GAVeCeLT

Gli Accessi Venosi Centrali a Lungo Termine

GAVePed

Gruppo Accessi Venosi Pediatrici

Evidenze a favore della venipuntura ecoguidata

Dott.ssa Zanaboni Clelia
UOSD Anestesia
Ospedale Gaslini
Genova

Dal 1996 ad oggi…

✓ **Meta-analisi**

Randolph 1996, Rothschild 2001, Keenan 2002, Calvert 2003, etc.

✓ **Consensus e Position papers**

ACS 2008, AVA 2008, etc.

✓ **'Bundle' per la riduzione delle complicanze**

Protocollo ISALT2, protocollo ISP

✓ **Linee guida**

NICE 2002, BCSH 2006, EPIC 2007, ESPEN 2009, INS 2011, CDC 2011,INS 2016 etc.

Rischi e complicanze dell'accesso venoso centrale "*landmark*"

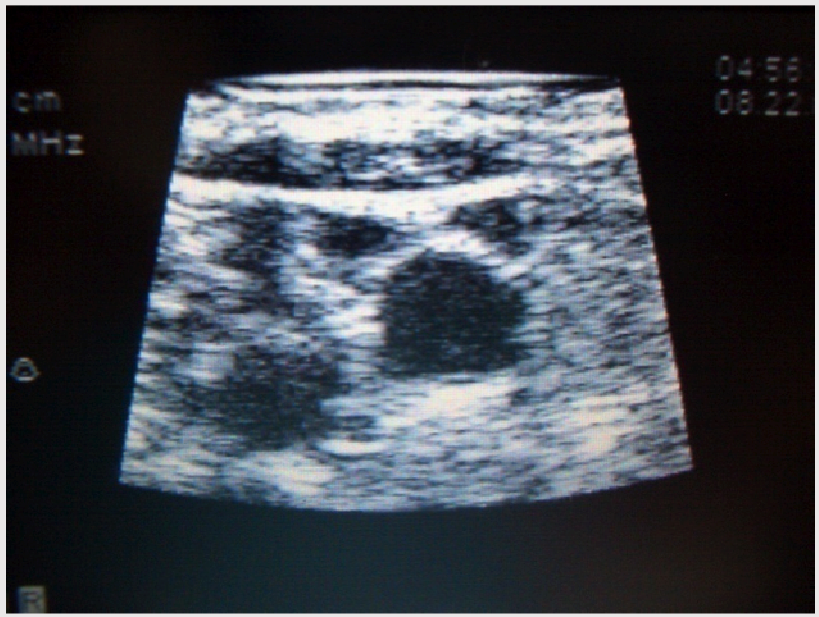
✓**Missed target**: ripetuti tentativi di puntura fino al fallimento

✓**Wrong target**: puntura di un'altra struttura (vaso arterioso, pleura, mediastino

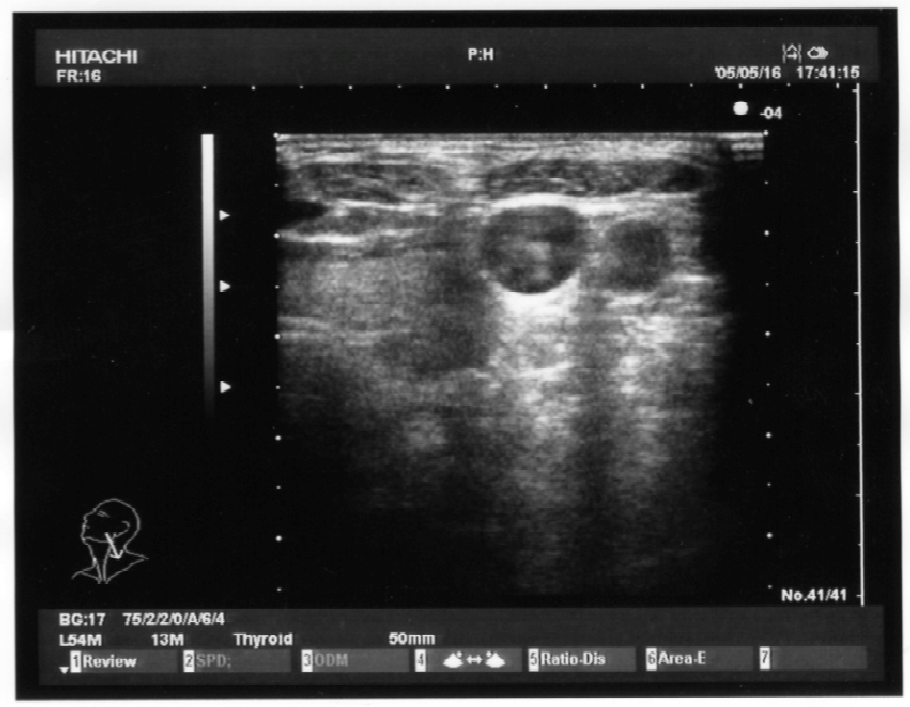
I 6 postulati della venipuntura ‘blind’

1. La vena c’è
2. La vena è nella posizione anatomica TIPICA
3. La vena è PERVIA
4. La vena è di CALIBRO adeguato
5. I reperi cutanei sono BEN DEFINITI
6. La vena non collassa significativamente in fase inspiratoria

1. La vena c’è…

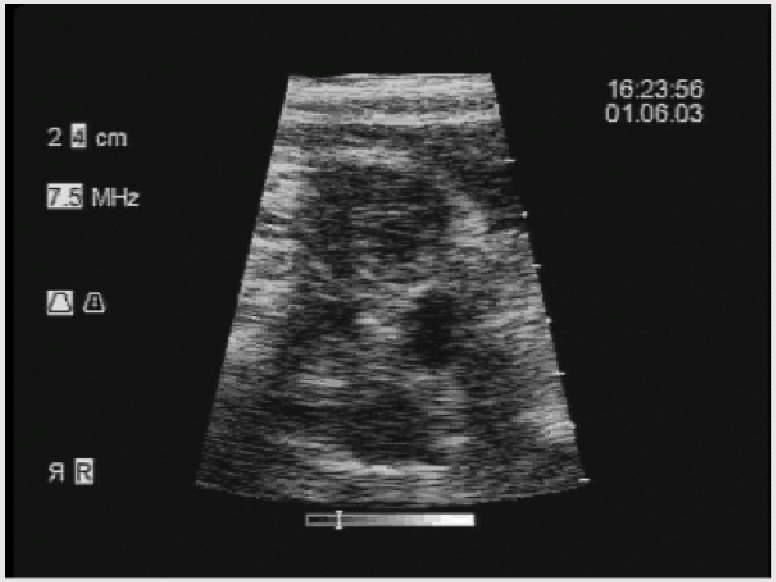
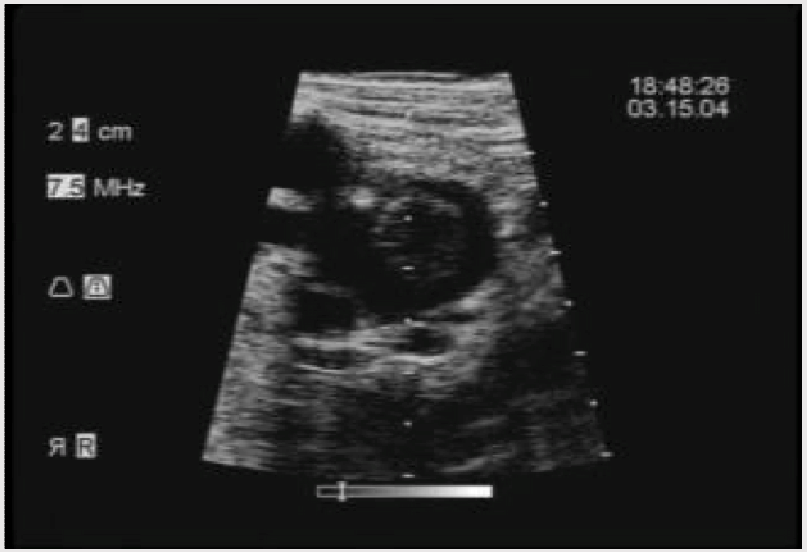
VGI doppia	Ematoma che oblitera la VGI
	

