2006)
  - 0.8 /1000 gg (Moreau 2007)
  - 1.07 /1000 gg (Garnacho 2009, in ICU; vs. 3.83 nei CVC)
- Con ECO
  - 0.4 /1000 gg (Studio prospettico UCSC 2006: paz in NP)
  - 0.3 /1000 gg (Scoppettuolo, UCSC 2010: rep mal infettive)
  - 0 /1000 gg (Harnage, 2006: 'bundle' specifico)
  - 0 /1000 gg (Cotogni, 2011: oncologici in NPD)
  - Picco CRBSI a 20-22 gg (vs. 10-12 gg nei CVC)

Accesso centrale intraosp.

Scelta tra CICC e PICC

No PICC se…

In caso di controindicazioni locali **bilaterali** al posizionamento di un accesso brachiale (fratture, ustioni, paresi croniche, svuotamento linfonodi ascellari, etc.)

Pazienti in dialisi o candidati a dialisi (fistola AV…!)

In emergenza o in sala operatoria o in terapia intensiva, quando occorre un accesso centrale ad inserzione rapida, per rapida replezione volemica o quando di prevede necessità di lumi multipli (> 3)

Quando è indicato l'accesso femorale (sindromi mediastiniche)

In bambini con vene del braccio < 3 mm

Appropriatezza: punto fondamentale

Sicurezza del Paziente

Protocollo ISALT e ISALT 2

Protocollo ISAC

Protocollo ISP

PIDAV

GAVeCeLT
Gli Accessi Venosi Centrali a Lungo Termine

Dal 2004…

Nell'ordine:

1. la SICUREZZA del paziente
2. la EFFICACIA clinica
3. la EFFICIENZA aziendale

Protocollo ISALT e ISALT 2

Protocollo ISAC

Protocollo ISP

PIDAV

GAVeCeLT
Gli Accessi Venosi Centrali a Lungo Termine

Dal 2004…

AHRQ Recommendations

2001

2013

Annals of Internal Medicine | SUPPLEMENT

The Top Patient Safety Strategies That Can Be Encouraged for Adoption Now

Paul G. Shekelle, MD, PhD; Peter J. Pronovost, MD, PhD; Robert M. Wachter, MD; Kathryn M. McDonald, MM; Karen Schoelles, MD, SM; Sydney M. Dy, MD, MSc; Kaveh Shojania, MD; James T. Reston, PhD, MPH; Alyce S. Adams, PhD; Peter B. Angood, MD; David W. Bates, MD, MSc; Leonard Bickman, PhD; Pascale Carayon, PhD; Sir Liam Donaldson, MBChB, MSc, MD; Naihua Duan, PhD; Donna O. Farley, PhD, MPH; Trisha Greenhalgh, BM BCH; John L. Haughom, MD; Eileen Lake, PhD, RN; Richard Lilford, PhD; Kathleen N. Lohr, PhD, MA, MPhil; Gregg S. Meyer, MD, MSc; Marlene R. Miller, MD, MSc; Duncan V. Neuhauser, PhD, MBA, MHA; Gery Ryan, PhD; Sanjay Saint, MD, MPH; Stephen M. Shortell, PhD, MPH, MBA; David P. Stevens, MD; and Kieran Walshe, PhD

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

Encouraged

- Multicomponent interventions to reduce falls
- Use of clinical pharmacists to reduce adverse drug events
- Documentation of patient preferences for life-sustaining treatment
- Obtaining informed consent to improve patients' understanding of the potential risks of procedures
- Team training
- Medication reconciliation
- Practices to reduce radiation exposure from fluoroscopy and CT
- The use of surgical outcome measurements and report cards, such as those from ACS NSQIP
- Rapid-response systems
- Use of complementary methods for detecting adverse events or medical errors to monitor for patient safety problems
- Computerized provider order entry
- Use of simulation exercises in patient safety efforts

Prevenzione delle complicanze

Immediate

- Respiratorie (PNX, emotorace etc.)
- Altre complicanze meccaniche (es. ematomi, puntura arteriosa etc.)
- Malposizionamento primario

Tardive (legate all'impianto)

- Infezioni catetere-relate (CR-BSI o altre)
- Trombosi catetere-relate
- Malposizionamento secondario o dislocazione precoce

Aspetti legati all'impianto

Scelta della vena

Pianificazione dell'exit site (o della tasca)

Tip location (e tip navigation)

Materali: es. microintroduttore etc.

Targeting zero catheter-related bloodstream infections in pediatric intensive care unit: a retrospective matched case-control study

Daniele G. Biasucci[1], Mauro Pittiruti[2], Alessandra Taddei[3], Enzo Picconi[1], Alessandro Pizza[1], Davide Celentano[1], Marco Piastra[1], Giancarlo Scoppettuolo[4], Giorgio Conti[1]

JVA

Insertion and maintenance bundle

1. Hand washing and maximal barrier precautions
2. Skin antisepsis with 2% chlorhexidine
3. Ultrasound pre-puncture evaluation through RaCeVA
4. Ultrasound guided venipuncture
5. Tunneling of the catheter so to obtain an exit site in the infraclavicular area
6. Sealing of the exit site with glue
7. Securement with sutureless device
8. Coverage with transparent semipermeable dressing
9. Chlorhexidine-impregnated sponges
10. Use of neutral NFC and port protectors
11. Simulation-based standardized training program

The NEW ENGLAND JOURNAL of MEDICINE

ESTABLISHED IN 1812 DECEMBER 28, 2006 VOL. 355 NO. 26

An Intervention to Decrease Catheter-Related Bloodstream Infections in the ICU

Peter Pronovost, M.D., Ph.D., Dale Needham, M.D., Ph.D., Sean Berenholtz, M.D., David Sinopoli, M.P.H., M.B.A., Haitao Chu, M.D., Ph.D., Sara Cosgrove, M.D., Bryan Sexton, Ph.D., Robert Hyzy, M.D., Robert Welsh, M.D., Gary Roth, M.D., Joseph Bander, M.D., John Kepros, M.D., and Christine Goeschel, R.N., M.P.A.

- Hand Hygiene
- Maximal Barrier Precautions Upon Insertion
- Chlorhexidine Skin Antisepsis
- Optimal Catheter Site Selection, with Subclavian Vein as the Preferred Site for Non-Tunneled Catheters
- Daily Review of Line Necessity with Prompt Removal of Unnecessary Lines

Journal of Hospital Infection (2007) 65(S2) 3-9

Available online at www.sciencedirect.com

SCIENCE DIRECT

www.elsevierhealth.com/journals/jhin

The United States approach to strategies in the battle against healthcare-associated infections, 2006: transitioning from benchmarking to zero tolerance and clinician accountability[1]

William R. Jarvis*

No single intervention is able to prevent HAI, but is essential a "bundle" approach

- Bundle: a package of evidence based interventions, applied by multidisciplinary teams

A culture of zero tolerance is required

A culture of accountability and administrative support is strongly required

PIDAV

CORRETTA INDICAZIONE

CORRETTA ASEPSI

SCELTA CORRETTA DEL SITO DI EMERGENZA

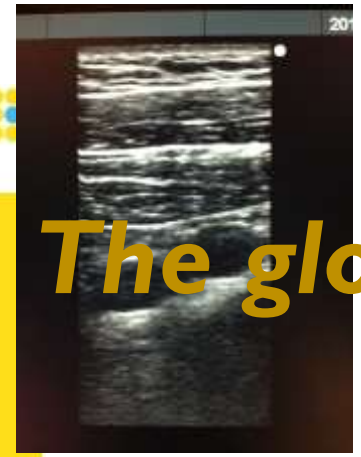
TECNICA CORRETTA DI IMPIANTO

FISSAGGIO APPROPRIATO

PROTEZIONE DEL SITO DI EMERGENZA

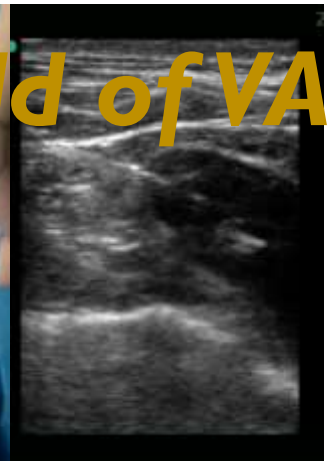
PROTEGGERE LA LINEA INFUSIONALE

FACILITARE L'ADOZIONE DEL BUNDLE

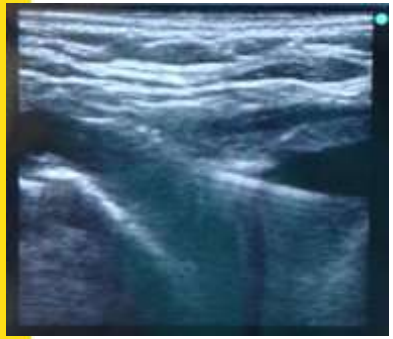


Pre-procedural US evaluation

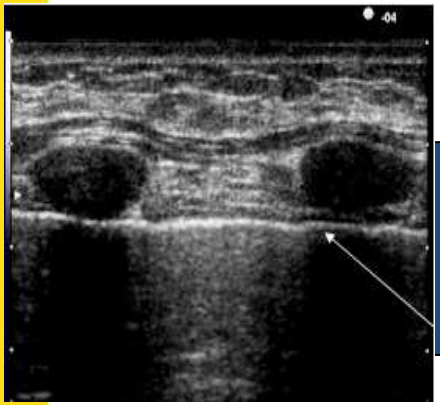
The global use of US in the field of VA



US guided puncture



Tip navigation and Tip location



Exclusion of early and late complications

D4.SD1.S9	There is no ideal site for cannulation in children; the best site should be determined after ultrasound examination	A

RaCeVA – Rapid Central Vein Assessment

Review

JVA The Journal of Vascular Access

Rapid Central Vein Assessment (RaCeVA): A systematic, standardized approach for ultrasound assessment before central venous catheterization

The Journal of Vascular Access
1–11

DOI: 10.1177/1129729818804718
journals.sagepub.com/home/jva
SAGE

Timothy R Spencer[1] and Mauro Pittiruti[2]

Table 1. The seven steps of the Rapid Central Vein Assessment (RaCeVA).

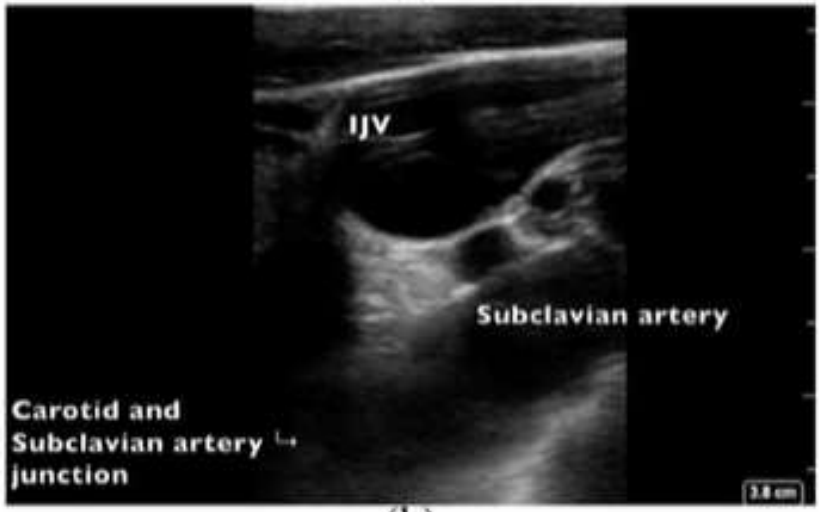
	Transducer position	Structures to be assessed	Surrounding structures
Step 1	Mid-neck (transverse)	Internal jugular vein Carotid artery	Thyroid gland Trachea
Step 2	Base of neck (transverse)	Internal jugular vein Carotid artery Subclavian artery	Trachea Phrenic and vagus nerve
Step 3	Sternoclavicular (transverse)	Internal jugular vein Brachiocephalic vein	Pleura (mediastinum) Phrenic nerve
Step 4	Supraclavicular (longitudinal)	Subclavian vein Subclavian artery External jugular vein	Pleura (lung apex)
Step 5	Infraclavicular (transverse)	Axillary vein Axillary artery Cephalic vein	Pleura Ribs
Step 6	Infraclavicular (longitudinal)	Axillary vein Axillary artery	Pleura Ribs
Step 7	Sliding lung (longitudinal)	Pleura (anterior chest wall)	Ribs

(a)

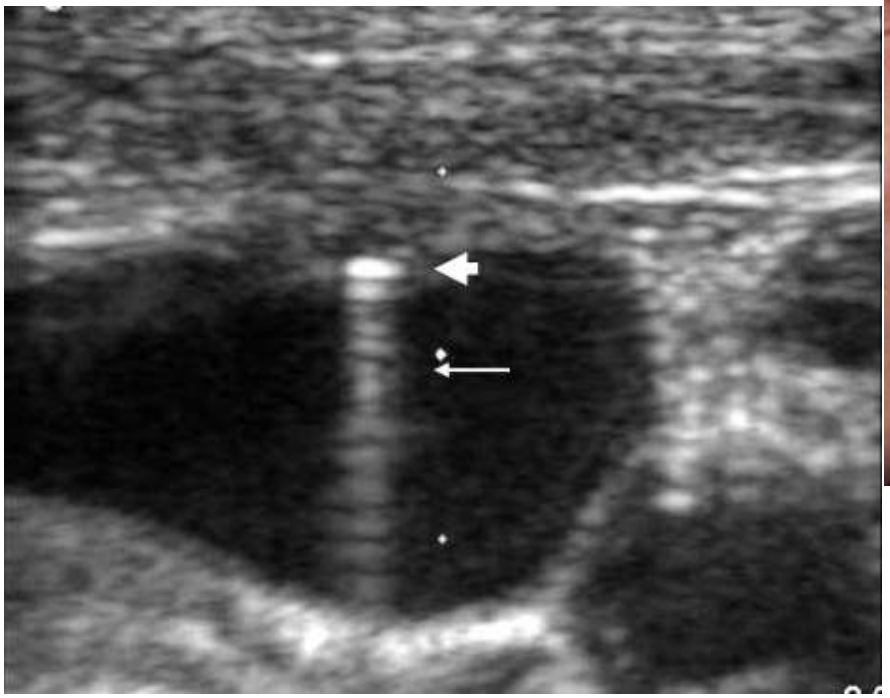

IJV
Thyroid
Gland
CA

(b)

(a)


IJV
Subclavian artery
Carotid and
Subclavian artery
junction

(b)




2003Mar29 03:29
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Calibri
Zoom
Vas
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IM
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ITT
0,0
Gen
MB
97%
216
2,6
Sblocca
Salva
Stampa
Annota
Altro
Esame
Paziente


SIEMENS


201

(a)


Subclavian Vein
Bracheocephalic Vein
Pleura and apex of lung

(b)


2003Mar14 03:18
162
Calibri
Zoom
Vas
L25
IM
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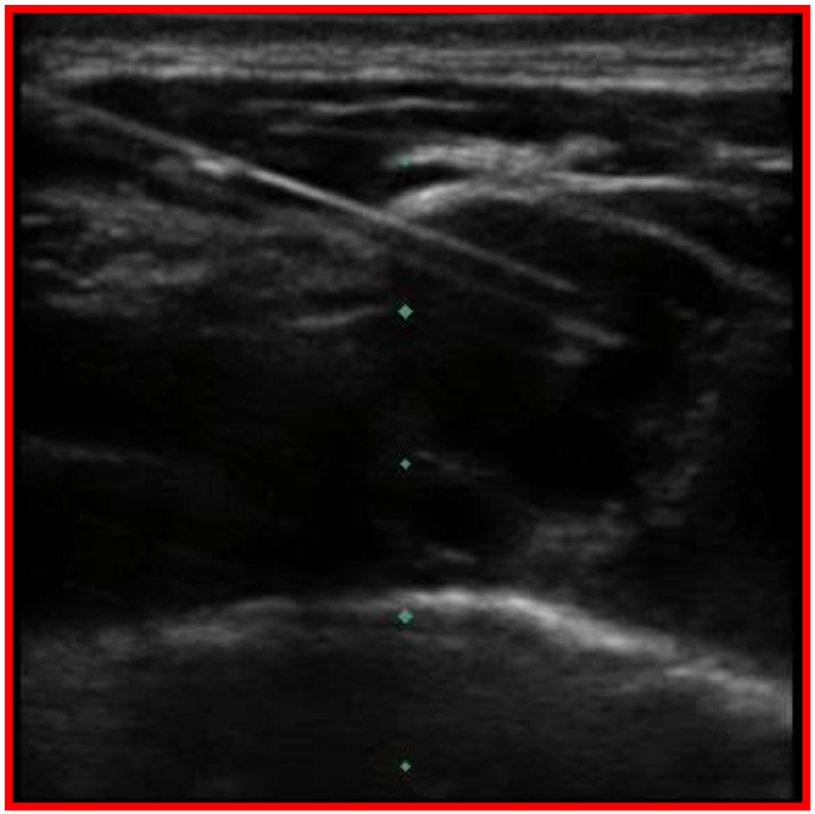
MB
98%
162
3,7
Sblocca
Salva
Stampa
Annota
Altro
Esame
Paziente



(a)


Subclavian Vein
Bracheocephalic Vein
Pleura and apex of lung

(b)


Subclavian Vein
(note valve activity)

(c)