2. La vena è nella posizione anatomica TIPICA…

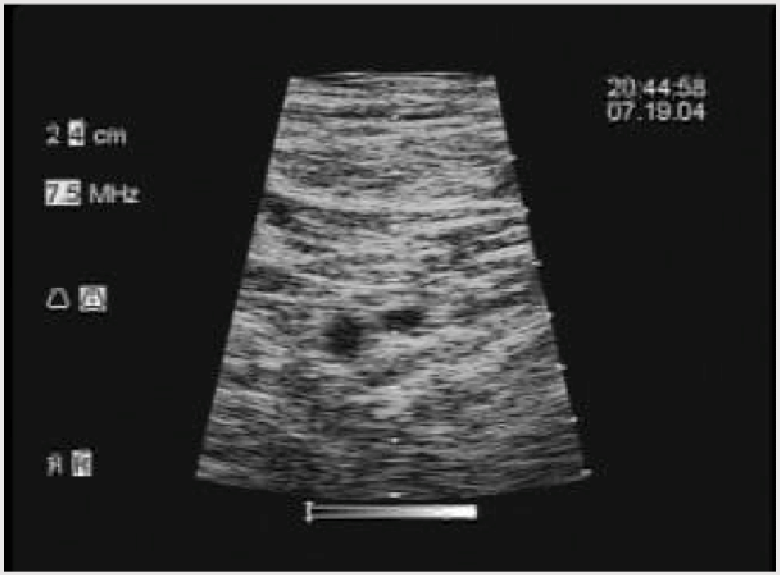


VGI mediale rispetto alla carotide

3. La vena è PERVIA…

Trombo in VGI	Trombo in VF
	

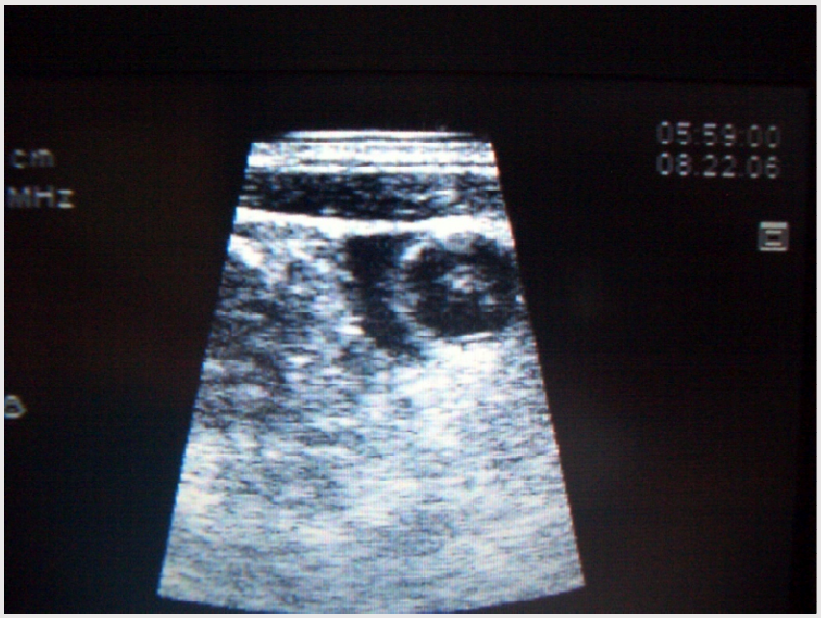
Mini VGI



Macro VGI

5. I reperi cutanei sono BEN DEFINITI…

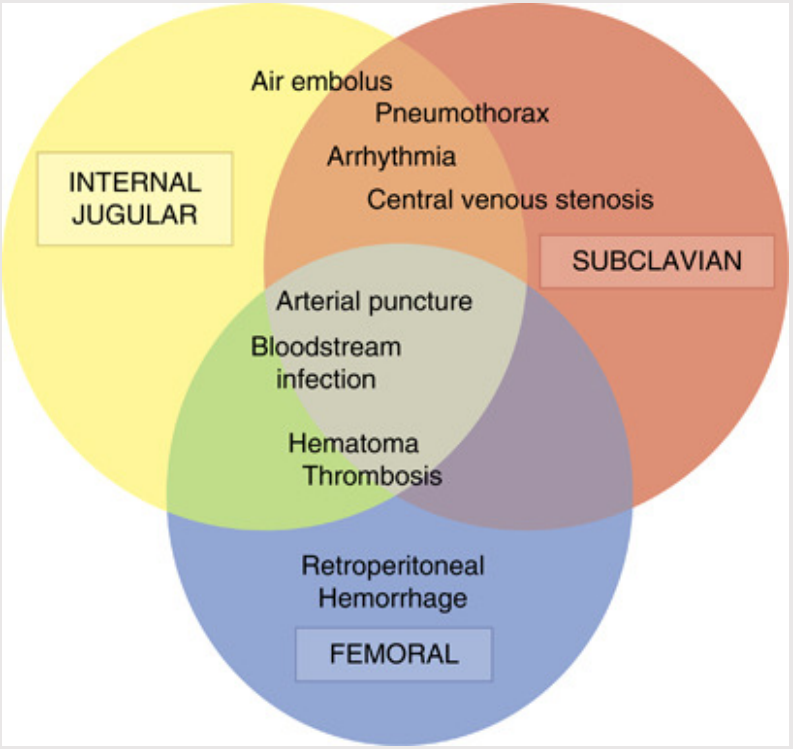
6. La vena non collassa in fase inspiratoria…



VGI durante inspirazione

Limiti Landmark

Due to normal human anatomical variances, landmarks cannot be trusted to offer accurate guidance in vascular selection and device insertion and their results in **complication rates exceeding 15%**



“there is strong statistical evidence to indicate that US-guided insertion of central catheters is more effective and safer than blind techniques in both adults and children. It may therefore now be considered unethical or lacking in common sense to withhold the use of this option”

Ma anche l'aspetto medico-legale…

Commentary

Can you justify not using ultrasound guidance for central venous access?

Andrew R Bodenham

Department of Anaesthesia, Leeds General Infirmary, Leeds, LS1 3EX, UK

Corresponding author: A R Bodenham, Andy.Bodenham@leedsth.nhs.uk

Published: 22 November 2006
This article is online at http://ccforum.com/content/10/6/175

Critical Care 2006, **10**:175 (doi:10.1186/cc5079)

See related research by Karakitsos *et al.*, http://ccforum.com/content/10/6/R162

Le evidenze pubblicate

- ✓ **Cfr le meta-analisi disponibili in letteratura**
  - ✓ Randolph 1996
  - ✓ Keenan 2002
  - ✓ Calvert 2003

- ✓ **Tutte dimostrano che la ecoguida si associa a**
  - ✓ Maggiore % successi al primo tentativo
  - ✓ Minore % di complicanze
  - ✓ Minor numero di punture ripetute
  - ✓ Minor costo
  - ✓ Minor tempo

Da dove siamo partiti quindi?

December 1996 - Volume 24 - Issue 12 - pp 2053-2058
Special Article

Ultrasound guidance for placement of central venous catheters: A meta-analysis of the literature

Randolph, Adrienne G. MD; Cook, Deborah J. MD, FRCPC, MSc(Epid); Gonzales, Calle A. MD, MPH; Pribble, Charles G. MD

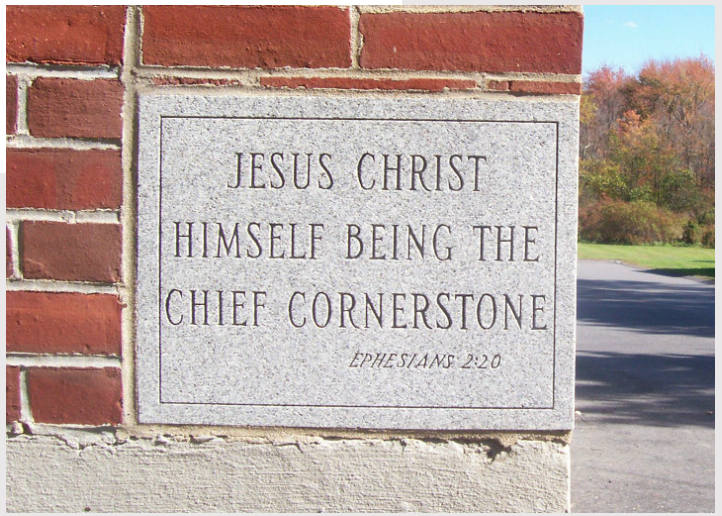
"When used for vessel location and catheter placement real-time, **ultrasound guidance or Doppler ultrasound guidance improves success rates** and **decreases the complications** associated with internal jugular and subclavian venous catheter placement."

Da dove siamo partiti quindi?

NICE National Institute for Health and Care Excellence

Guidance on the use of ultrasound locating devices for placing central venous catheters

Issued: September 2002



Tanto tempo fa…ma non troppo….

•Two-dimensional (2-D) imaging ultrasound guidance is recommended as the preferred method for insertion of CVCs into the internal jugular vein in adults and children in elective situations

•The use of 2-D imaging ultrasound guidance should be considered in most clinical circumstances where CVC insertion is necessary either electively or in an emergency situation

•It is recommended that all those involved in placing CVCs using 2-D imaging ultrasound guidance should undertake appropriate training to achieve competence

•Audio-guided Doppler ultrasound guidance is not recommended for CVC insertion

Tanto tempo fa…ma non troppo....

Anaesthesia, 2004, **59**, pages 1116–1120

Ultrasound for central venous cannulation: economic evaluation of cost-effectiveness

The marginal economic cost of using ultrasound for central venous cannulation was less than £10 per procedure

We believe that our simple economic model provides economic arguments which give further credence to the clinical effectiveness results previously presented supporting the wider use of ultrasound for central venous cannulation.

Tanto tempo fa…ma non troppo....

REVIEW

Should ultrasound guidance be used for central venous catheterisation in the emergency department?

P Atkinson, A Boyle, S Robinson, G Campbell-Hewson

Emerg Med J 2005;**22**:158–164. doi: 10.1136/emj.2003.011288

Table 1 Levels of evidence for various Outcome Measures with the use of Ultrasound Guidance for CVC insertion

Outcome measure	Highest level of evidence (In general)	Highest level of evidence (Emergency Department)
Mortality	None	None
Length of stay in ED/ Hospital	None	None
Reduction in failure rate	Meta-analysis	Not statistically significant
Improved first attempt success rate	Meta-analysis	RCT
Reduced time to cannulation	RCT	RCT
Reduced number of attempts	Meta-analysis	RCT
Reduced complication rate	Meta-analysis	RCT
Cost saving	Economical analysis	None

CVC, central venous cathetorisation; ED, emergency department; RCT, randomised controlled trial.

- 3 metanalisi
- 19 RCT

Tanto tempo fa…ma non troppo….

REVIEW

Should ultrasound guidance be used for central venous catheterisation in the emergency department?

P Atkinson, A Boyle, S Robinson, G Campbell-Hewson

Emerg Med J 2005;**22**:158–164. doi: 10.1136/emj.2003.011288

- The use of ultrasonography by emergency physicians in the UK is likely to increase in the future.
- With the increasing availability of ultrasound technology in the Emergency Department (ED), and the publication of national guidelines supporting its use, it is likely that ultrasound guidance for CVC placement in the ED will become more common.

Tanto tempo fa…ma non troppo….

ESPEN Guidelines on Parenteral Nutrition: Central Venous Catheters (access, care, diagnosis and therapy of complications)

Mauro Pittiruti [a], Helen Hamilton [b], Roberto Biffi [c], John MacFie [d], Marek Pertkiewicz [e]

Clinical Nutrition 28 (2009) 365–377

There is compelling evidence that ultrasound-guided venepuncture (by real-time ultrasonography) is associated with a lower incidence of complications and a higher rate of success than 'blind' venepuncture. Ultrasound support is therefore strongly recommended for all CVC insertions. Placement by surgical cutdown is not recommended, in terms of cost-effectiveness and risk of infection.	A	4
In placement of PICCs, percutaneous cannulation of the basilic vein or the brachial vein in the midarm, utilizing ultrasound guidance and the micro-introducer technique, is the preferred option	B	4

Ed in campo pediatrico?

British Journal of Anaesthesia 1993; 70: 145–148

USE OF ULTRASOUND TO EVALUATE INTERNAL JUGULAR VEIN ANATOMY AND TO FACILITATE CENTRAL VENOUS CANNULATION IN PAEDIATRIC PATIENTS†

P. J. ALDERSON, F. A. BURROWS, L. I. STEMP AND H. M. HOLTBY

Ed in campo pediatrico?