2003Feb19 03:43
185
Calibri
Zoom
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Stampa
Annota
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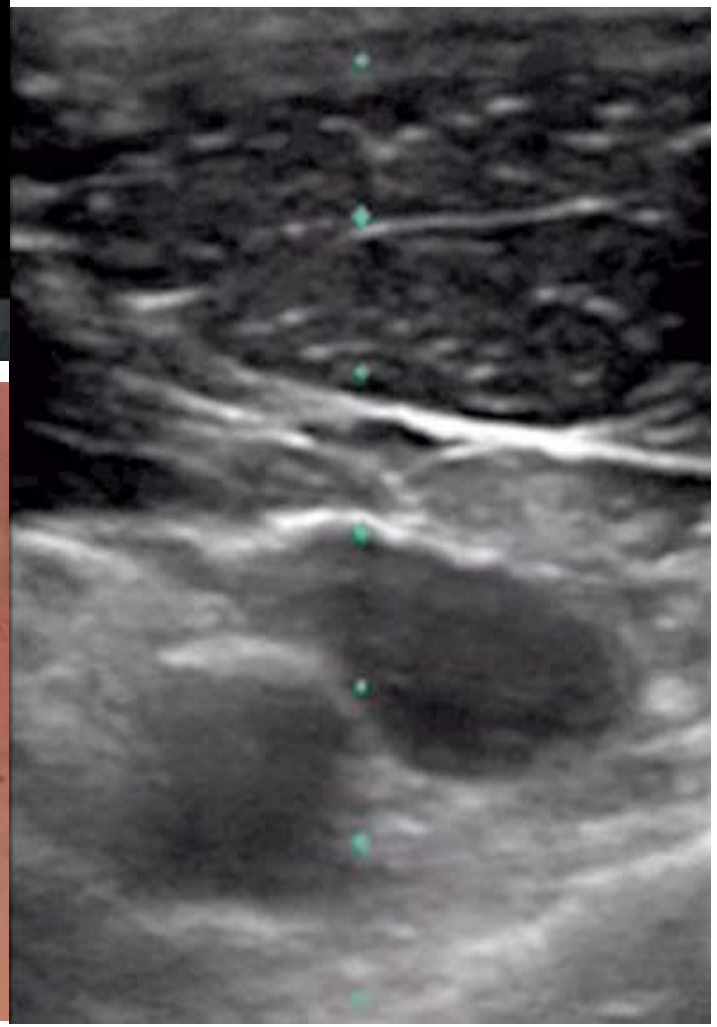
Paziente


Annota
Altro
Esame




Stampa
Annota
Opzioni
Esam

(a)

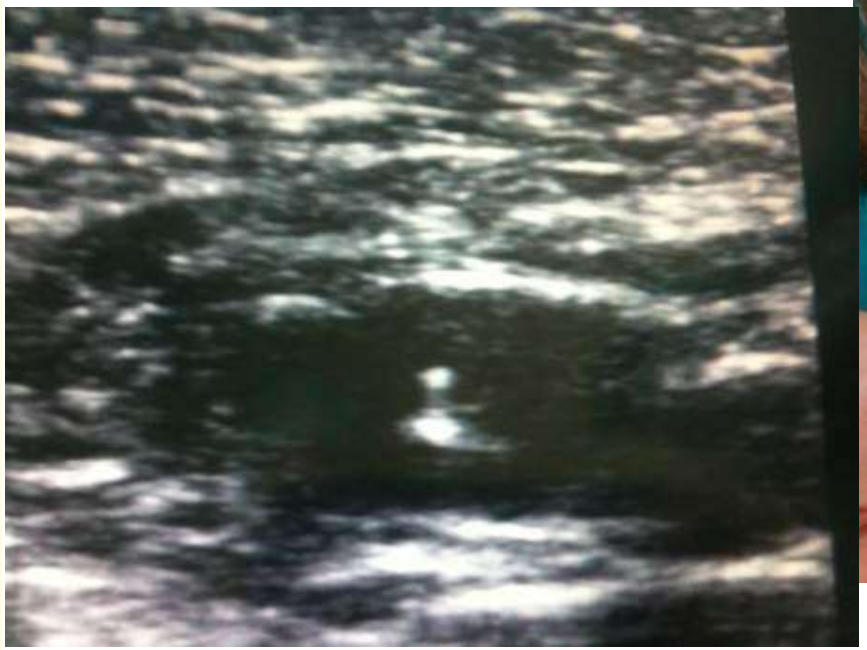

Axillary Nerve
Axillary Vein
Axillary Artery

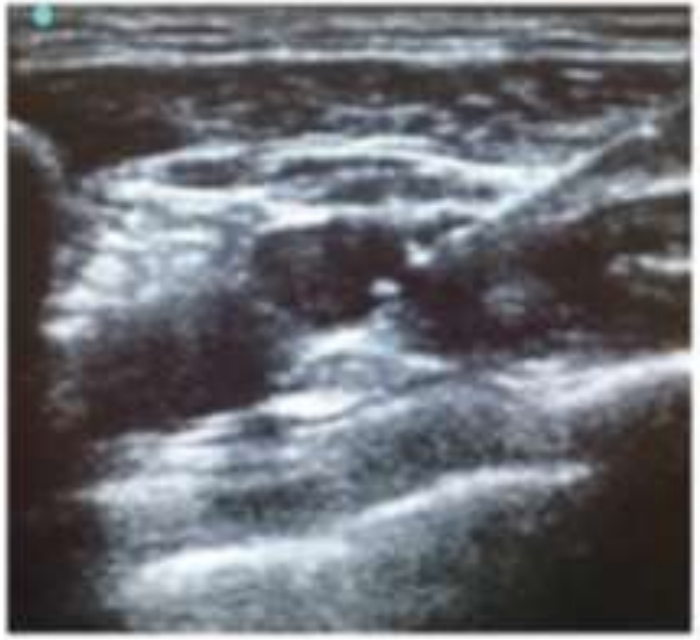
(b)

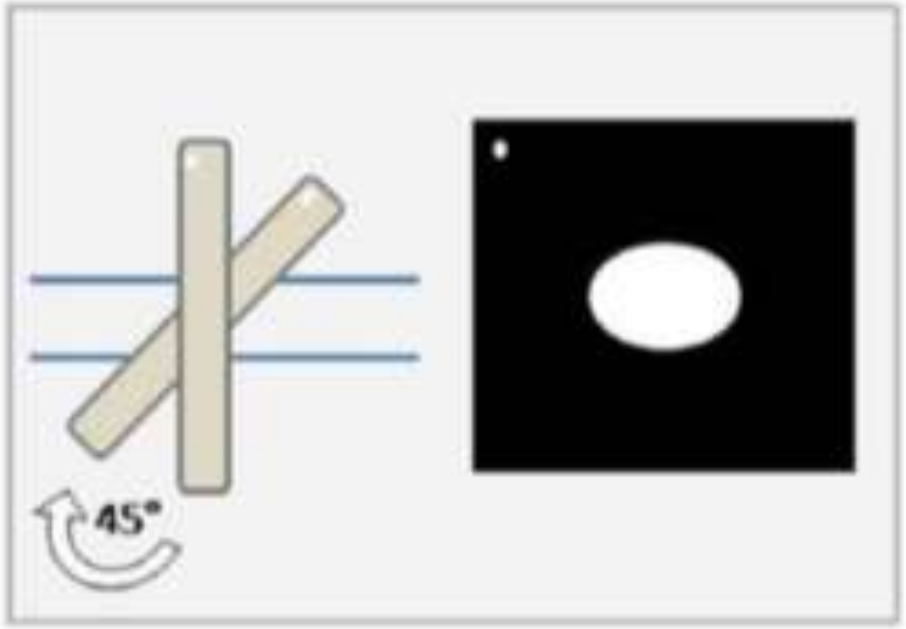
(a)


Axillary Vein

(b)






45°

Review

JVA The Journal of Vascular Access

Rapid Central Vein Assessment (RaCeVA): A systematic, standardized approach for ultrasound assessment before central venous catheterization

The Journal of Vascular Access
1–11

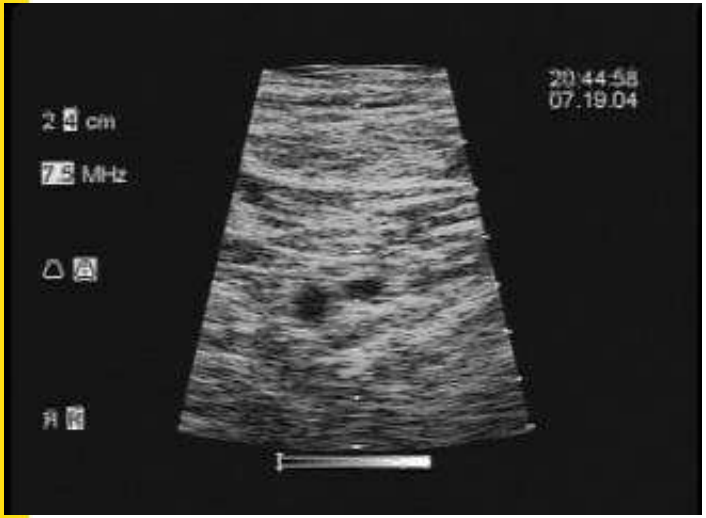
DOI: 10.1177/1129729818804718
journals.sagepub.com/home/jva
SAGE

Timothy R Spencer[1] and Mauro Pittiruti[2]

Table 2. Criteria for choosing the vein.

1. Size of the vein (internal diameter/caliber)
2. Depth of the vein (depth of target vessel from skin surface)
3. Respiratory variations (influence of respiratory cycle on vein diameter)
4. Compression by artery (influence of arterial pulsation on vein diameter)
5. Proximity to non-venous structures which must not be damaged (pleura, nerve, and artery)
6. Exit site location—convenience/appropriateness in terms for best care and maintenance

I – Size of the vein



Intensive Care Med
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
Susan T. Verghese

International evidence-based recommendations on ultrasound-guided vascular access

The internal diameter of the vein to be cannulated—as assessed by ultrasound—should be at least three times the external diameter of the catheter, so as to reduce the risk of venous thrombosis.

JVA
ISSN 1129-7298

J Vasc Access 2014; 00 (00): 000-000
DOI: 10.5301/jva.5000314

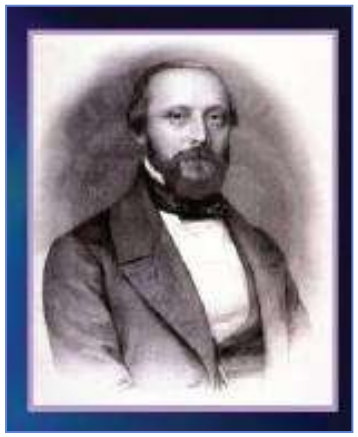
ORIGINAL ARTICLE

Central venous access devices in pediatric malignancies: a position paper of Italian Association of Pediatric Hematology and Oncology

Alessandro Crocoli[1], Assunta Tornesello[2], Mauro Pittiruti[3], Angelica Barone[4], Paola Muggeo[5], Alessandro Inserra[1], Angelo Claudio Molinari[6], Valeria Grillenzoni[7], Viviana Durante[8], Maria Pia Cicalese[9], Giulio Andrea Zanazzo[10], Simone Cesaro[7]

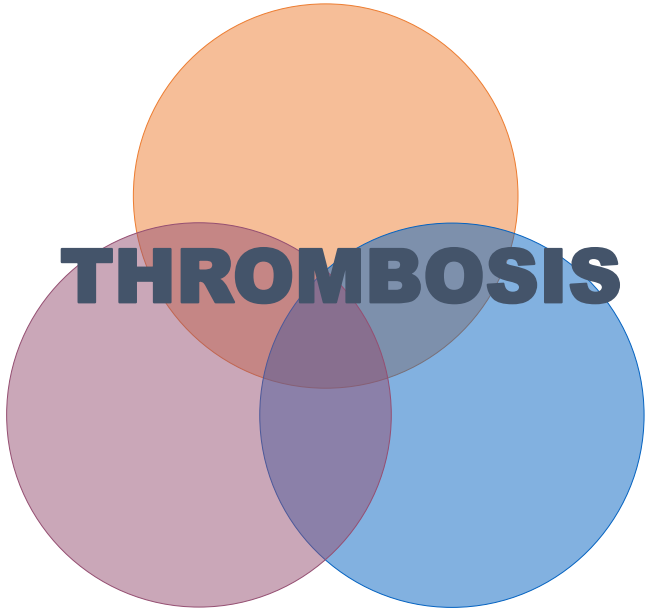
International evidence-based recommendations on ultrasound-guided vascular access

ICM 2012



Rudolph Virchow
1821 - 1902

HYPERCOAGULABILITY



VESSEL TRAUMA

VENOUS STASIS

CHEST

Original Research

CRITICAL CARE

The Effect of Catheter to Vein Ratio on Blood Flow Rates in a Simulated Model of Peripherally Inserted Central Venous Catheters

Thomas P. Nifong, MD; and Timothy J. McDevitt, PhD

Venous Catheters

Thomas P. Nifong, MD; and Timothy J. McDevitt, PhD

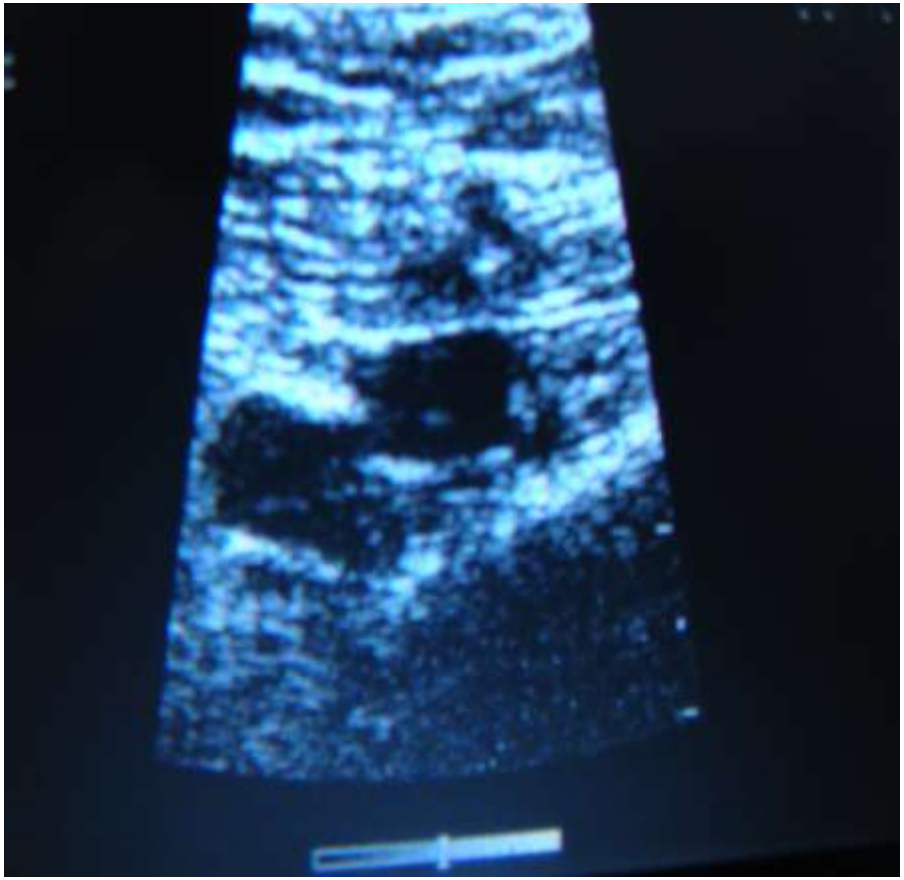
Venous stasis

Catheter size relative to vein size

Vein	Initial Flow	2 Fr		4 Fr		6 Fr		8 Fr	
Cephalic (4 mm)	10	5	48%	3	28%	1.5	14%	0.5	0.5%
Brachial (5 mm)	25	13	53%	9	36%	6	22%	3	12%
Basilic (6 mm)	52	29	56%	21	41%	15	28%	9	18%
Axillary (8 mm)	164	100	61%	79	48%	62	38%	47	28%
Subclavian (10 mm)	400	256	64%	212	53%	175	44%	143	36%

Nifong TP & McDevitt T. CHEST Published online before print February 24, 2011

2 – Depth of the vein



3 – Respiratory collapse of the vein

4 – Compression of the vein

5 – Proximity to pleura, arteries or nerves

Journal of Hospital Infection 86S1 (2014) S1-S70

Available online at www.sciencedirect.com

Journal of Hospital Infection

journal homepage: www.elsevierhealth.com/journals/jhin

epic3: National Evidence-Based Guidelines for Preventing Healthcare-Associated Infections in NHS Hospitals in England

H.P. Loveday[a]*, J.A. Wilson[a], R.J. Pratt[a], M. Golsorkhi[a], A. Tingle[a], A. Bak[a], J. Browne[a], J. Prieto[b], M. Wilcox[c]

[a] *Richard Wells Research Centre, College of Nursing, Midwifery and Healthcare, University of West London (London).*

[b] *Faculty of Health Sciences, University of Southampton (Southampton).*

[c] *Microbiology and Infection Control, Leeds Teaching Hospitals and University of Leeds (Leeds).*

Selection of catheter insertion site

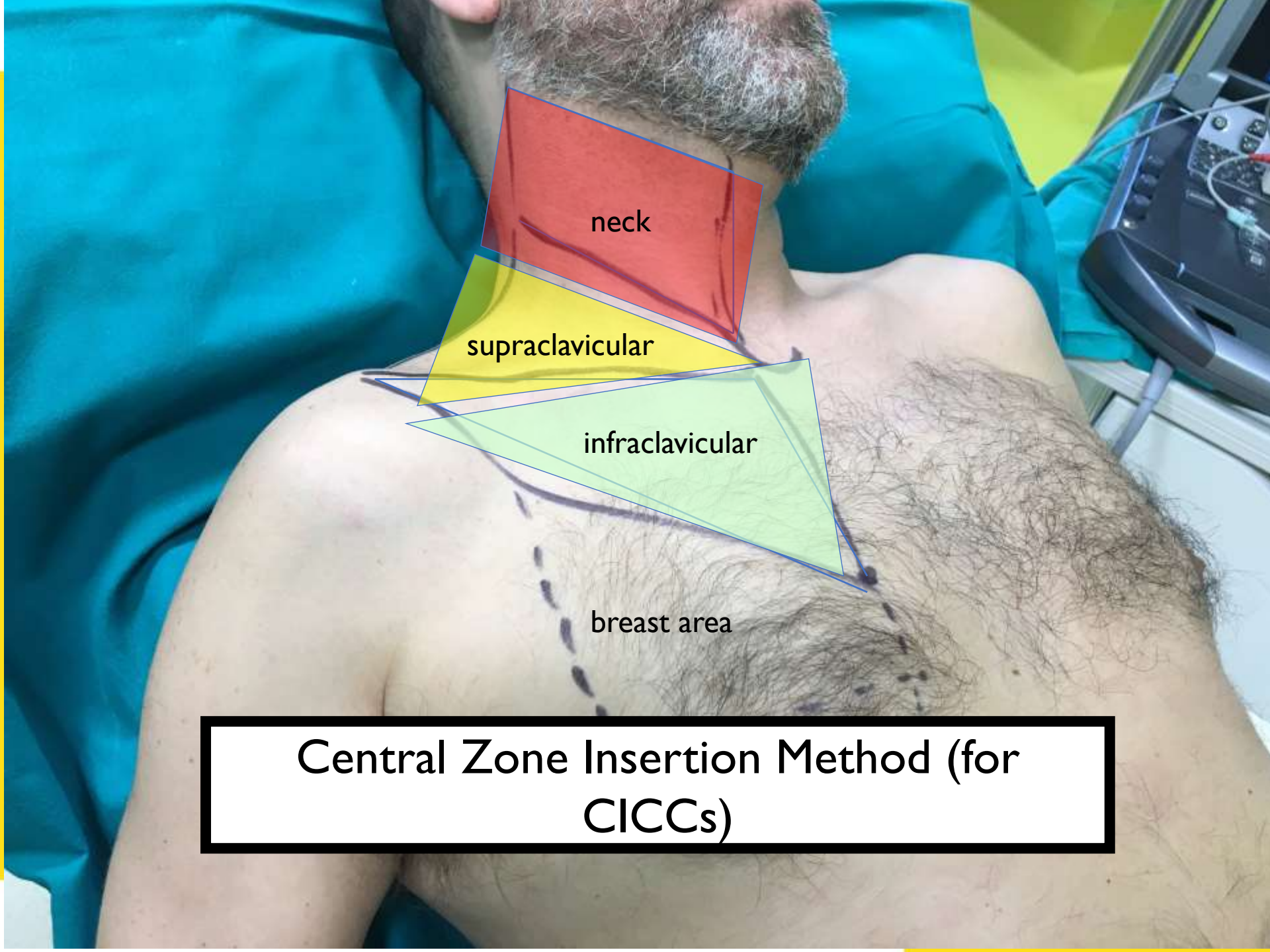
IVAD11 In selecting an appropriate intravascular insertion site, assess the risks for infection against the risks of mechanical complications and patient comfort.

Class D/GPP

IVAD12 Use the upper extremity for non-tunnelled catheter placement unless medically contraindicated.

Class C

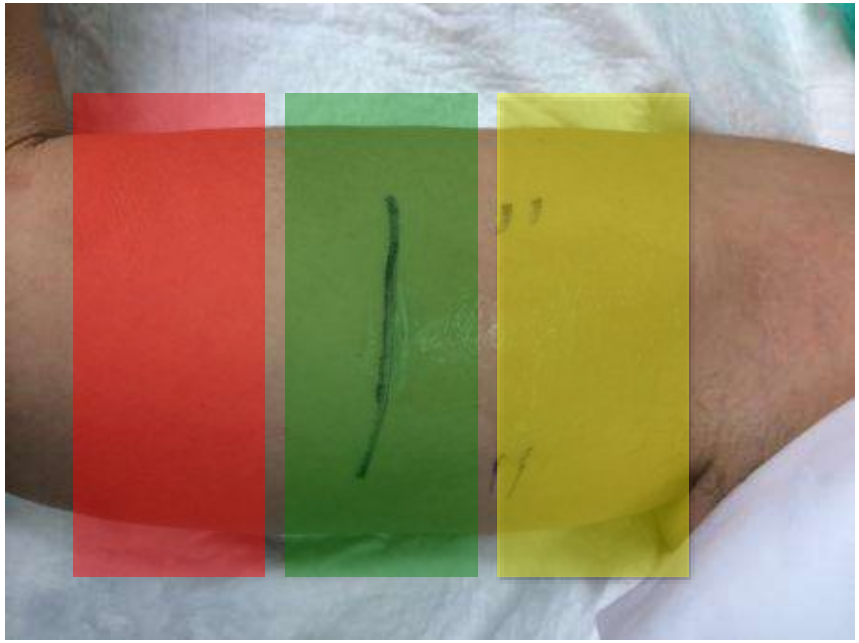
EPIC 2014



Central Zone Insertion Method (for CICCs)

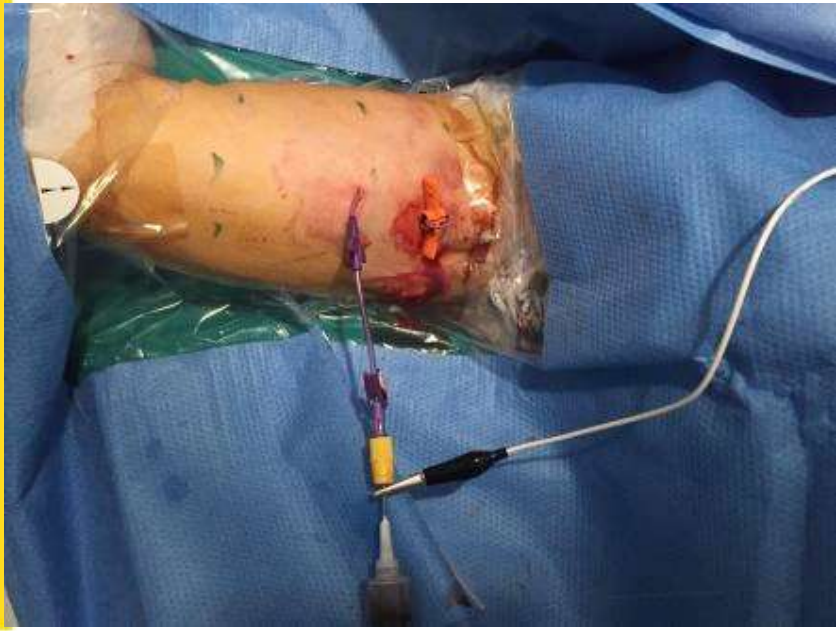
6 – Exit site location

Dawson's Zone Insertion Method



Red Zone

Green Zone

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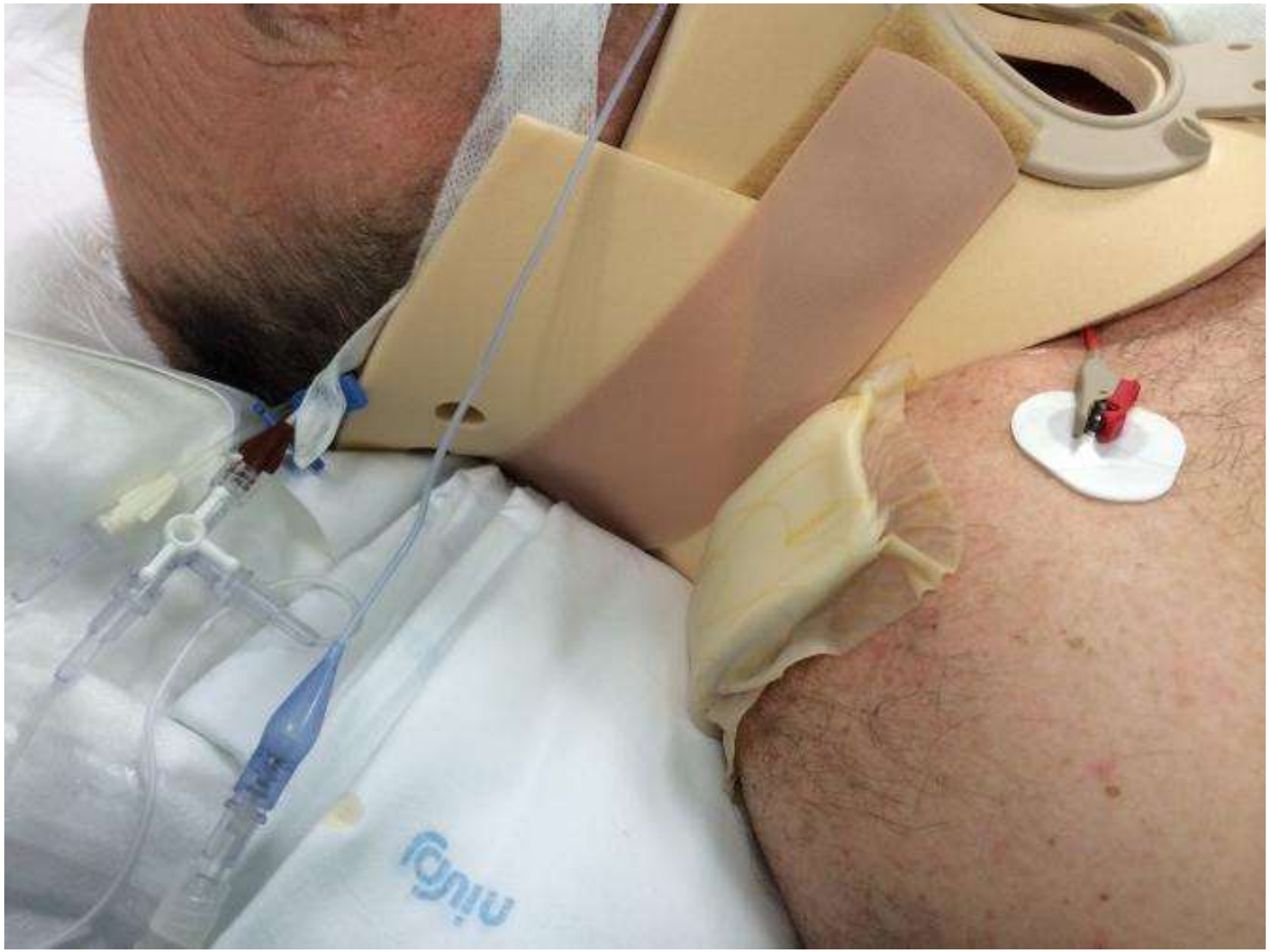
MANUALE
OFF


700


06
25


23/6



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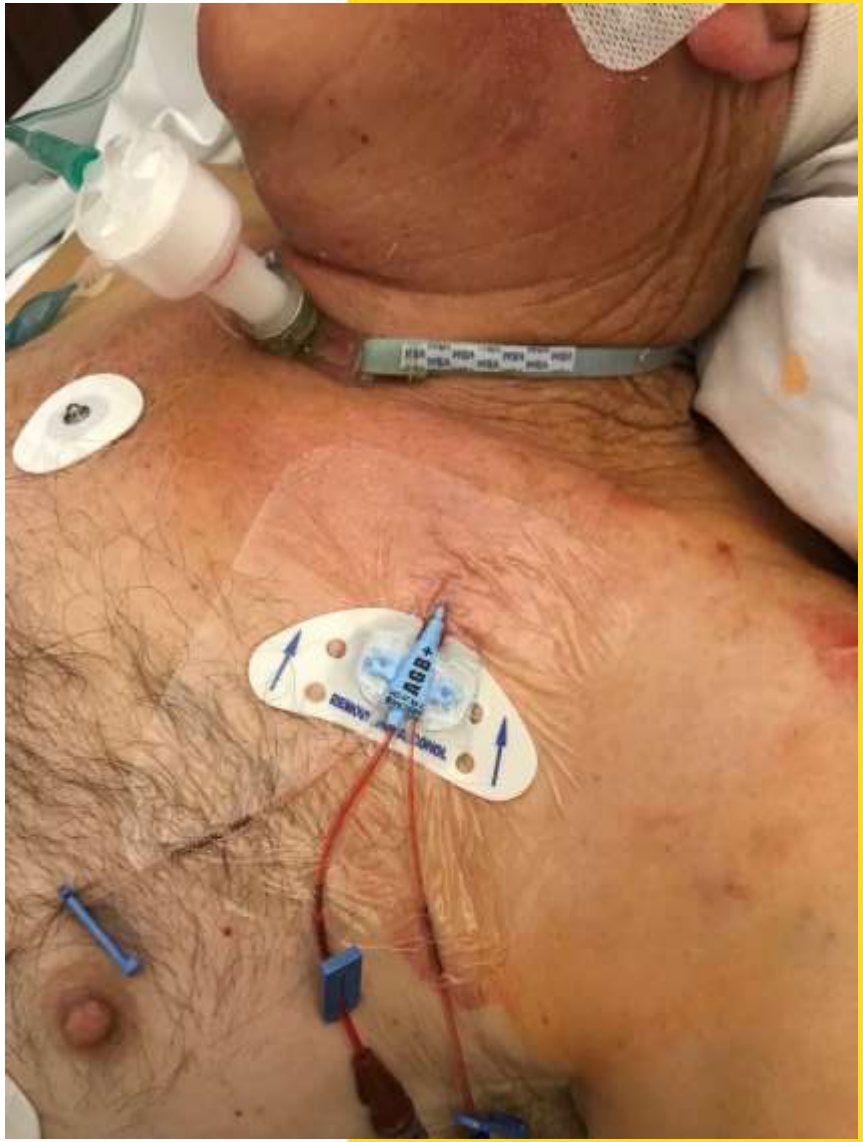
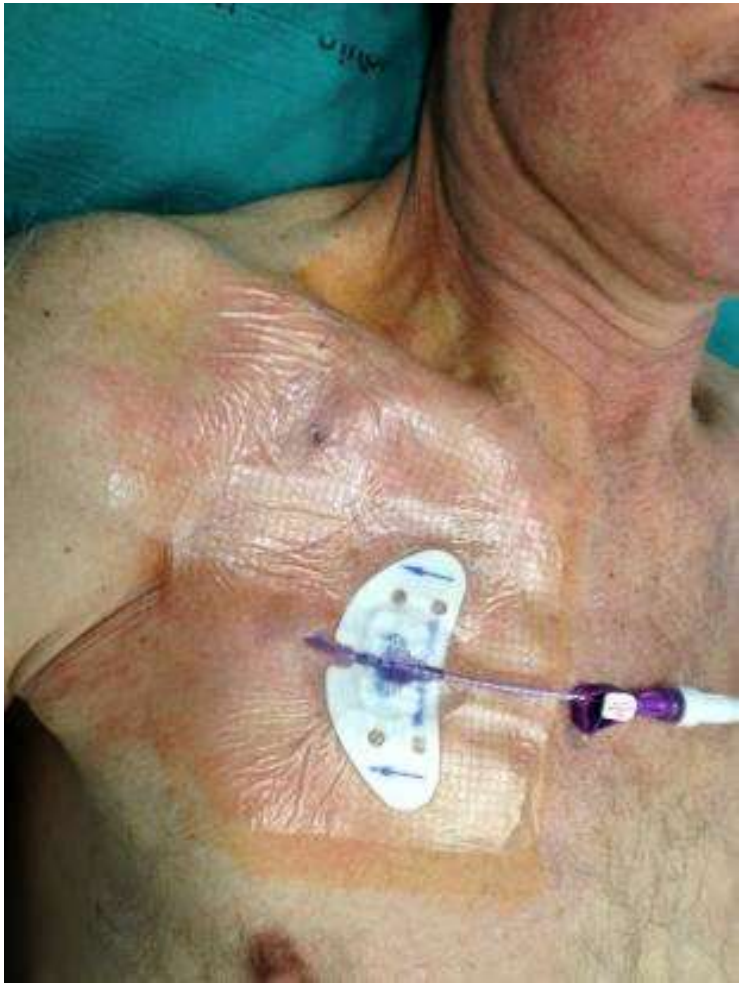
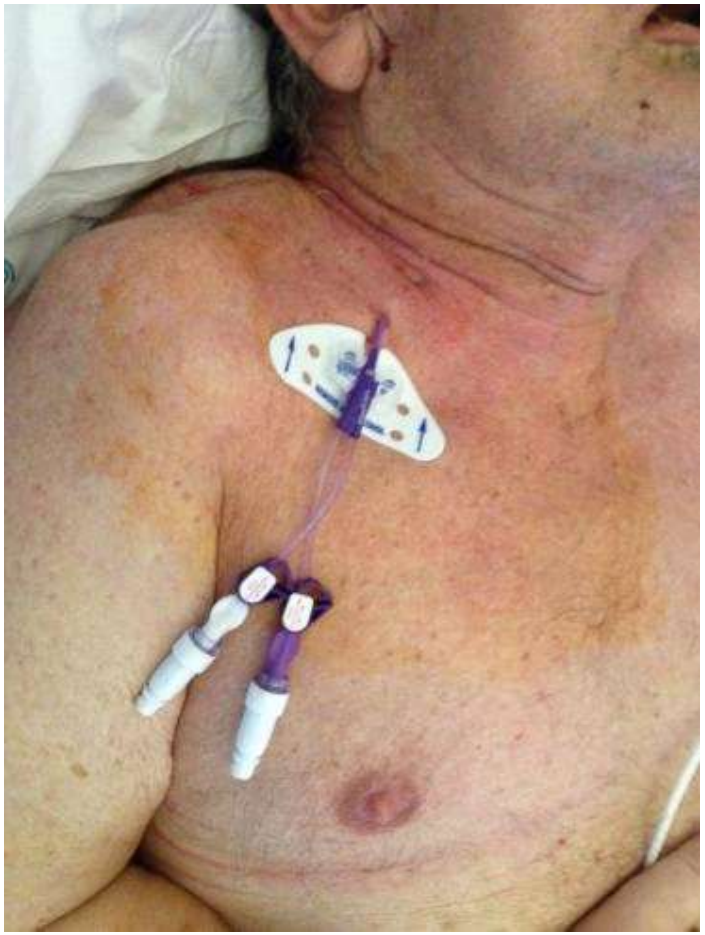
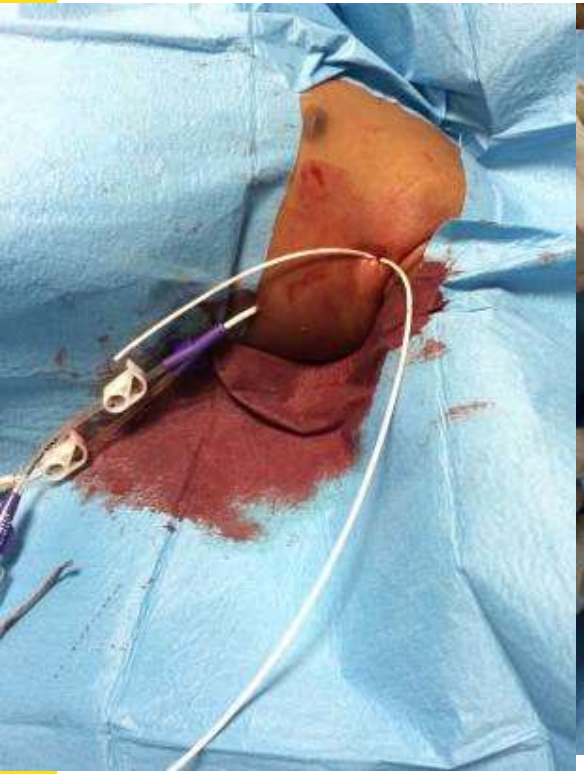