Radiology. 1995 Nov;197(2):542-4.

Peripherally inserted central venous catheters: US-guided vascular access in pediatric patients.

Donaldson JS[1], Morello FP, Junewick JJ, O'Donovan JC, Lim-Dunham J.

- **Initial placement was successful in 218 patients but unsuccessful in eight;**
- Catheters were in place from 3 days to 6 months (mean, 36 days).
- **US guidance allowed successful venipuncture for placement of central venous catheters in children.**

Ed in campo pediatrico?

Anesthesiology
1999; 91:71–77

Ultrasound-guided Internal Jugular Venous Cannulation in Infants

A Prospective Comparison with the Traditional Palpation Method

JVA
ISSN 1129-7298

J Vasc Access 2015; 16 (2): 130-136
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]

[1] General and Thoracic Surgery Unit, Department of Surgery, Bambino Gesù Children's Hospital, IRCCS, Rome - Italy
[2] Pediatric Oncology Unit, Vito Fazzi Hospital, Lecce - Italy
[3] Department of Surgery, "Agostino Gemelli" Catholic University, Rome - Italy
[4] Pediatric Hematology and Oncology Unit, Department of Pediatrics, Azienda Ospedaliero-Universitaria di Parma, Parma - Italy
[5] Pediatric Hematology and Oncology, Pediatric Clinic, Azienda Ospedaliero-Universitaria Policlinico, Bari - Italy
[6] Thrombosis and Hemostasis Unit, Giannina Gaslini's Children Hospital, Genova - Italy
[7] Pediatric Hematology Oncology, Azienda Ospedaliera Universitaria Integrata, Verona - Italy
[8] Pediatric Surgery Unit, University Policlinic Hospital, Modena - Italy
[9] Pediatric Immunology and Bone Marrow Transplantation Unit, San Raffaele Telethon Institute for Gene Therapy (HSR-TIGET), "San Raffaele" Scientific Institute, Milan - Italy
[10] Institute for Maternal and Child Health, IRCCS "Burlo Garofolo", Trieste - Italy

Tanto tempo fa…ma non troppo….

A Prospective Randomized Trial of Ultrasound- vs Landmark-Guided Central Venous Access in the Pediatric Population

Matias Bruzoni, MD, Bethany J Slater, MD, James Wall, MD, Shawn D St Peter, MD, Sanjeev Dutta, MD, FACS

The use of ultrasound guidance by pediatric surgeons performing venous cannulation for central line placement in children **reduces the number of cannulation attempts** necessary for venous access compared with the standard landmark-guided technique, **suggesting a potential to decrease complications** from this procedure if ultrasound is routinely used.

J Am Coll Surg 2013;216:939e943.

J Am Coll Surg. 2013 May;216(5):939-43. doi: 10.1016/j.jamcollsurg.2013.01.054. Epub 2013 Mar 7.

A prospective randomized trial of ultrasound- vs landmark-guided central venous access in the pediatric population.

Bruzoni M, Slater BJ, Wall J, St Peter SD, Dutta S.

- ✓RCT
- ✓150 pts < 18 anni
- ✓Outcome primario: N° tentativi
- ✓Outcome secondario: tempo, puntura arteriosa, altre complicanze
- ✓Solo VGI

RESULTS: There were 150 patients enrolled between April 2008 and September 2011. There was no difference when comparing demographic data. Success at first attempt was achieved in 65% of patients in the **ultrasound** group vs 45% in the landmark group (p = 0.021). Success within 3 attempts was achieved in 95% of **ultrasound** group vs 74% of landmark group (p = 0.0001).

CONCLUSIONS: Ultrasound reduced the number of cannulation attempts necessary for **venous access**. This indicates a potential to reduce complications when **ultrasound** is used by pediatric surgeons.

Am J Infect Control. 2011 May;39(4 Suppl 1):S1-34. doi: 10.1016/j.ajic.2011.01.003.

Guidelines for the prevention of intravascular catheter-related infections.

O'Grady NP, Alexander M, Burns LA, Dellinger EP, Garland J, Heard SO, Lipsett PA, Masur H, Mermel LA, Pearson ML, Raad II, Randolph AG, Rupp ME, Saint S; Healthcare Infection Control Practices Advisory Committee.

TABLE 2. Summary of Selected, Key Recommendations for the Prevention of Catheter-Associated Bloodstream Infections

Recommendations	Category
CVC insertion	
Avoid using femoral vein for central venous access in adults	1A
Use a CVC with the minimum number of ports essential for patient management	1B
Use ultrasound guidance to place CVCs (if this technology is available and the operator has been trained) to reduce the number of cannulation attempts and mechanical complications	1B

Karakitsos et al.

Critical Care, 2006

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)
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%)

Linee guida internazionali di riferimento

- ✓ Raccomandazioni AHRQ 2001
- ✓ Linee guida NICE 2002
- ✓ Linee guida pediatriche ESPEN 2005
- ✓ Linee guida BCSH 2006
- ✓ Linee guida EPIC 2007
- ✓ Position Statement AVA 2008
- ✓ Position Statement ACS 2008
- ✓ Linee guida ESPEN 2009
- ✓ Linee guida CDC Atlanta 2011
- ✓ INS 2016

Le Linee Guida:

NICE 2002

1.1 Two-dimensional (2-D) imaging ultrasound guidance is recommended as the preferred method for insertion of central venous catheters (CVCs) into the internal jugular vein (IJV) in adults and children in elective situations.

ESPEN 2009

There is compelling evidence that ultrasound-guided venepuncture (by real-time ultrasonography) is associated with a lower incidence of complications and a higher rate of success than 'blind' venepuncture. Ultrasound support is therefore strongly recommended for all CVC insertions. Placement by surgical cutdown is not recommended, in terms of cost-effectiveness and risk of infection. A

CDC 2011

Use ultrasound guidance to place central venous catheters (if this technology is available) to reduce the number of cannulation attempts and mechanical complications. Ultrasound guidance should only be used by those fully trained in its technique. [60–64].

Category 1B

Le Linee Guida:

ASECHO\SCA 2012

10.2. Recommendations for Pediatric Patients

It is the recommendation of this writing committee that trained clinicians use real-time ultrasound during IJ cannulation whenever possible to improve cannulation success and reduce the incidence of complications associated with the insertion of large-bore catheters in pediatric patients. This recommendation is based on category A, level 1 supportive literature. *It is also the recommendation of this council that trained clinicians use real-time ultrasound during FV cannulation whenever possible to improve cannulation success and reduce the incidence of complications associated with insertion of*

SHEA\IDSA 2014

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 noninfectious complications of CVC placement.[100]

SFAR 2015

3.6.3. *Guideline*

To insert central venous access via the internal jugular vein in children, ultrasound-guided puncture should be used rather than anatomical cutaneous landmark-based cannulation (level 1+).