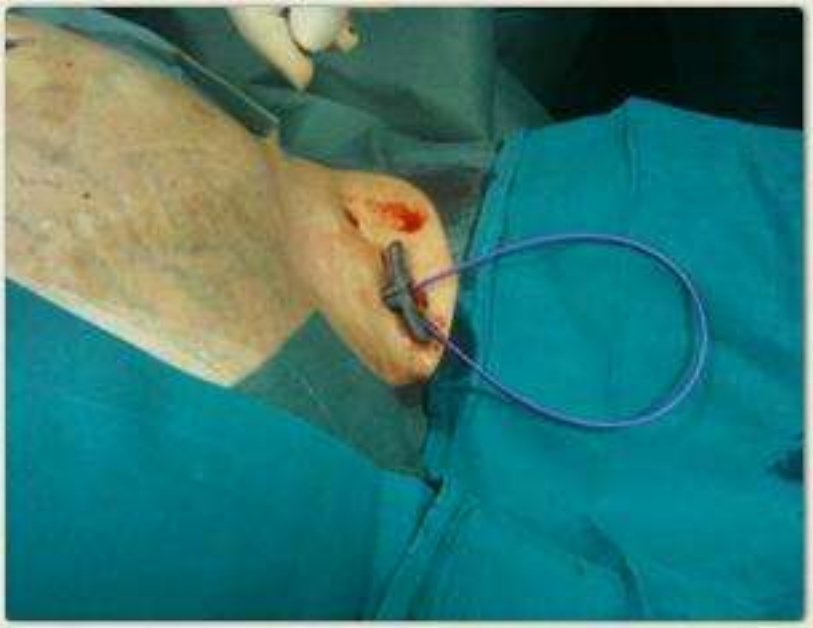







SonoSite
SonoMax



FICC tunnellizzato in adulto


ALCOHOL
REMOVE

Real-time ultrasound-guided catheterisation of the internal jugular vein: a prospective comparison with the landmark technique in critical care patients

D. Karakitsos et al - *Critical Care* 2006, **10**:R162

Table 2

Outcome measures in the ultrasound group versus the landmark group of patients

Outcome measures	Ultrasound group ($n = 450$)	Landmark group ($n = 450$)
Access time (seconds)	17.1 ± 16.5 (11.5 to 41.4)[a]	44 ± 95.4 (33.2 to 77.5)
Success rate	450 (100%)[a]	425 (94.4%)
Carotid puncture	5 (1.1%)[a]	48 (10.6%)
Haematoma	2 (0.4%)[a]	38 (8.4%)
Haemothorax	0 (0%)[a]	8 (1.7%)
Pneumothorax	0 (0%)[a]	11 (2.4%)
Average number of attempts	1.1 ± 0.6 (1.1 to 1.9)[a]	2.6 ± 2.9 (1.5 to 6.3)
CVC-BSI	47 (10.4%)[a]	72 (16%)

[a]Comparison of the outcome measures between the ultrasound group and the landmark group of patients ($p < 0.001$). Access time and average number of attempts are expressed as mean ± standard deviation (95% confidence interval). Success rate, carotid puncture, haematoma, haemothorax, pneumothorax, and CVC-BSI are expressed as the absolute number of patients and percentage of their group. CVC-BSI, central venous catheter-associated blood stream infection.

CDC 2011

CENTERS FOR DISEASE CONTROL AND PREVENTION

EPIC 2014

Journal of Hospital Infection 86S1 (2014) S1-S70

Available online at www.sciencedirect.com

Journal of Hospital Infection

journal homepage: www.elsevierhealth.com/journals/jhin

epic3: National Evidence-Based Guidelines for Preventing Healthcare-Associated Infections in NHS Hospitals in England

H.P. Loveday[a]*, J.A. Wilson[a], R.J. Pratt[a], M. Golsorkhi[a], A. Tingle[a], A. Bak[a], J. Browne[a], J. Prieto[b], M. Wilcox[c]

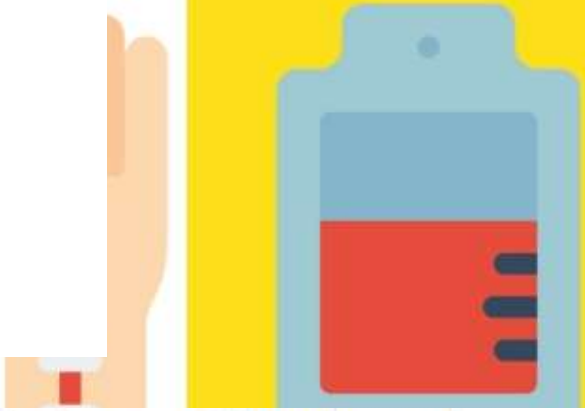
[a] *Richard Wells Research Centre, College of Nursing, Midwifery and Healthcare, University of West London (London).*
[b] *Faculty of Health Sciences, University of Southampton (Southampton).*
[c] *Microbiology and Infection Control, Leeds Teaching Hospitals and University of Leeds (Leeds).*

INFECTION CONTROL AND HOSPITAL EPIDEMIOLOGY JULY 2014, VOL. 35, NO. 7

SHEA/IDSA PRACTICE RECOMMENDATION

Strategies to Prevent Central Line–Associated Bloodstream Infections in Acute Care Hospitals: 2014 Update

Jonas Marschall, MD;[1,2,a] Leonard A. Mermel, DO, ScM;[3,a] Mohamad Fakih, MD, MPH;[4] Lynn Hadaway, MEd, RN, BC, CRNI;[5] Alexander Kallen, MD, MPH;[6] Naomi P. O'Grady, MD;[7] Ann Marie Pettis, RN, BSN, CIC;[8] Mark E. Rupp, MD;[9] Thomas Sandora, MD, MPH;[10] Lisa L. Maragakis, MD, MPH;[11] Deborah S. Yokoe, MD, MPH[12]



5. Use ultrasound guidance for internal jugular catheter insertion (quality of evidence: II).[99]
   a. Ultrasound-guided internal jugular vein catheterization reduces the risk of CLABSI and of non-infectious complications of CVC placement.[100]

Consensus 2012

Intensive Care Med
DOI 10.1007/s00134-012-2597-x

CONFERENCE REPORTS AND EXPERT PANEL

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Andrew R. Bodenham
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International evidence-based recommendations on ultrasound-guided vascular access

Table 6 Recommendations regarding sterility using ultrasound guidance and prevention of infectious and mechanical complications using ultrasound-guided cannulation

Domain code	Suggested definition	Level of evidence	Degree of consensus	Strength of recommendation
Sterility during ultrasound vascular procedures				
D8.S1	Sterile techniques should always be used during the placement of a vascular access device, including hand washing; sterile full body drapes; wearing of sterile gowns, gloves, caps and masks covering both the mouth and nose. Probe and cable sterility have to be maintained	A	Very good	Strong
Prevention of infectious and mechanical complications with ultrasound-guided cannulation				
D8.S2	Ultrasound guidance should be used in order to decrease the rate of CRBSI in adults and children	C	Very good	Strong
D8.S3–4	A multi-faceted strategy, including the use of ultrasound guidance with specific preventive and educational measures and the promotion of good practices applied by both medical and nursing staff, is suggested in order to reduce the incidence of CRBSI	B	Good	Strong
D8.S5	Ultrasound guidance should be used to avoid cannulation of thrombotic sites	A	Very good	Strong
D8.S6	Ultrasound guidance, by reducing puncture attempts, technical failure rates and mechanical complications, has to be preferred because of a reduced incidence of catheter-related thrombosis	A	Very good	Strong

Intensive Care Med
DOI 10.1007/s00134-012-2597-x

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Thierry Pirotte
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International evidence-based recommendations on ultrasound-guided vascular access

Use ultrasound !

Table 6 Recommendations regarding sterility using ultrasound guidance and prevention of infectious and mechanical complications using ultrasound-guided cannulation

Domain code	Suggested definition	Level of evidence	Degree of consensus	Strength of recommendation
Sterility during ultrasound vascular procedures				
D8.S1	Sterile techniques should always be used during the placement of a vascular access device, including hand washing; sterile full body drapes; wearing of sterile gowns, gloves, caps and masks covering both the mouth and nose. Probe and cable sterility have to be maintained using sterile gel and appropriate probe and cable shields	A	Very good	Strong
Prevention of infectious and mechanical complications with ultrasound-guided cannulation				
D8.S2	Ultrasound guidance should be used in order to decrease the rate of CRBSI in adults and children	C	Very good	Strong
D8.S3–4	A multi-faceted strategy, including the use of ultrasound guidance with specific preventive and educational measures and the promotion of good practices applied by both medical and nursing staff, is suggested in order to reduce the incidence of CRBSI	B	Good	Strong
D8.S5	Ultrasound guidance should be used to avoid cannulation of thrombotic sites	A	Very good	Strong
D8.S6	Ultrasound guidance, by reducing puncture attempts, technical failure rates and mechanical complications, has to be preferred because of a reduced incidence of catheter-related thrombosis	A	Very good	Strong

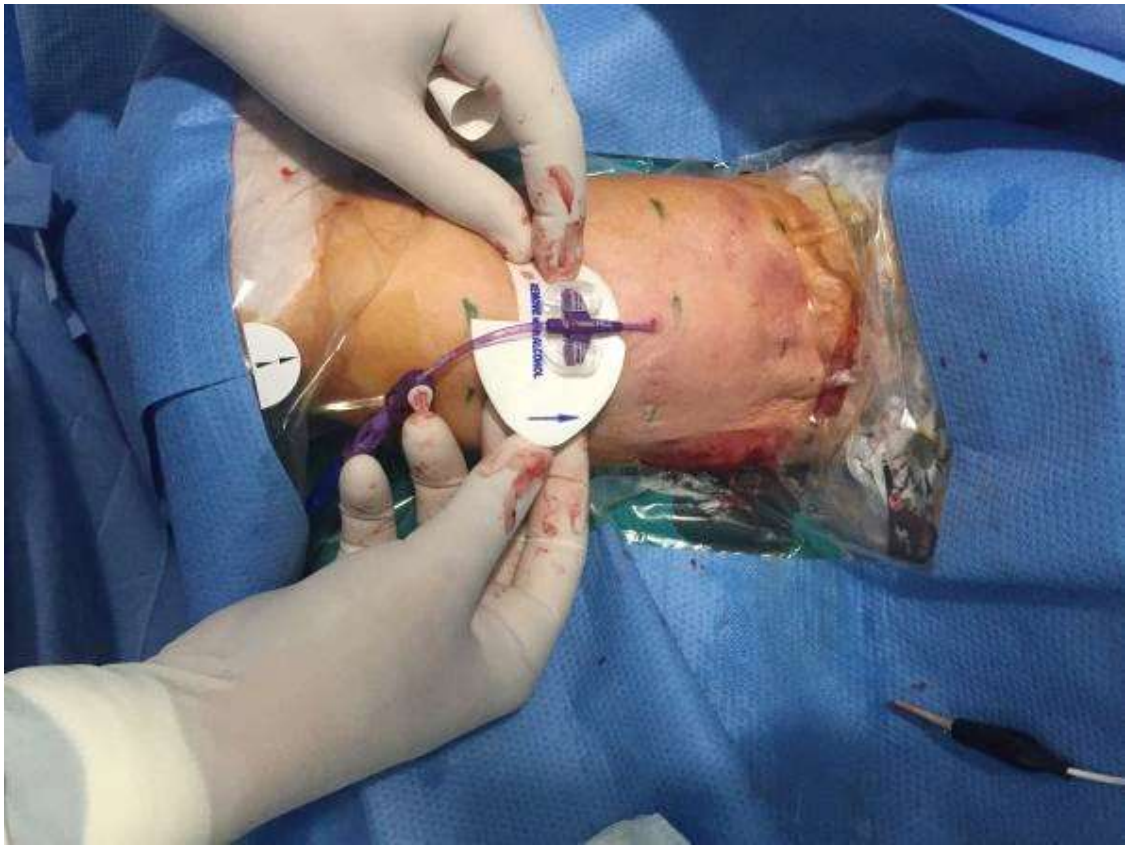
Microintroducer kits!

Always: for CICCs, PICCs, FICCs – both in adults and children

Glue

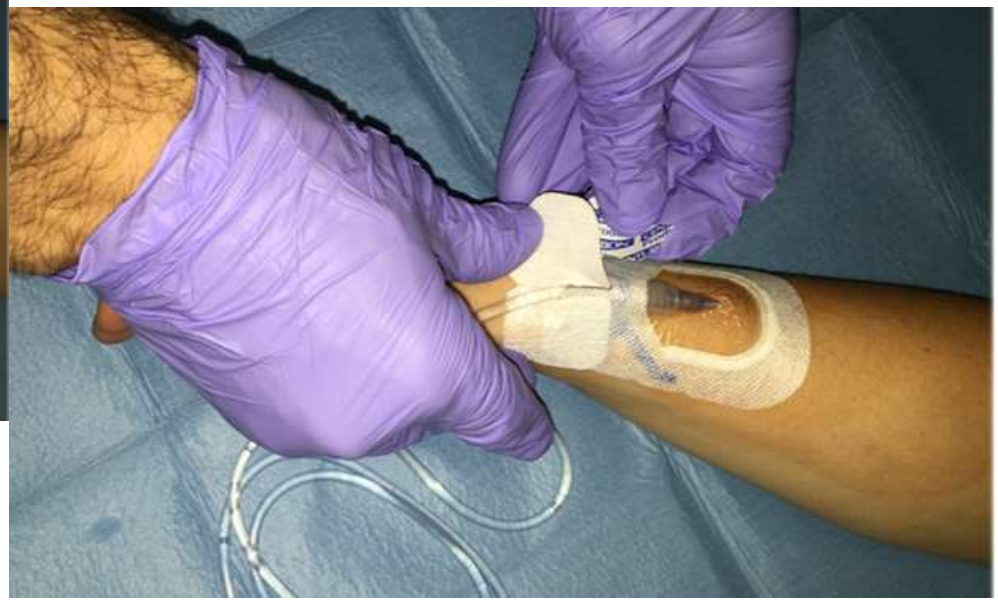
Sutureless devices

Skin adhesion



Sutureless devices

Included in the dressing



Sutureless devices

Anchored subcutaneously

Transparent dressing

Transparent dressings are to be preferred not only because protective against bacterial contamination, but also because of the catheter securement they offer (see EPIC guidelines 2014)

Journal of Hospital Infection 8651 (2014) S1-S70

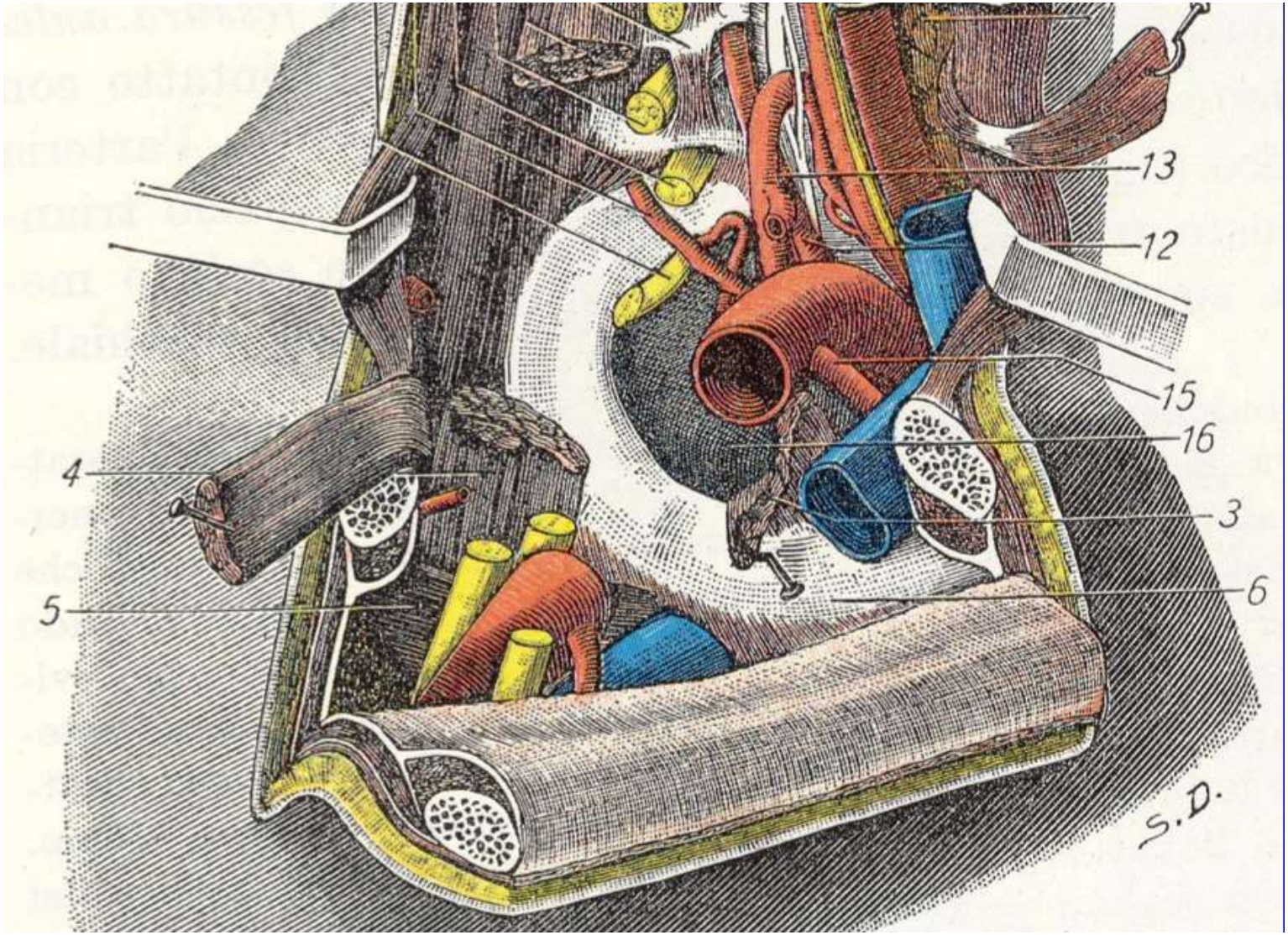
Available online at www.sciencedirect.com

Journal of Hospital Infection

journal homepage: www.elsevierhealth.com/journals/jhin

epic3: National Evidence-Based Guidelines for Preventing Healthcare-Associated Infections in NHS Hospitals in England

H.P. Loveday[a*], J.A. Wilson[a], R.J. Pratt[a], M. Golsorkhi[a], A. Tingle[a], A. Bak[a], J. Browne[a], J. Prieto[b], M. Wilcox[c]


13
12
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S.D.

EUROPEAN GUIDELINES ON PERIOPERATIVE USE OF ULTRASOUND (PERSEUS): VASCULAR ACCESS

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

European Society of Anaesthesiology

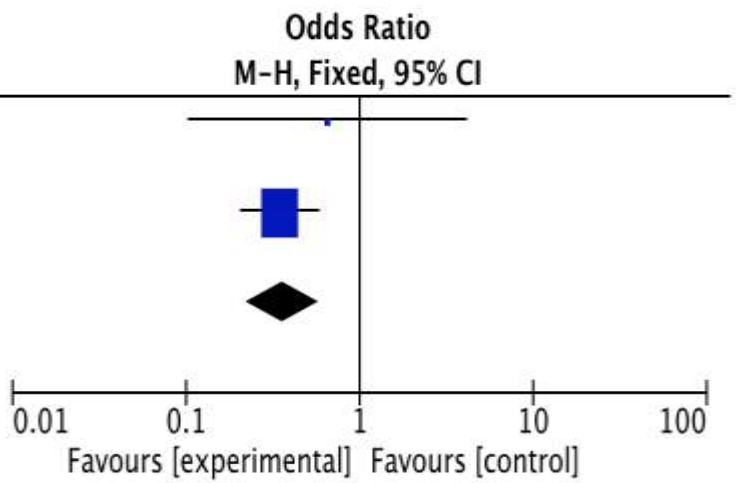
ESA

Axillary Vein Puncture – Overall Success

Study or Subgroup	Experimental Events	Experimental Total	Control Events	Control Total	Weight	Odds Ratio M-H, Fixed, 95% CI
Licardo 2015	2	45	3	45	4.9%	0.65 [0.10, 4.10]
Licardo 2016	0	0	0	0		Not estimable
Xu 2013	21	687	57	682	95.1%	0.35 [0.21, 0.58]
Total (95% CI)		**732**		**727**	**100.0%**	**0.36 [0.22, 0.59]**
Total events	23		60			

Heterogeneity: $Chi^2 = 0.42$, df = 1 (P = 0.52); $I^2 = 0\%$

Test for overall effect: Z = 4.06 (P < 0.0001)



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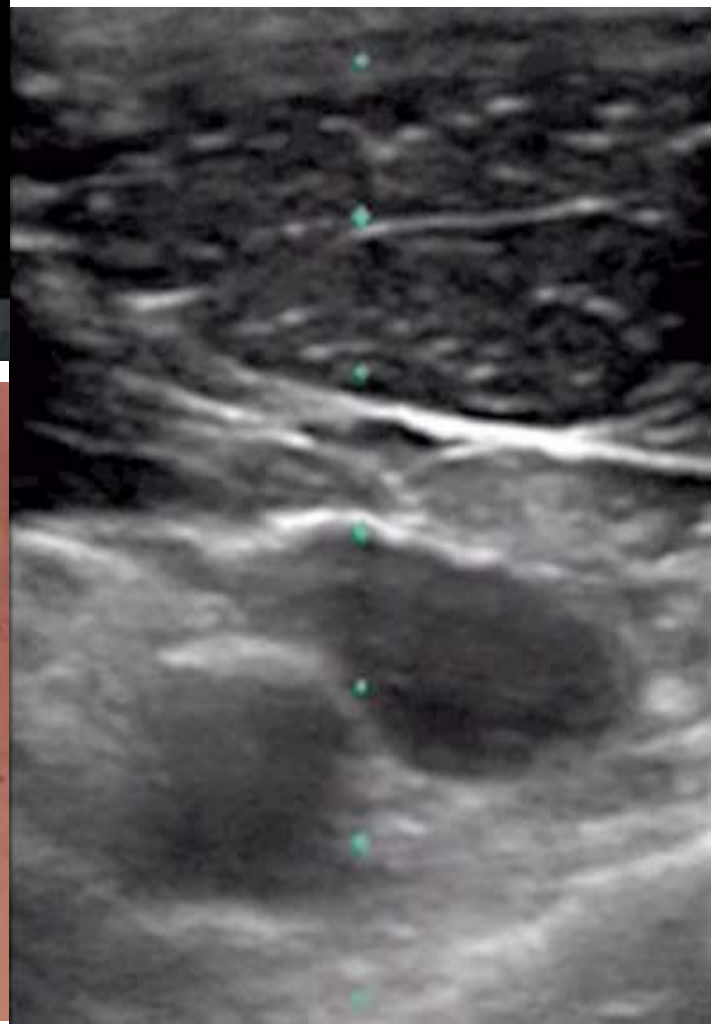
Ultrasound-guided cannulation of the Axillary Vein (AXV)

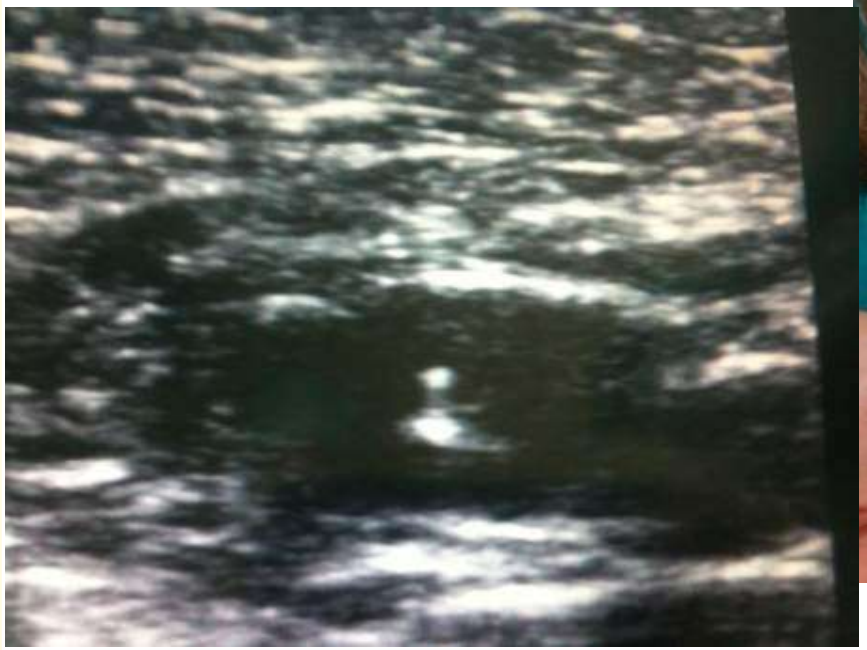
…

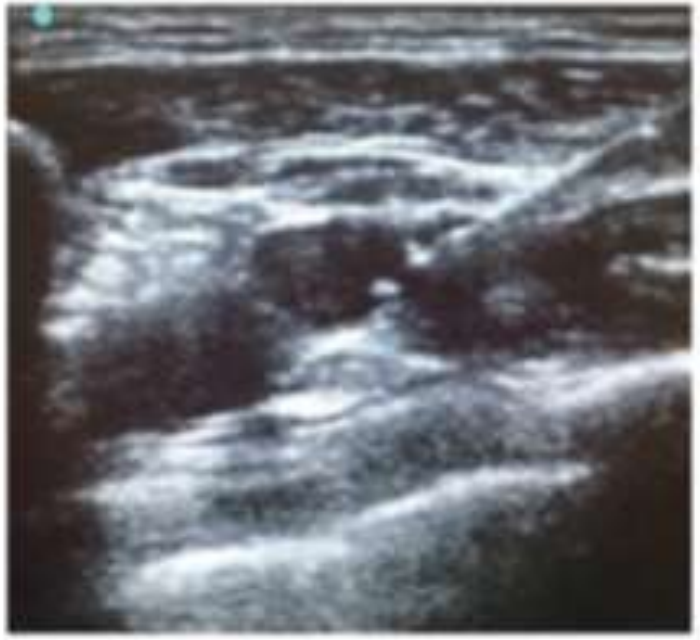
We recommend the use of USG during axillary vein cannulation, since it reduces the risk of major complications and increases the first-time success if compared to the landmark technique (2A).


Annota
Altro
Esame




Stampa
Annota
Opzioni
Esam





Techniques in vascular access

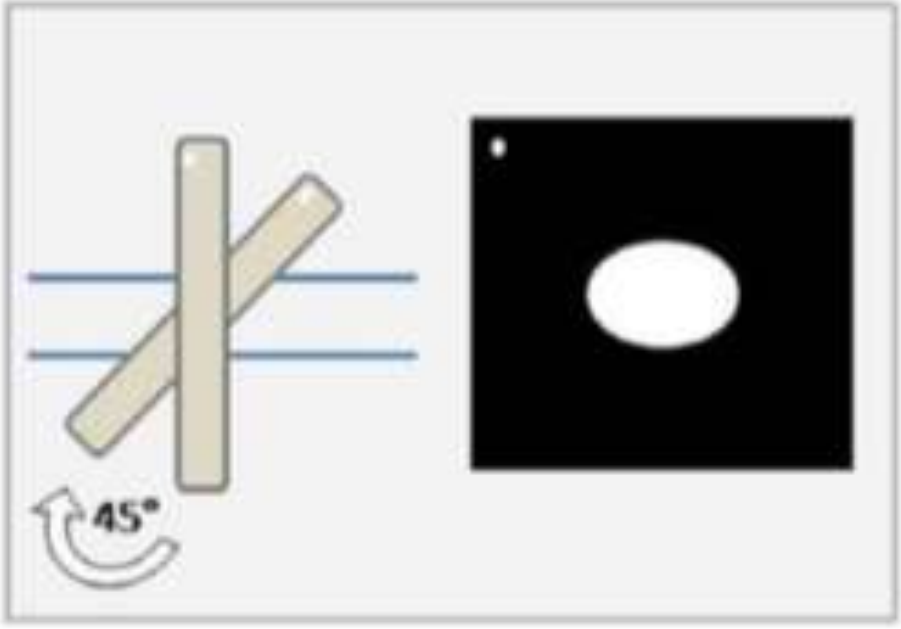
JVA The Journal of Vascular Access

A novel ultrasound-guided approach to the axillary vein: Oblique-axis view combined with in-plane puncture

The Journal of Vascular Access
1–6

DOI: 10.1177/1129729819826034
journals.sagepub.com/home/jva
SAGE

Fabrizio Brescia[1], Daniele G Biasucci[2], Fabio Fabiani[1], Michela Favarato[1], Fabio Costa[3], Ferdinando Longo[3], Matteo Martuscelli[3], Michelangelo Vitiello[4] and Mauro Pittiruti[5,6]



J Vasc Access 2013; 00 (00): 000-000
DOI: 10.5301/jva.5000201

ORIGINAL ARTICLE

Is ultrasound-guided central venous port placement effective to avoid pinch-off syndrome?

Akio Tamura[1], Miyuki Sone[2], Shigeru Ehara[1], Kenichi Kato[1], Ryoichi Tanaka[1], Tatsuhiko Nakasato[1], Tetsuya Itabashi[3]

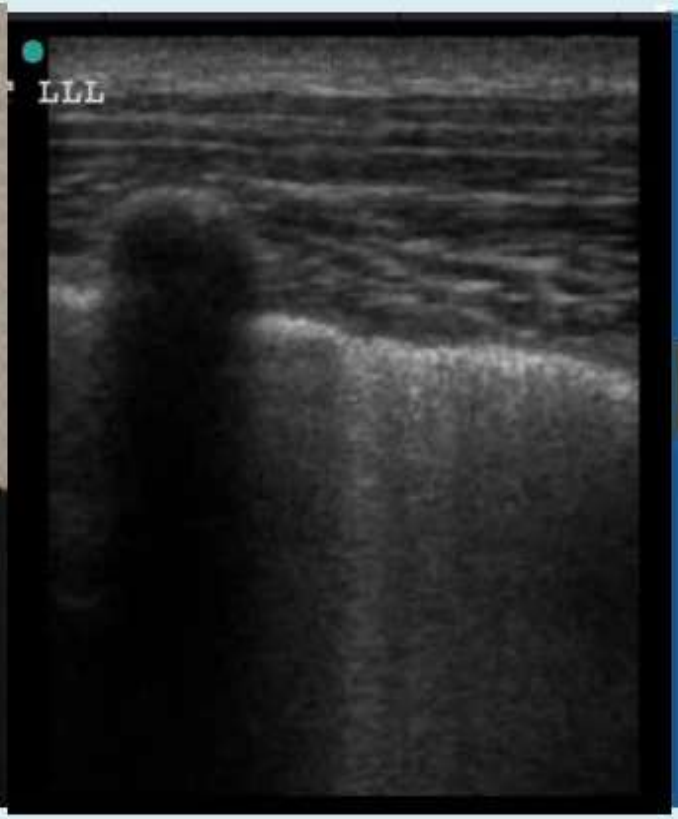
US guided puncture of the axillary vein has been proved to avoid 'pinch-off' syndrome in totally implanted central VADs

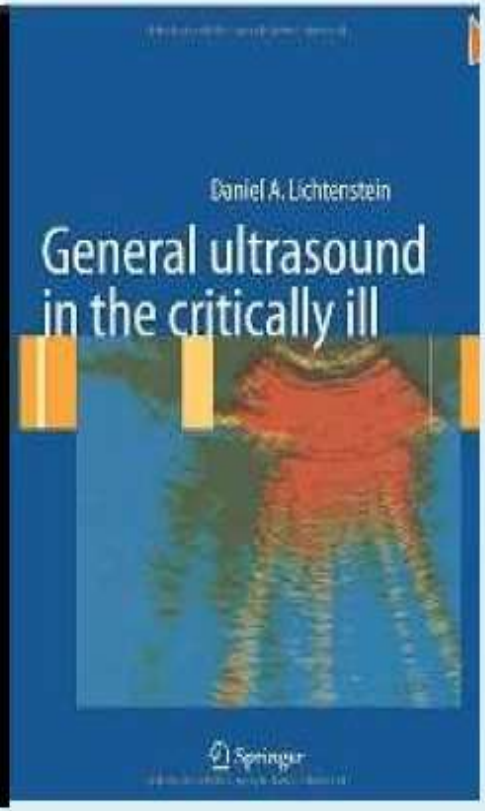
How to make the axillary vein larger? Effect of 90° abduction of the arm to facilitate ultrasound-guided axillary vein puncture☆

Mauro Pittiruti, MD [a], Daniele Guerino Biasucci, MD [b,*], Antonio La Greca, MD [a], Alessandro Pizza, MD [b], Giancarlo Scoppettuolo, MD [c]

1989: **Daniel Lichtenstein** pioneers point-of-care lung ultrasound in the ICU

"Ultrasound is the real stethoscope"






2003

CHEST

Official publication of the American College of Chest Physicians

Test Characteristics of Ultrasonography for the Detection of Pneumothorax: A Systematic Review and Meta-analysis

Khaled Alrajhi, Michael Y. Woo and Christian Vaillancourt

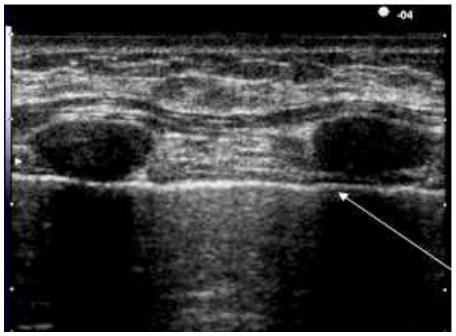
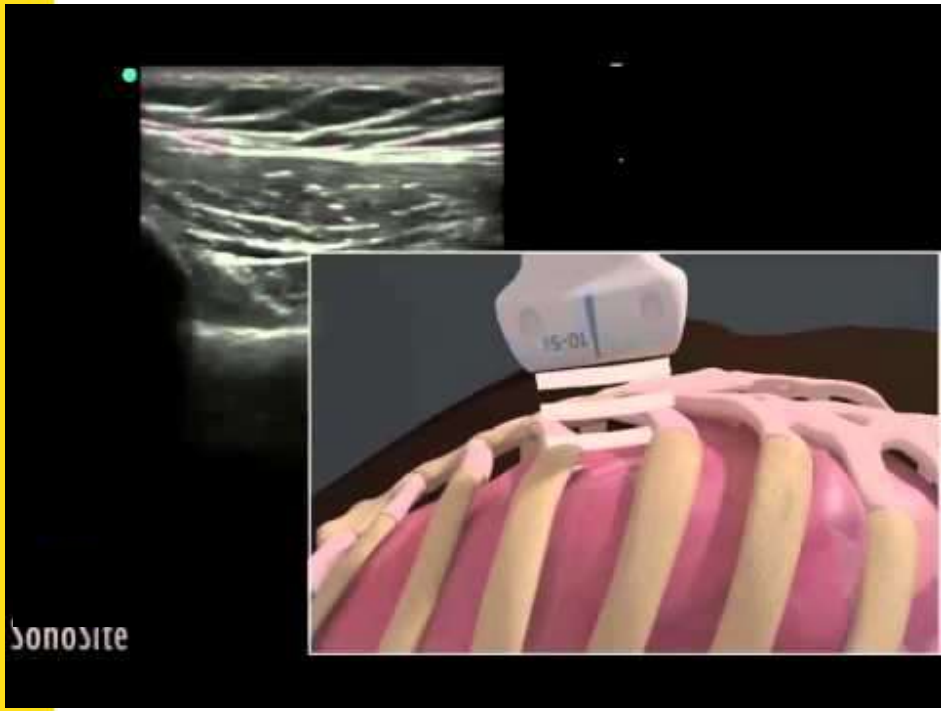
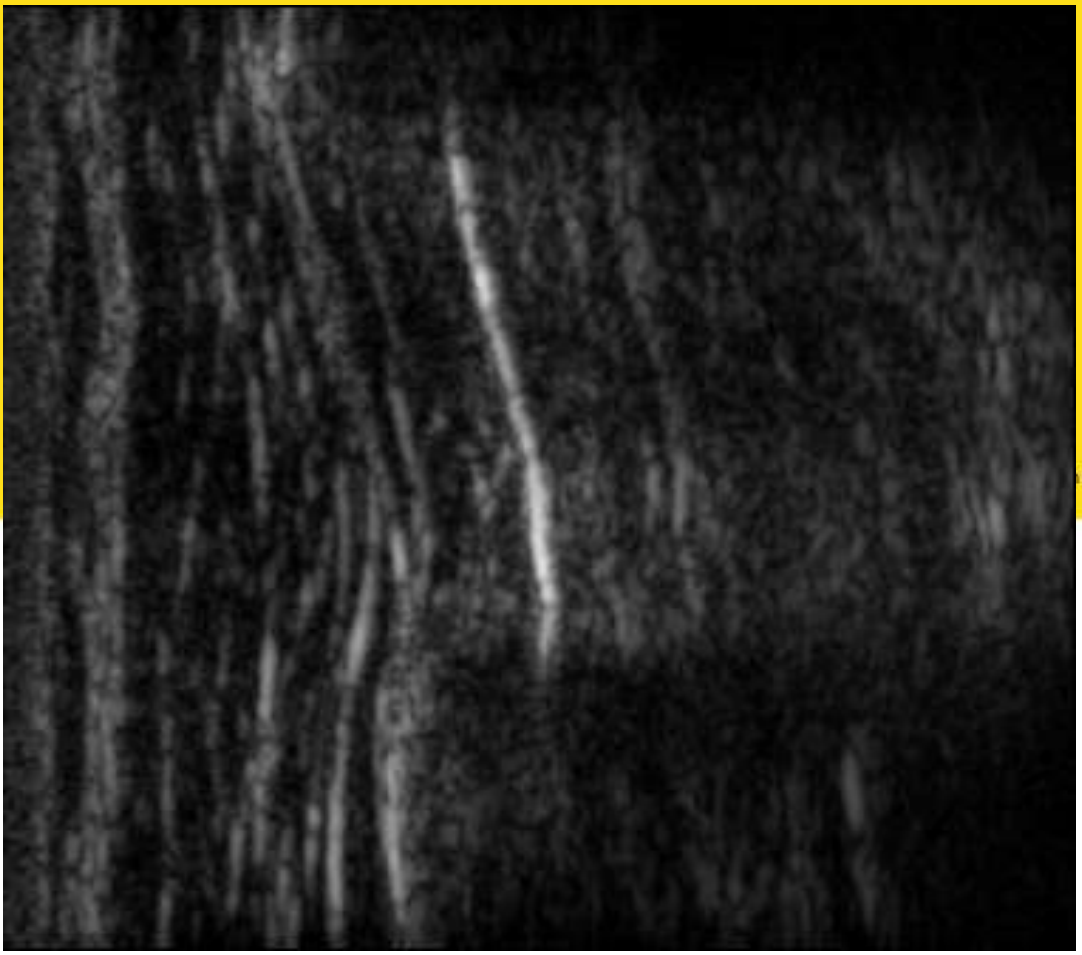