Consensus, Standards of practice, Position Papers:

Intensive Care Med 2012

Ultrasound guidance should be routinely used for short- and long-term central venous access in children and neonates	A

Ann Intern Med 2013

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

Consensus, Standards of practice, Position Papers:

RCN fourth edition

Use of 2D ultrasound imaging is recommended for all routine placements of all central venous access devices (Bodenham et al., 2016; Lamperti et al., 2012).

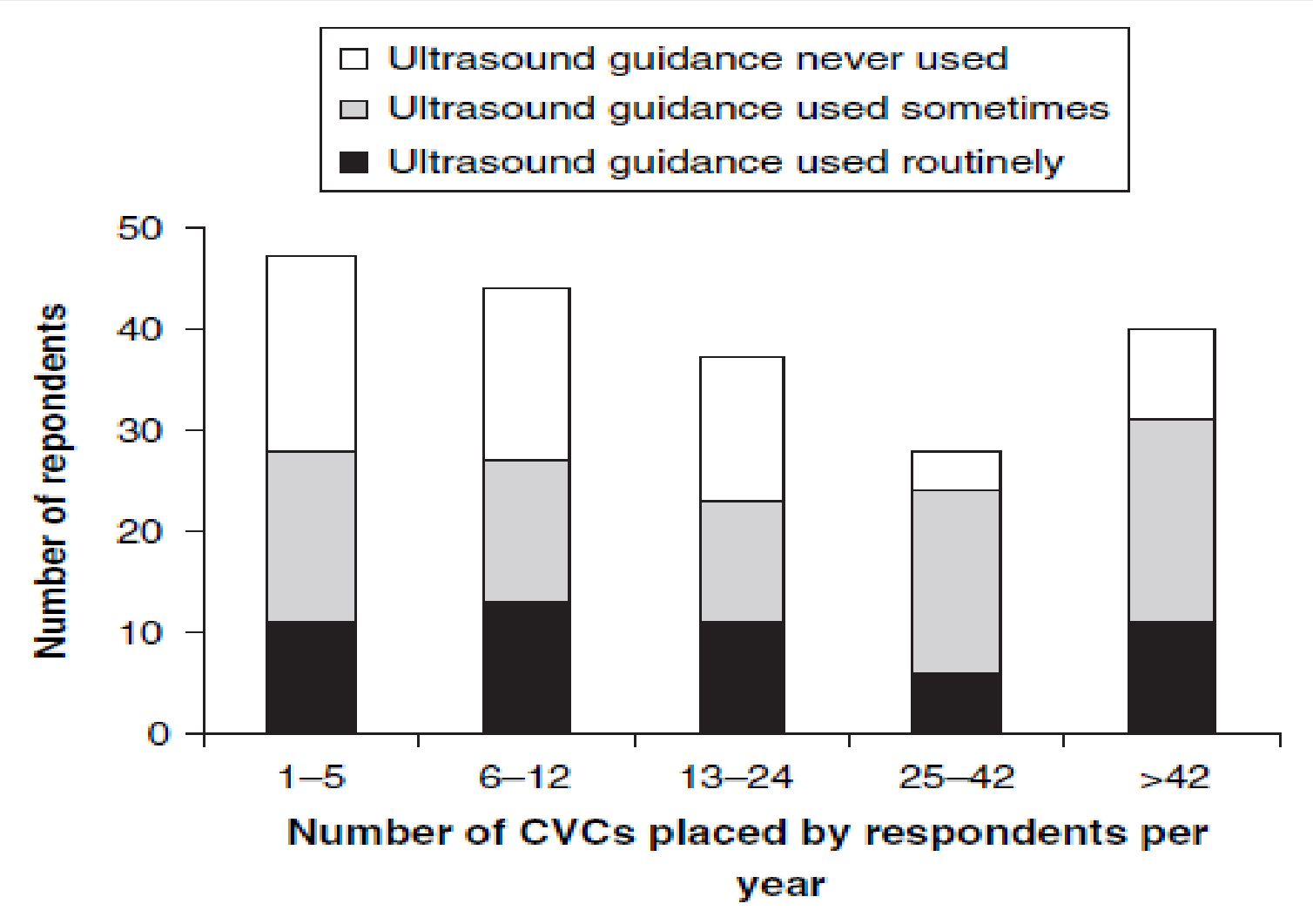
Bundle GAVeCeLT

3. IMPIANTO ECOGUIDATO, OVUNQUE POSSIBILE, SIA PER I CATETERI A INSERZIONE CENTRALE CHE PER I CATETERI A INSERZIONE PERIFERICA).

AIEOP 2014

Ultrasound-guided venipuncture should be adopted, so as to reduce the risk of early and late complications.

La realtà quotidiana..



Bosman, Pediatric Anesthesia 2006

Table 2. Description of Ultrasound Use for Central Venous Cannulation

	Number of responders
Frequency of US use	
Never	549 (37.4)
1	435 (29.6)
2	156 (10.6)
3	107 (7.3)
4	110 (7.7)
Always	113 (7.7)
Reasons for not using US	
Cost	18 (1.4)
Time delay to obtain US	95 (7.2)
Time delay to perform CVS with US	113 (8.5)
Lack of availability of US	234 (17.7)
No need to use US to perform CVC	605 (45.7)
Other	19 (1.3)
Missing	235 (17.8)
Description of US use for CVC	
Real-time (during needle puncture)	246 (26.4)
Screen anatomy	293 (31.4)
Rescue (after initial CVC attempt fails)	375 (40.2)
Other	19 (2.0)
Verification of CVC placement	
None	9 (0.6)
Color/pulsatility of blood	695 (46.5)
Mechanical transduction	501 (33.5)
Electronic transduction (waveform)	183 (12.3)
TEE visualization of wire	60 (4.0)
Other	20 (1.3)
Missing	26 (1.7)

Values given in parentheses indicate percentages.
CVC = central venous cannulation; US = ultrasound; TEE = transesophageal echocardiography.

Bailey, Anesth Analgesia 2007

Evidenze..

Pediatric Anesthesia

Pediatric Anesthesia 2009 **19**: 1199–1206 doi:10.1111/j.1460-9592.2009.03171.x

Ultrasound guided internal jugular vein access in children and infant: A meta-analysis of published studies

STEPHANIE SIGAUT MD*, ALIA SKHIRI MD*, IDA STANY MD*, JONATHAN GOLMAR MD*, YVES NIVOCHE MD PhD†, ISABELLE CONSTANT MD PhD‡, ISABELLE MURAT MD PhD§ AND SOUHAYL DAHMANI MD PhD*

**Assistant Professor of Anesthesia, Robert Debre University Hospital, †Professor of Anesthesia, Head of Department, Robert Debre University Hospital, ‡Professor of Anesthesia, Trousseau University Hospital and §Professor of Anesthesia, Head of Department, Trousseau University Hospital, Paris, France*

In conclusion, the current meta-analysis has shown UPG to have no effects on both success rate and complications during IJV access in children and infant. However, this technique seems useful when used by novice operators or when limited to the prelocation of the vein.

Evidenze..