Table 2: Summary of sensitivity and specificity for included studies

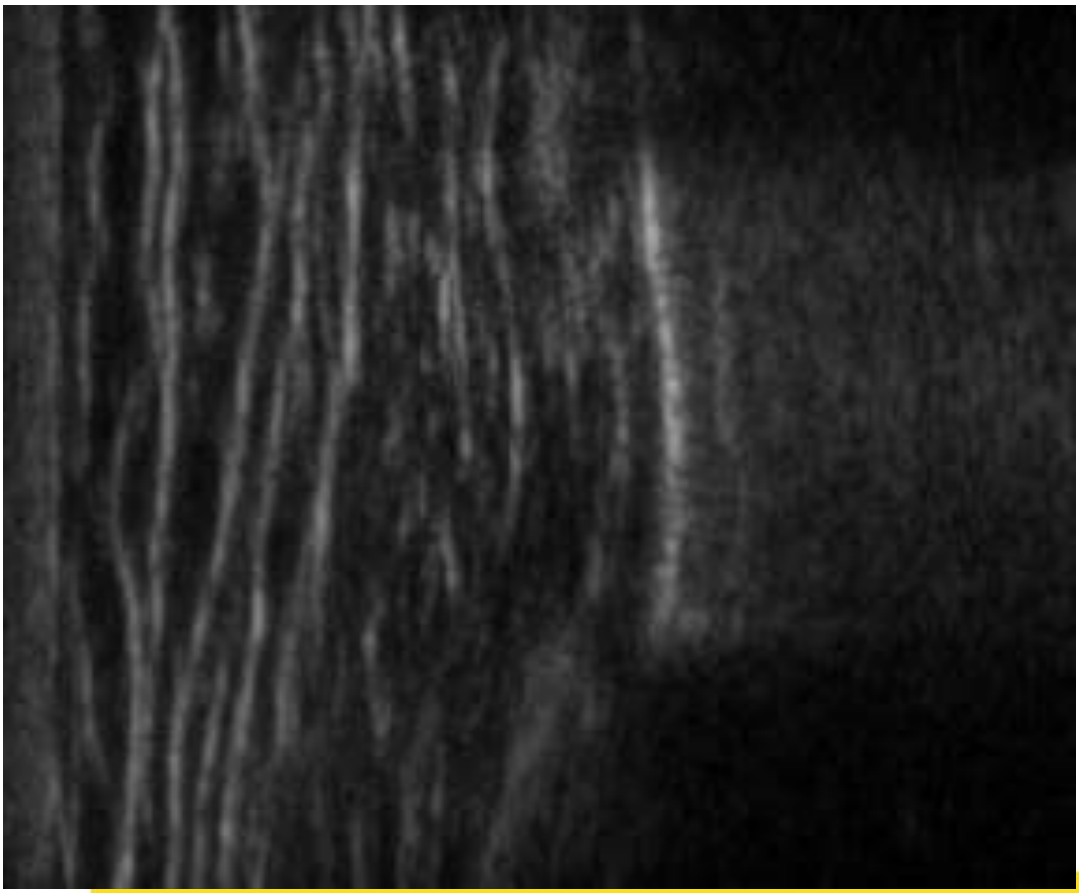
Author	N	Ultrasonography		Chest X-ray	
		Sensitivity	Specificity	Sensitivity	Specificity
Blaivas[14]	176	98.1%	99.2%	75.5%	100.0%
Chung[15]	97	88.2%	89.3%	47.1%	94.0%
Garofalo[13]	184	95.7%	100%	-	-
Kirkpatrick[11]	133	48.8%	98.7%	20.9%	99.6%
Rowan[16]	27	100%	93.8%	36.4%	100.0%
Soldati[17]	186	98.2%	100%	53.6%	100.0%
Soldati[18]	109	92.0%	99.5%	52.0%	100.0%
Zhang[19]	135	86.2%	97.2%	27.6%	100.0%

The scanning technique

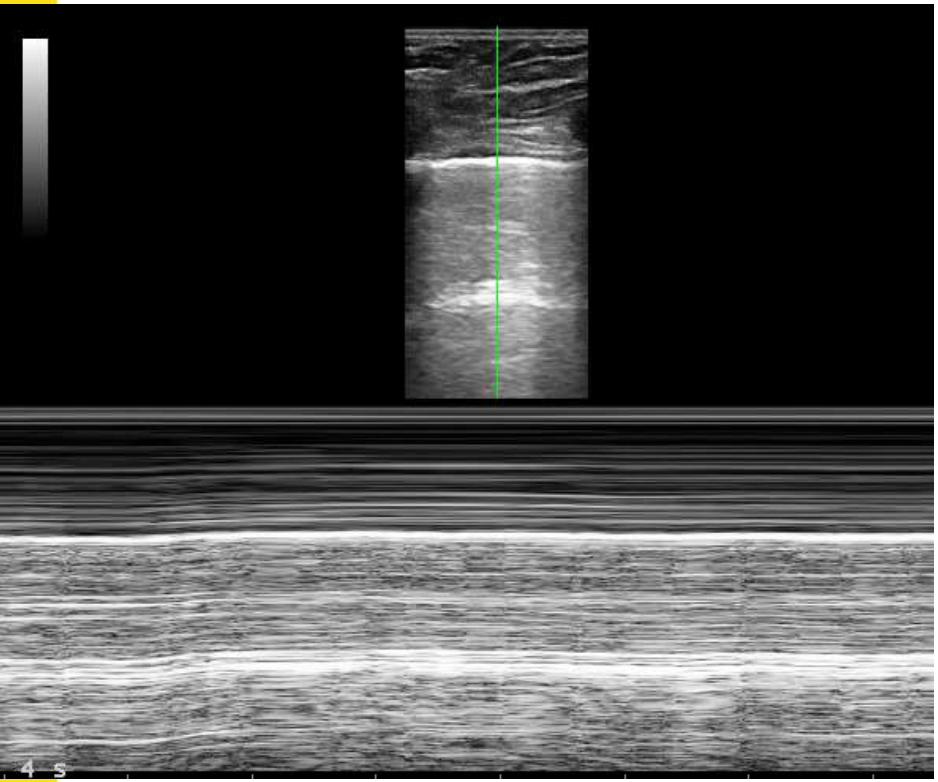


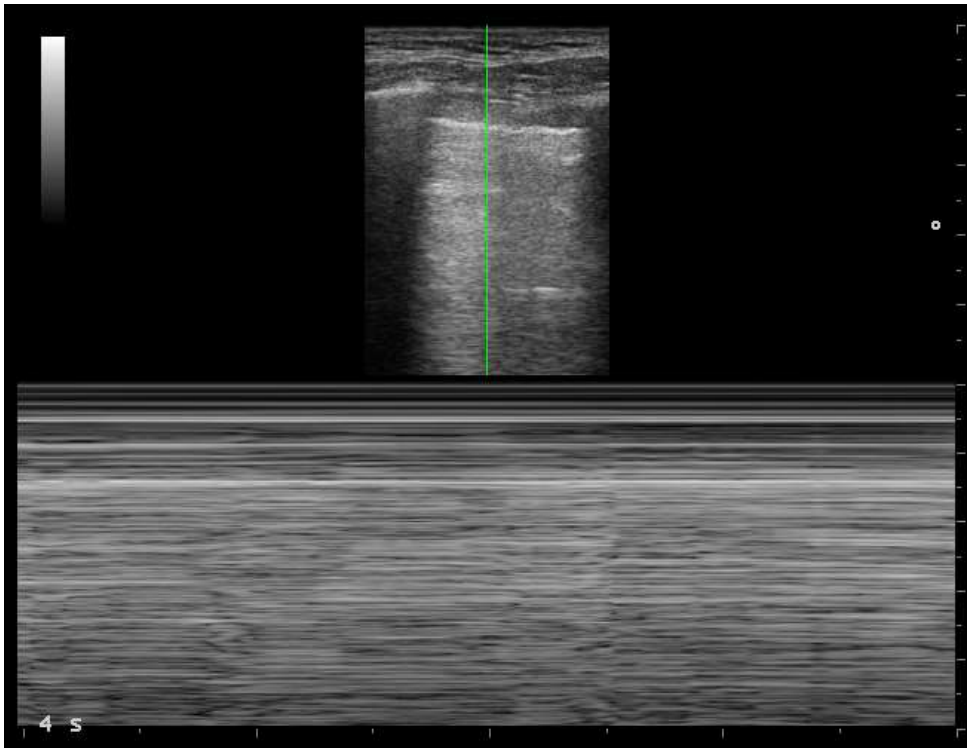


made by Smashicons from pexels



M - MODE





Stratosphere sign


000


LSL
PSL
LIL
PIL

Consensus 2012

Intensive Care Med
DOI 10.1007/s00134-012-2597-x

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Eric Desruennes
Lawrence A. Melniker
Susan T. Verghese

International evidence-based recommendations on ultrasound-guided vascular access

Table 4 Recommendations on ultrasound vascular access in adults and cost-effectiveness

Ultrasound vascular access in adults

Domain code	Suggested definition		Degree of consensus	Strength of recommendation
D4.SD2.S1	Ultrasound guidance should be … central venous access in …	A	V…	
D4.SD2.S2	Ultrasound guidance … central veno…	A		…trong
D4.SD2.S3	PICCs sh… …vel by ultrasound …		…good	Strong
D4.SD2.S4	…que … taken into consid… …enous line when d…		Very good	Strong
D4.	… arterial catheterizat… …d should be used ro…	A	Very good	Strong
D4.S…	…ound can accurately … routinely performed … when the ple… …should be …ter cannulation …ed	B	Very good	Strong
D4.SD2.S7	CEUS (co… …) is a valid method for det… …meter tip in the right atrium	B	Very good	Strong
Cost-effectiveness	…for vascular cannulation			
D5.S1–3	…ascular access has to be used because it …ical benefits and reduced overall costs of care …t cost-effective	A	Very good	Strong

Ultrasound can accurately detect pneumothorax and should be routinely performed after central venous catheter cannulation when the pleura could have been damaged

CEUS (contrast-enhanced ultrasound) is a valid method for detecting a central venous catheter tip in the right atrium

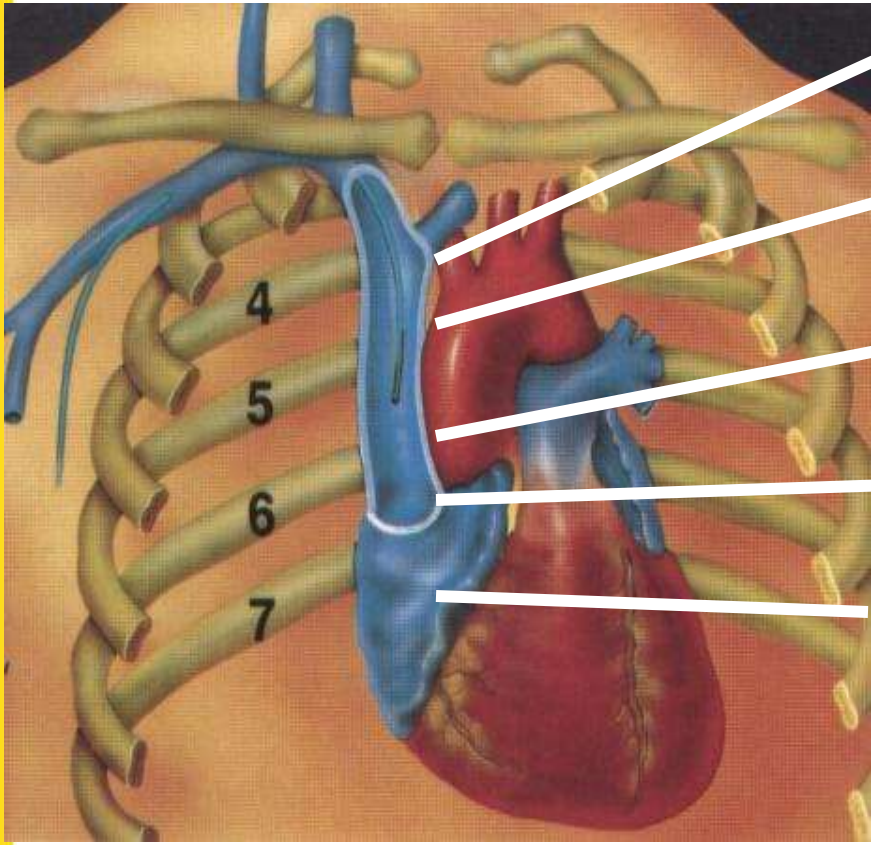
Metodica accurata per Tip Location

Support Care Cancer (2005) 13:325–331
DOI 10.1007/s00520-004-0723-1

ORIGINAL ARTICLE

Jo Caers
Christel Fontaine
Vincent Vinh-Hung
Johan De Mey
Gerrit Ponnet

Catheter tip position as a risk factor for thrombosis associated with the use of subcutaneous infusion ports