Authors, Year of publication	*Age (mean ± SD)*	*Weight (mean ± SD)*	*Surgery*	*Ultrasound technique*	*Practitioners*	*Failure U (%)*	*Failure L (%)*
Alderson PJ, 1993 (2)	281 ± 218 vs 258 ± 170 (days)	6.8 ± 2.5 vs 6.6 ± 2.5 (Kg)	Not defined	PL	Senior	0	20
Chuan WX, 2005 (7)	21 ± 13 vs 20.5 ± 12.83 (months)	8.9 ± 2 vs 8.8 ± 1.97 (Kg)	Cardiac Surgery	PL	Senior	0	20
Verghese ST, 1999 (8)	5.9 ± 4.4 vs 6.4 ± 3.8 (months)	5.8 ± 2/6.0 ± 2.3 (Kg)	Cardiac Surgery	IUG	Fellows	0	23.1
Verghese ST, 2000 (9)	5.4 ± 4.1 vs 5.1 ± 3.8 (months)	6 ± 1.8 vs 5 ± 2.1 (Kg)	Cardiac Surgery	IUG	Fellows	6	18.7
Grabenic CR, 2004 (10)	2 days–7 year vs 1 day–8 year	8.9 ± 5.99 vs 8.57 ± 5.39 (Kg)	Cardiac Surgery	IUG	Senior	20	10.8

PL, prelocation; IUG, intraoperative ultrasound guidance; U, ultrasound; L, skin landmark

Pediatric Anesthesia 2009 **19**: 1199–1206

Paediatr Anaesth. 2009 Dec;19(12):1199-206. doi: 10.1111/j.1460-9592.2009.03171.x. Epub 2009 Oct 23.

Ultrasound guided internal jugular vein access in children and infant: a meta-analysis of published studies.

Sigaut S, Skhiri A, Stany I, Golmar J, Nivoche Y, Constant I, Murat I, Dahmani S.

✓**Non vantaggi significativi**

Limiti

- ✓Numero pazienti arruolati
- ✓Solo VGI
- ✓Eco assistenza e Eco Guida

Evidenze 2.0..

Systematic Review

Pediatric RESEARCH Volume 80 | Number 2 | August 2016

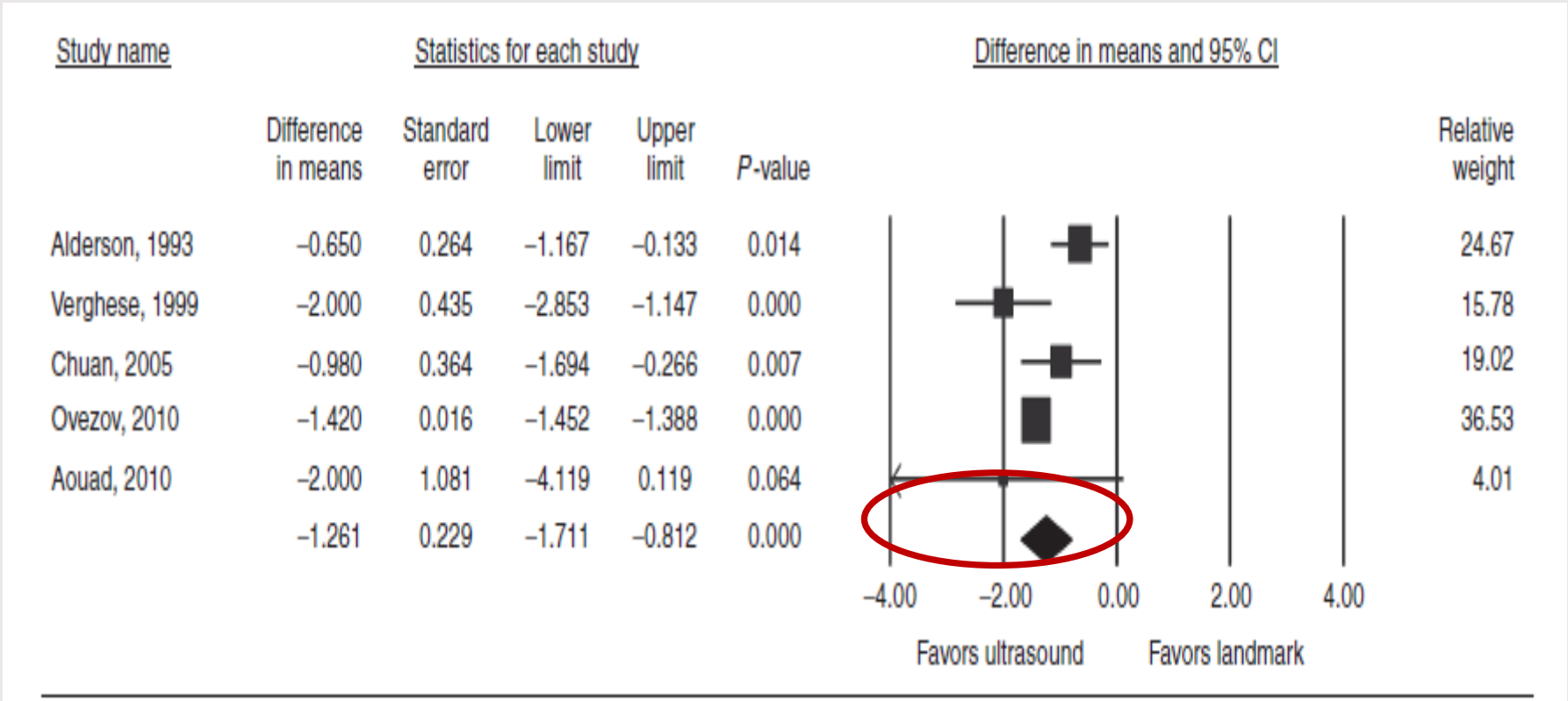
Ultrasound-guided central venous catheter placement increases success rates in pediatric patients: a meta-analysis

Christine S.M. Lau[1,2] and Ronald S. Chamberlain[1,2,3]

Despite these limitations, this study demonstrates that US guidance improves CVC insertion success rates, efficacy, and safety among pediatric patients. Given the number of CVC insertions performed and the risk of morbidity associated with LM-guided CVC insertions, US guidance should be utilized for CVC placements in most, if not all, pediatric patients.

Evidenze 2.0..

N° di tentativi:



Study name	Difference in means	Standard error	Lower limit	Upper limit	*P*-value	Relative weight
Alderson, 1993	−0.650	0.264	−1.167	−0.133	0.014	24.67
Verghese, 1999	−2.000	0.435	−2.853	−1.147	0.000	15.78
Chuan, 2005	−0.980	0.364	−1.694	−0.266	0.007	19.02
Ovezov, 2010	−1.420	0.016	−1.452	−1.388	0.000	36.53
Aouad, 2010	−2.000	1.081	−4.119	0.119	0.064	4.01
	−1.261	0.229	−1.711	−0.812	0.000	

Figure 2. Forest plot evaluating the difference in mean for the number of attempts required for central venous catheter placement with the use of ultrasound guidance among pediatric patients. (Note: Individual studies are represented by the squares. Overall summaries are represented by the diamonds).