45.2 %

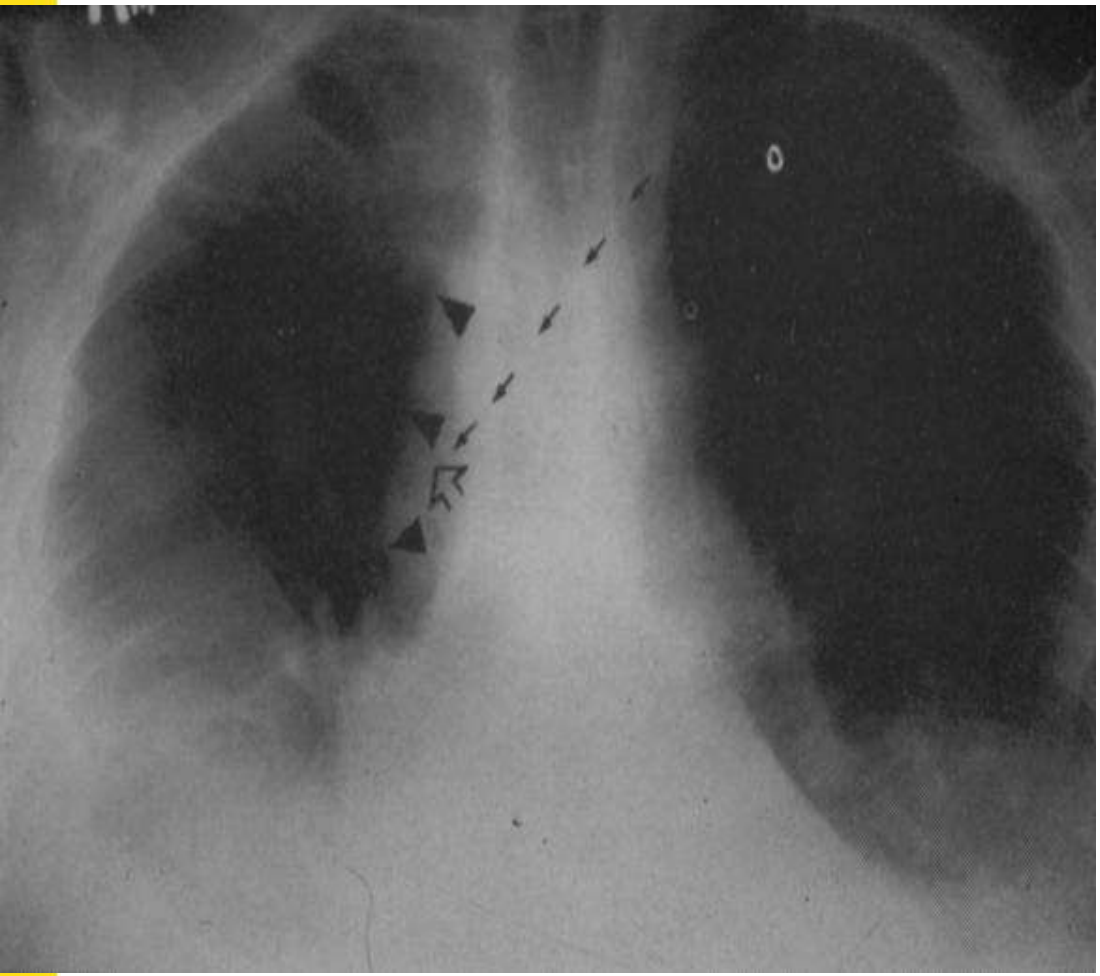
19 %

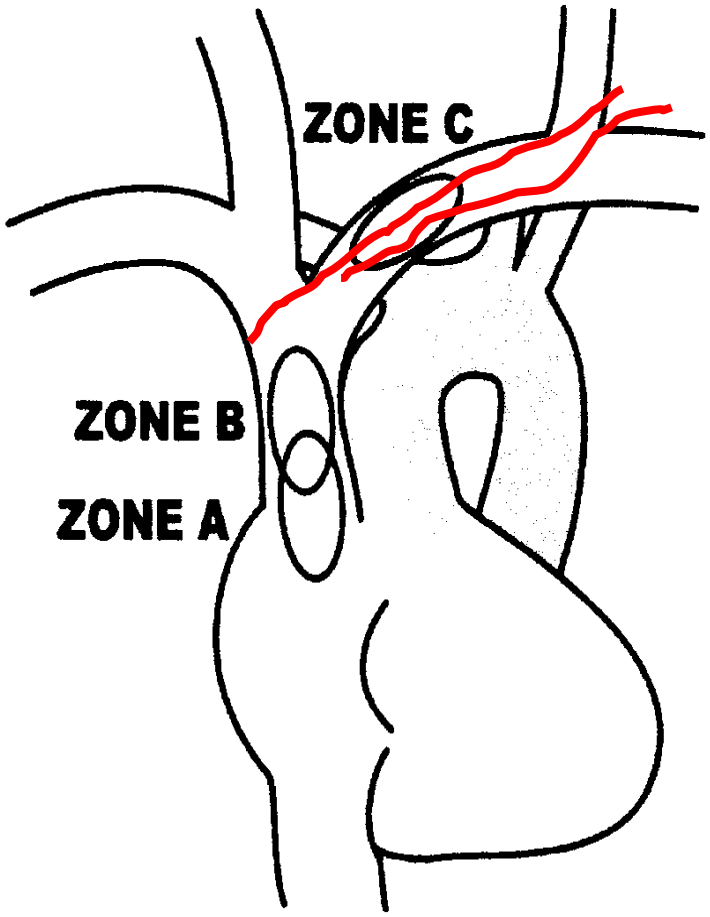
4.2 %

1.5 %

5.6 %

Petersen Am J Surg 1999
Luciani, Radiology 2001
Puel, Cancer 2003
Melina Verso, J Clin Oncol 2003
Caers, Support Care Cancer 2005




ZONE C
ZONE B
ZONE A

review

Annals of Oncology 20: 1459–1471, 2009
doi:10.1093/annonc/mdp052
Published online 12 June 2009

2008 SOR guidelines for the prevention and treatment of thrombosis associated with central venous catheters in patients with cancer: report from the working group

P. Debourdeau[1]*, D. Kassab Chahmi[2], G. Le Gal[3], I. Kriegel[4], E. Desruennes[5], M.-C. Douard[6], I. Elalamy[7], G. Meyer[8], P. Mismetti[9], M. Pavic[1], M.-L. Scrobohaci[10], H. Lévesque[11], J. M. Renaudin[12] & D. Farge[13] on behalf of the working group of the SOR

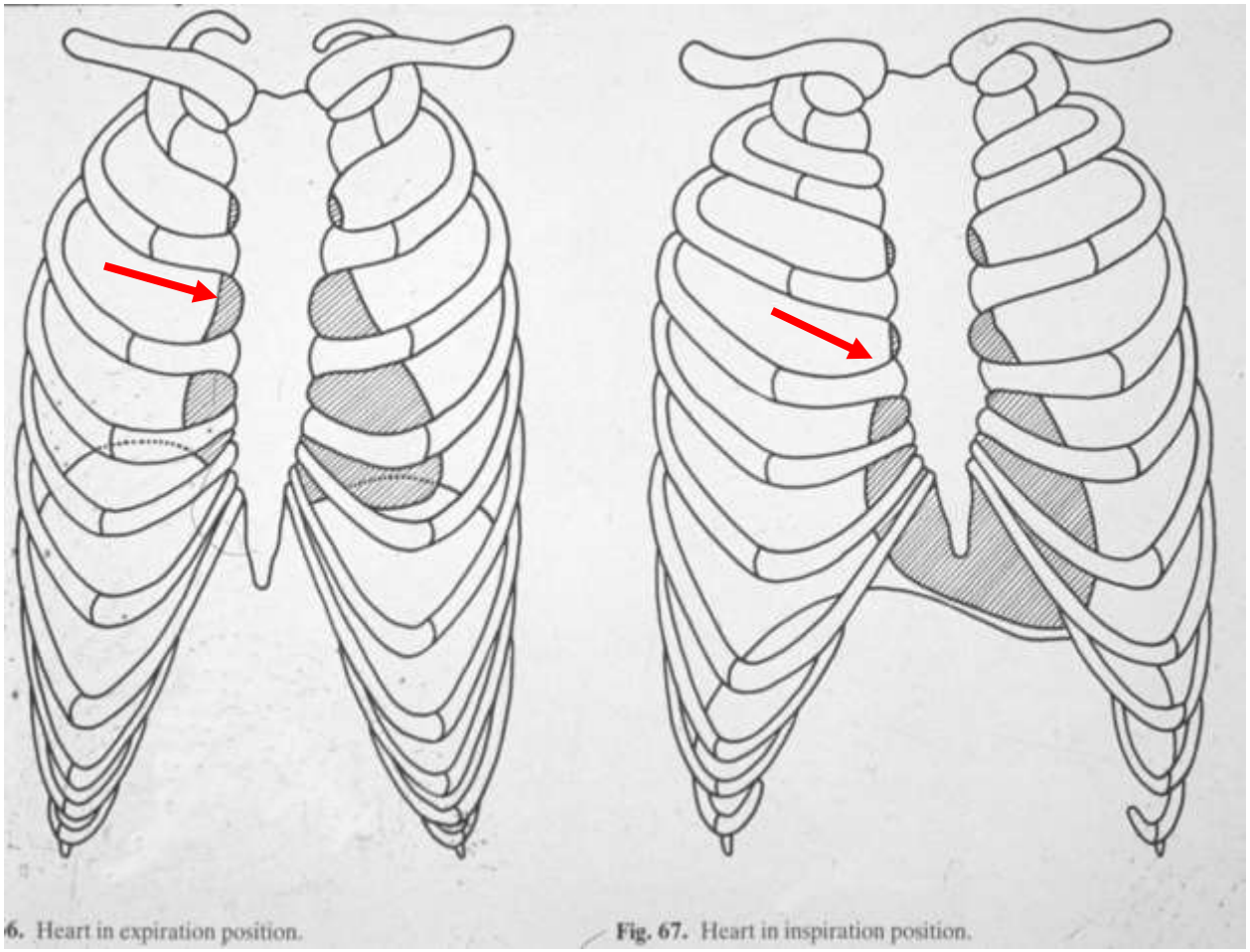
primary prevention of CVC-associated thrombosis in patients with cancer

standards.

1 The distal tip of CVC should be placed at the junction between the superior vena cava and the right atrium.

LIMITI della radiologia

I reperi anatomici cambiano con la respirazione



6. Heart in expiration position.

Fig. 67. Heart in inspiration position.

LIMITI della radiologia

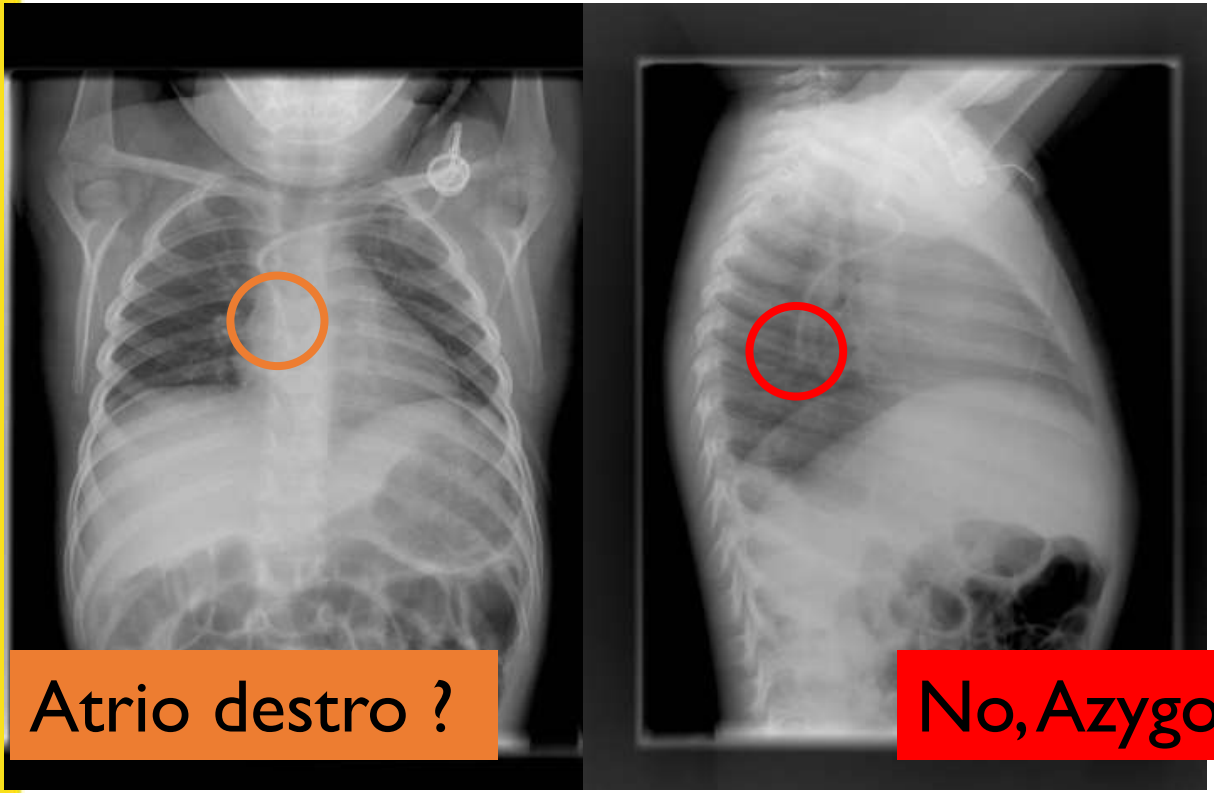
La sola proiezione AP può ingannare

PARALLASSE

Le strutture ossee usate come reperi nella proiezione AP sono anteriori o posteriori all'asse vascolare e la loro proiezione sul profilo cardiaco non corrisponde ai reali rapporti anatomici

LIMITI della radiologia

La sola proiezione AP può ingannare



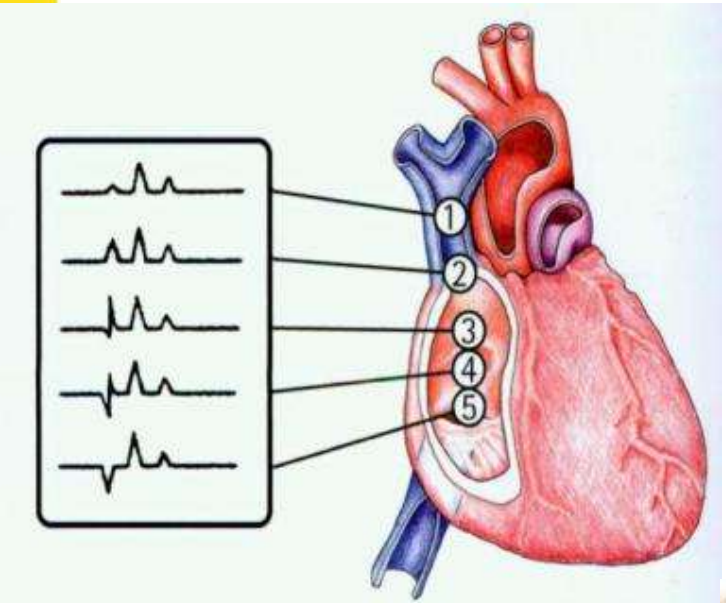
SONO NECESSARIE DUE PROIEZIONI !!!

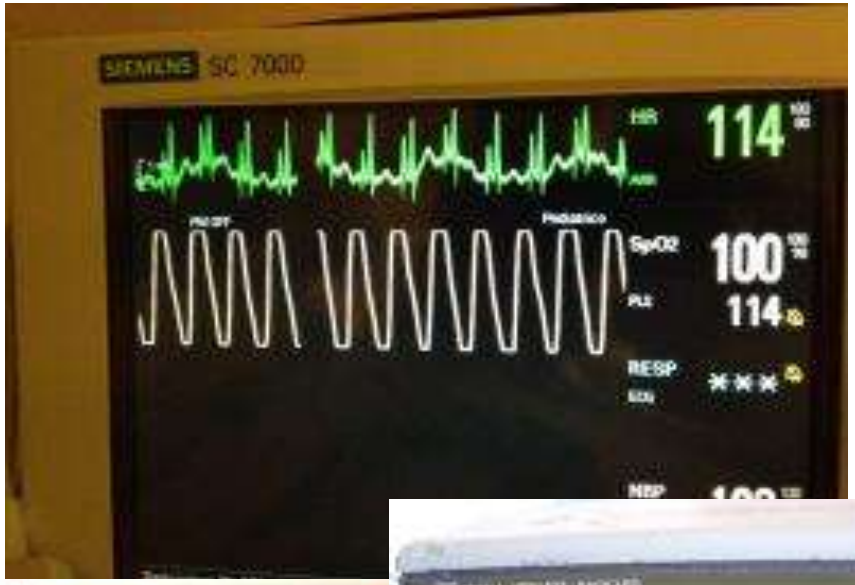
LIMITI della radiologia

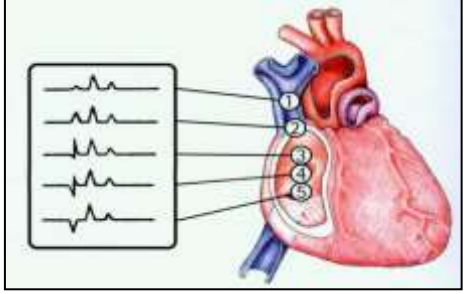
La sola proiezione AP può ingannare

SONO NECESSARIE DUE PROIEZIONI

Intracavitary EKG !



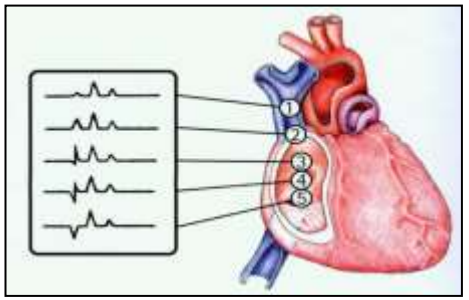




	Adults*	Children**
Accuracy	94.5%	95.8%
Feasibility	98.5%	99.3%

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

** The intracavitary ECG method for positioning the tip of central venous devices in pediatric patients: a multicenter study. F. Rossetti, M. Pittiruti et al. J Vasc Access, IN PRESS



A subgroup of patients cannot benefit from IC-ECG:

Global applicability: 91-93% (hospitalized population)

IC-ECG usually considered not applicable to patients without an evident P wave on their ECG tracking

atrial fibrillation or other morphologic abnormalities of p wave (junctional rhythms and others)

active pace-makers

Global feasibility about 95% (even worse if AF patients included)

Original research article

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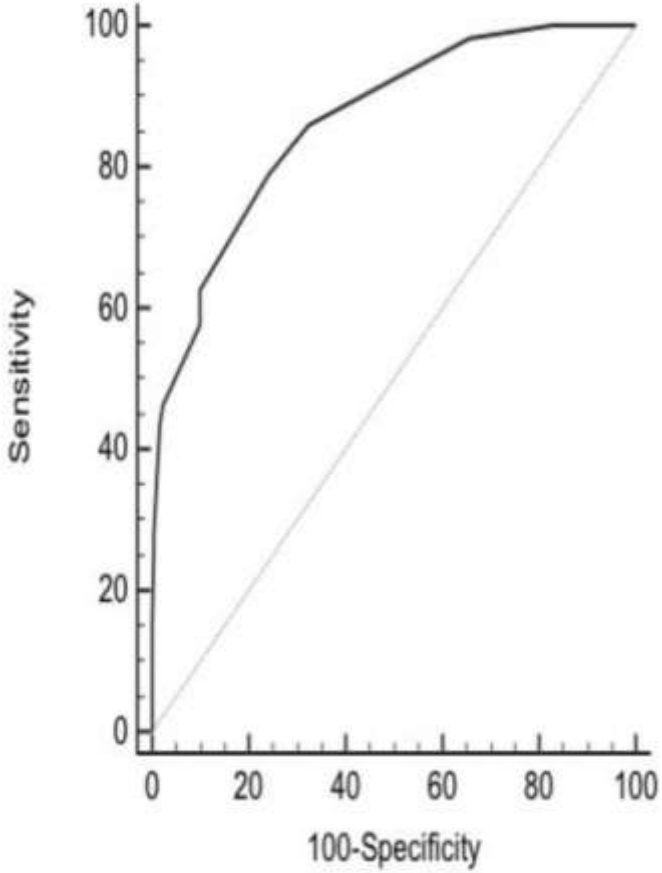
SAGE

A modified intracavitary electrocardiographic method for detecting the location of the tip of central venous catheters in atrial fibrillation patients

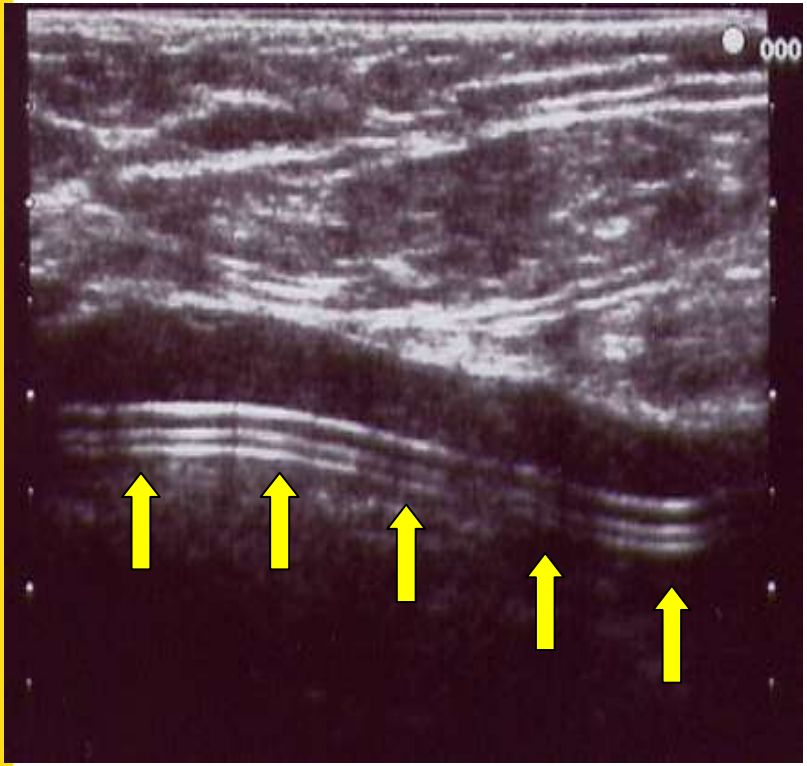
Maria Calabrese[1], Luca Montini[2], Gabriella Arlotta[1], Antonio La Greca[3], Daniele G Biasucci[2], Francesca Bevilacqua[1], Enrica Antoniucci[1], Andrea Scapigliati[1], Franco Cavaliere[1] and Mauro Pittiruti[3]

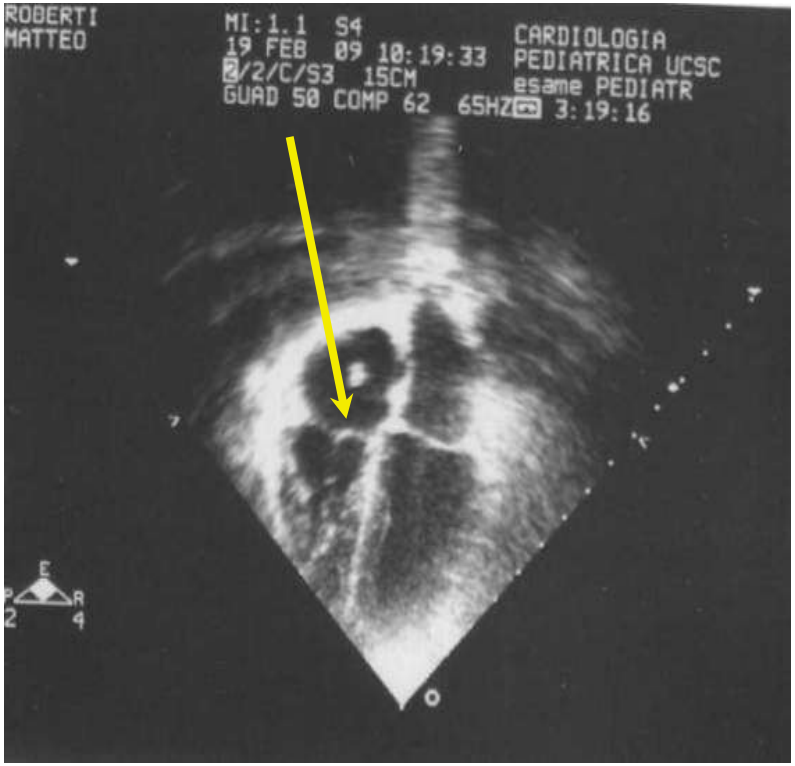
- Method B had the best accuracy
  - very high AUC (0.86; 95% CI: 0.82-0.9) for discriminating the tip position at CAJ vs. RA and also a high AUC (0.84) for CAJ vs. SVC
  - the cut-off value of the height of the *f* wave was 2.5 mm and 2 mm respectively.

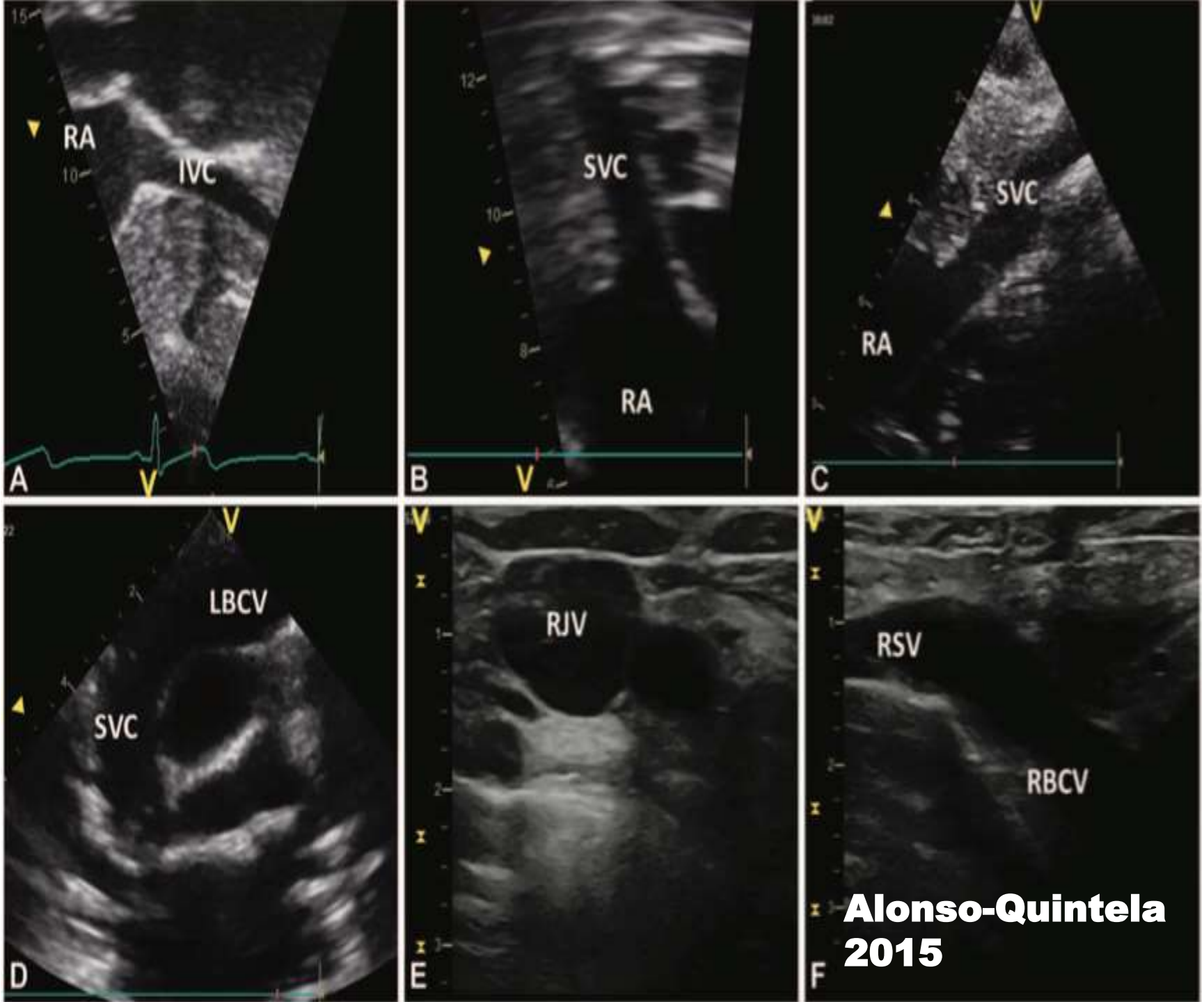


ROC curve: measurements of the f waves (method B) when the tip was placed in CAJ respect to RA

Clinical Question…



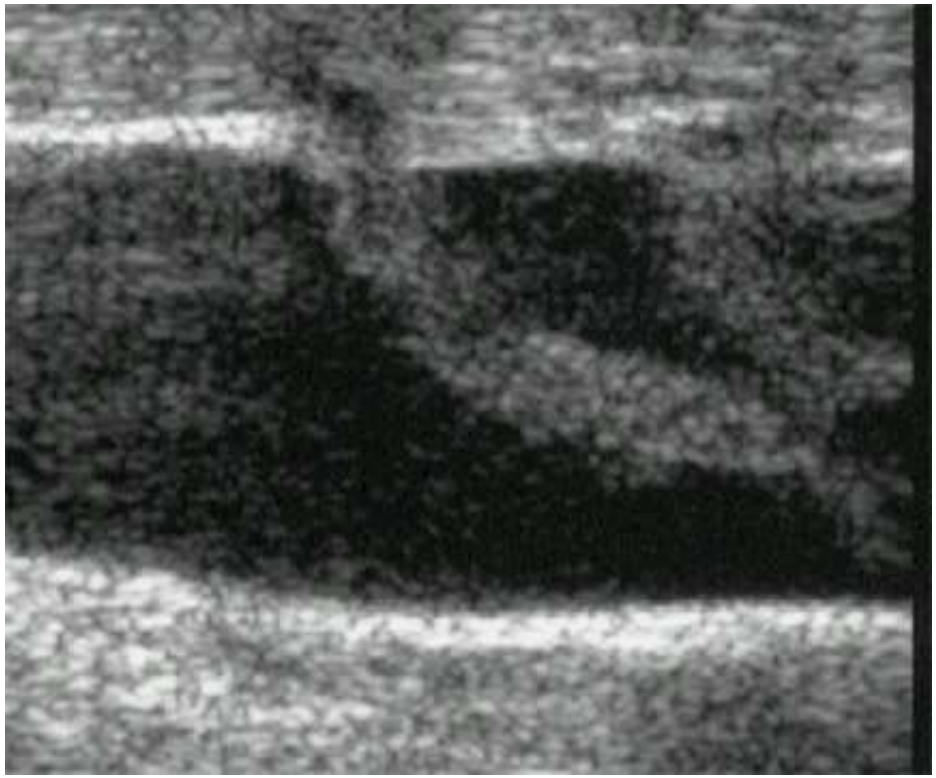


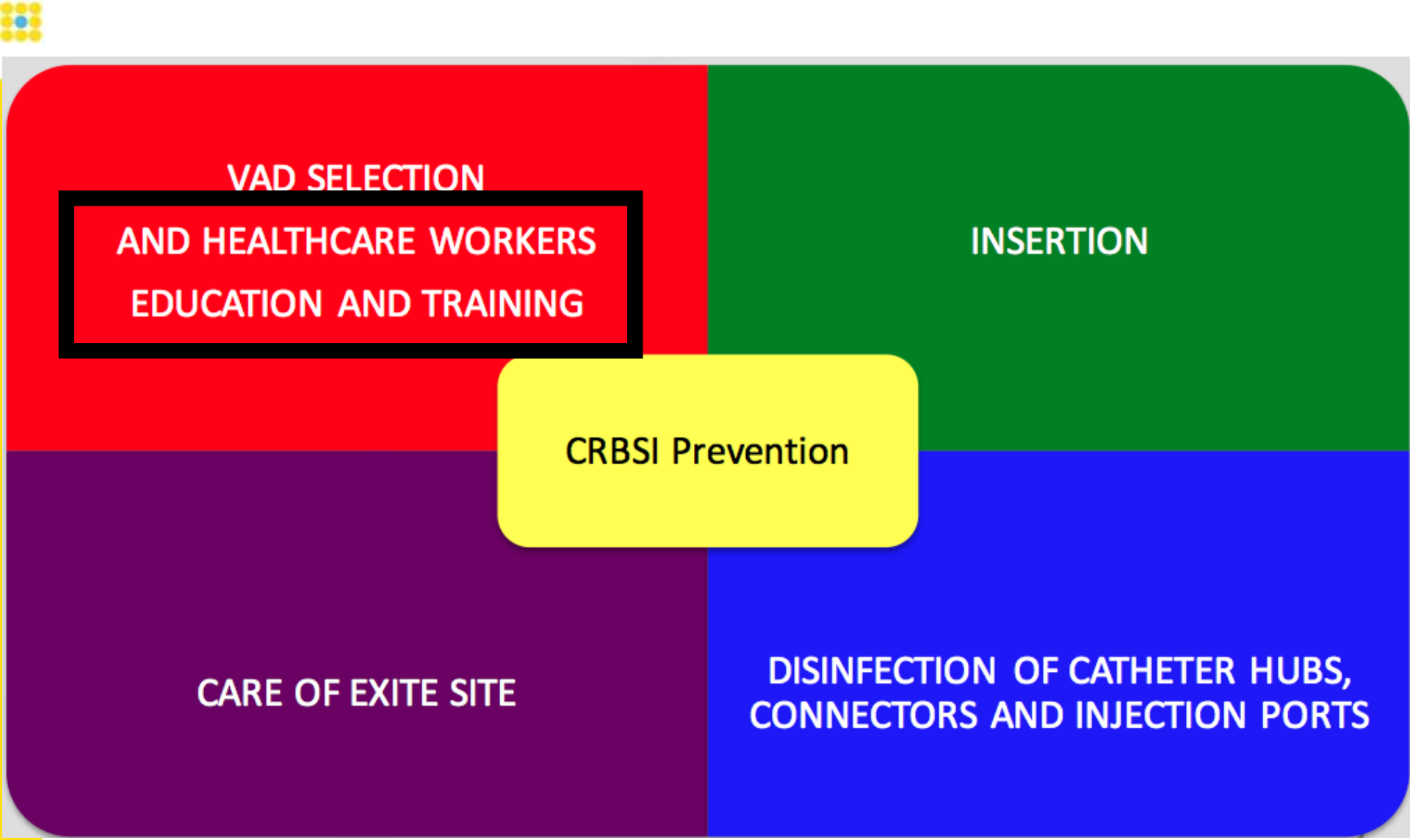


Alonso-Quintela 2015


BR IIIINF BR SN


SN

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DISINFECTION OF CATHETER HUBS,
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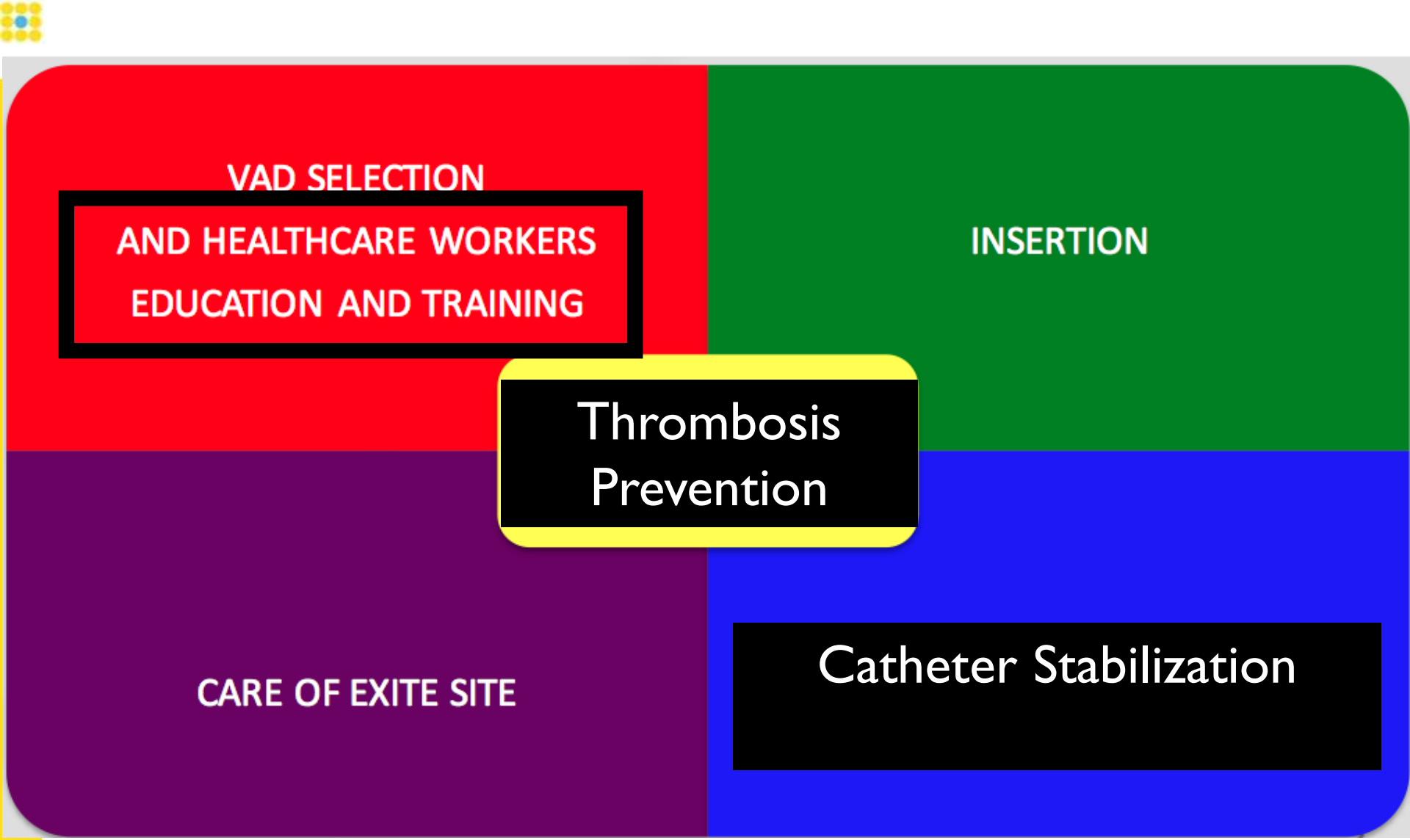
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Prevention
CARE OF EXITE SITE
Catheter Stabilization

BLOCKBUSTER

NETFLIX

Prof. Paolo Pelosi, *Sir Robert Macintosh Lecture, Euroanaesthesia 2019*

Grazie!

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