Pediatric RESEARCH Volume 80 | Number 2 | August 2016

Evidenze 2.0..

Puntura accidentale arteriosa:

Study name	Ultrasound	Landmark	Risk ratio	Lower limit	Upper limit	*P*-value	Relative weight
Alderson, 1993	1/20	2/20	0.500	0.049	5.083	0.558	10.84
Verghese, 1999	0/43	13/52	0.045	0.003	0.729	0.029	8.94
Verghese, 2000	1/16	3/16	0.333	0.039	2.874	0.318	11.58
Grebanik, 2004	7/59	4/65	1.928	0.594	6.254	0.274	16.64
Chuan, 2005	1/32	8/30	0.117	0.016	0.882	0.037	12.23
Ovezov, 2010	1/107	28/102	0.034	0.005	0.246	0.001	12.44
Aouad, 2010	3/24	1/24	3.000	0.335	26.841	0.326	11.41
Bruzoni, 2013	3/66	7/84	0.545	0.147	2.029	0.366	15.92
			0.359	0.118	1.093	0.071	

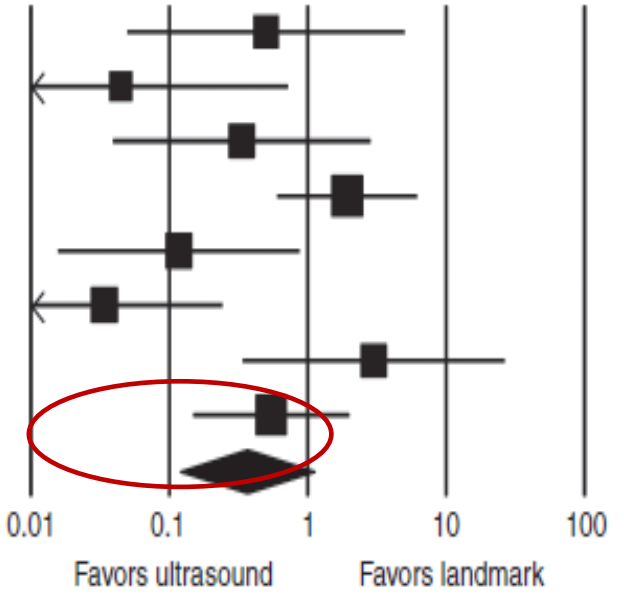


Figure 3. Forest plot evaluating the relative risk of accidental arterial puncture with the use of ultrasound guided central venous catheter insertion among pediatric patients (Note: Individual studies are represented by the squares. Overall summaries are represented by the diamonds).

Pediatric RESEARCH Volume 80 | Number 2 | August 2016

Evidenze 2.0..

Tempo di incannulamento:

Study name	Difference in means	Standard error	Lower limit	Upper limit	*P*-value	Relative weight
Alderson, 1993	–0.110	0.209	–0.519	0.299	0.598	40.05
Verghese, 1999	–9.800	2.337	–14.381	–5.219	0.000	8.30
Verghese, 2000	–2.100	1.616	–5.267	1.067	0.194	14.24
Grebanik, 2004	0.090	0.379	–0.653	0.833	0.812	37.40
	–1.123	0.753	–2.600	0.353	0.136	

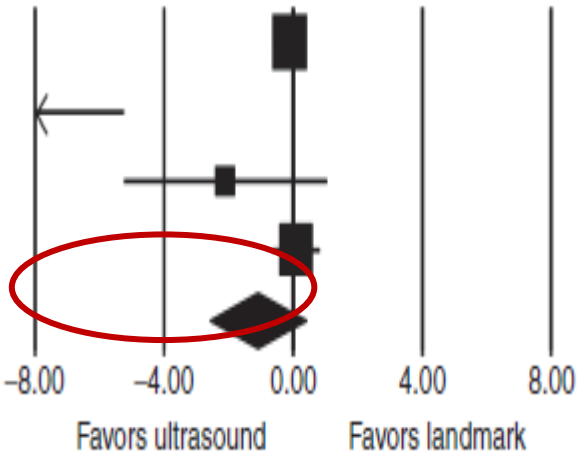


Figure 4. Forest plot evaluating the difference in mean for time to cannulation with the use of ultrasound guided central venous catheter insertion among pediatric patients (Note: Individual studies are represented by the squares. Overall summaries are represented by the diamonds).

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Evidenze 2.0..

Successo della procedura:

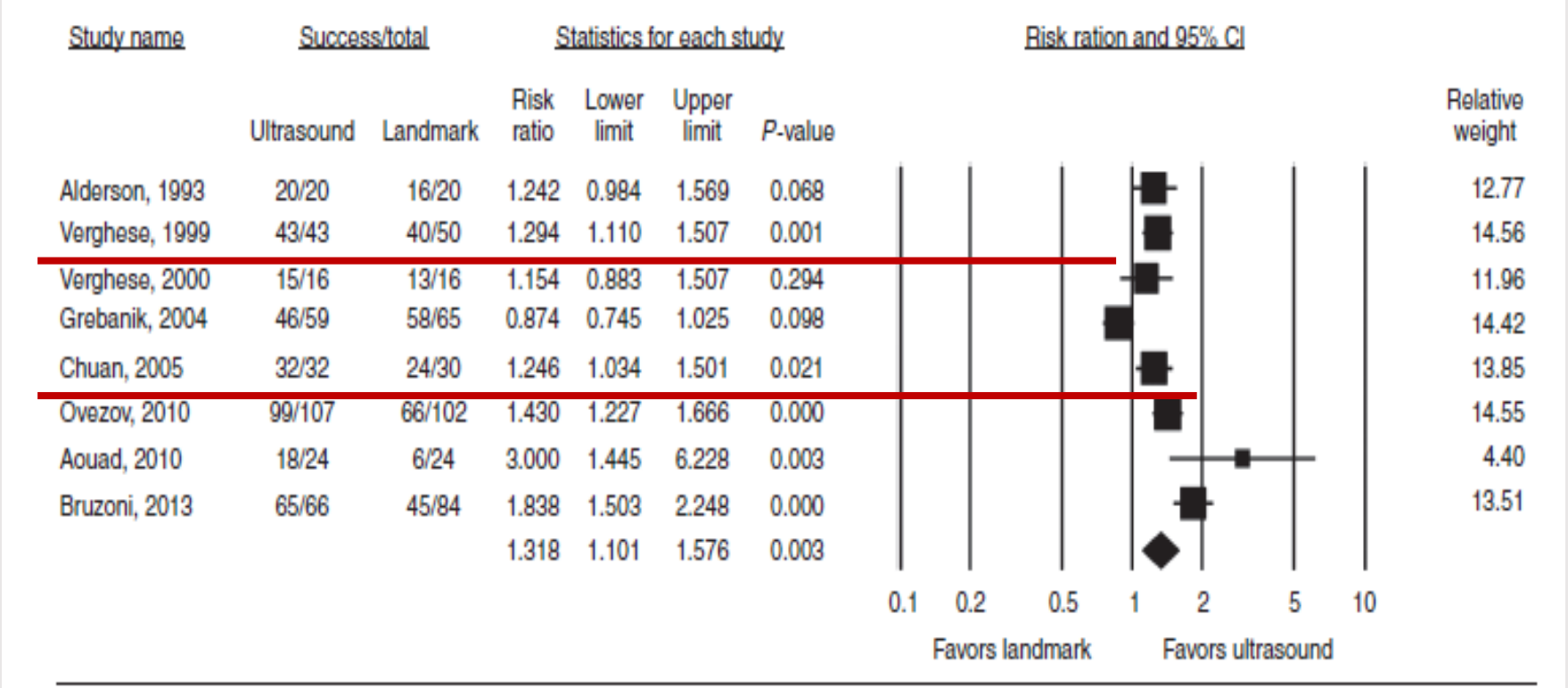

Figure 1. Forest plot evaluating the relative risk of successful central venous catheter placement with the use of ultrasound guidance among pediatric patients (Note: Individual studies are represented by the squares. Overall summaries are represented by the diamonds).

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La differenza è nel training!

Training….

Pediatr Surg Int (2010) 26:819–824
DOI 10.1007/s00383-010-2636-z

Shifting from open surgical cut down to ultrasound-guided percutaneous central venous catheterization in children: learning curve and related complications

Shifting from OSC to US-guided percutaneous CVC insertion inevitably involves a challenging learning curve which is generally associated with high complication rates. **Complications progressively decrease once a good experience in US guidance and percutaneous technique has been obtained.**

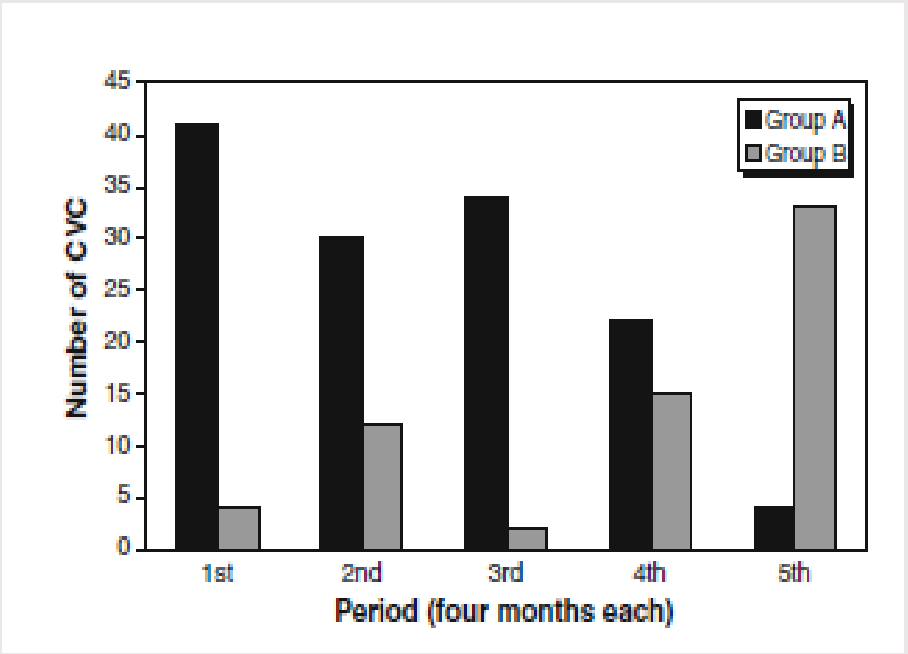
Questione di training..

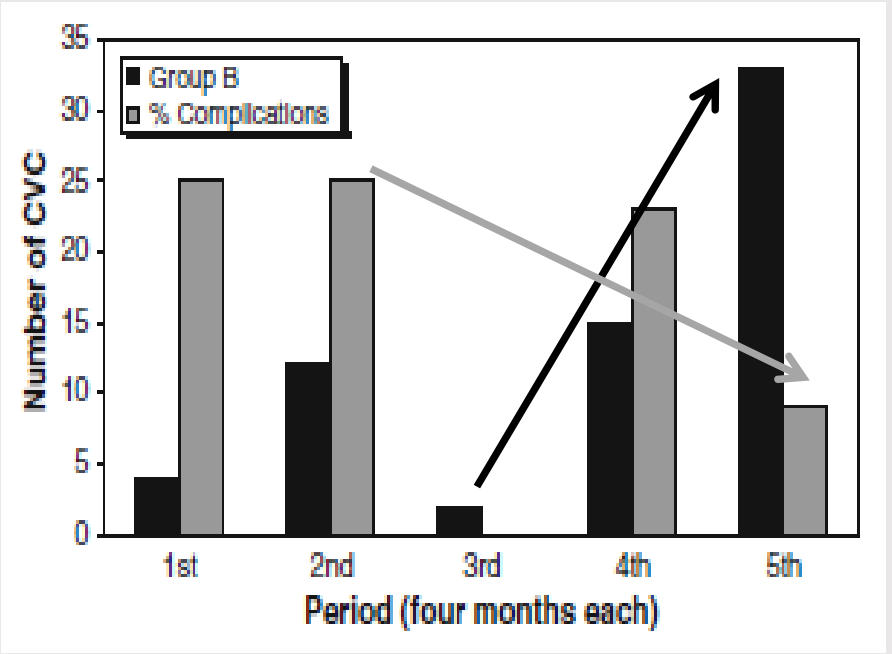
Pediatr Surg Int (2010) 26:819–824
DOI 10.1007/s00383-010-2636-z

ORIGINAL ARTICLE

Shifting from open surgical cut down to ultrasound-guided percutaneous central venous catheterization in children: learning curve and related complications

S. Avanzini · E. Guida · M. Conte · F. Faranda · P. Buffa · C. Granata · E. Castagnola · G. Fratino · L. Mameli · A. Michelazzi · A. Pini-Prato · G. Mattioli · A. C. Molinari · E. Lanino · V. Jasonni





Evidence-based consensus on the insertion of central venous access devices: definition of minimal requirements for training

N. Moureau[1], M. Lamperti[2*], L. J. Kelly[3], R. Dawson[4], M. Elbarbary[5], A. J. H. van Boxtel[6] and M. Pittiruti[7]

BJA 2013

It is necessary to have minimal cannulation of 70 central vein punctures per year in order to maintain the skills and the competence in these patients.[91] Ultrasound guidance enhances first-time success and time to cannulation in small infants, but requires supervised training to gain proficiency. It has been demonstrated to take 15 supervised, ultrasound-guided cannulations to reach proficiency with small infants.[91]

E' dimostrato che un processo di training sistematico riduce le complicanze meccaniche e infettive

Ultrasound-guided central venous catheter placement decreases complications and decreases placement attempts compared with the landmark technique in patients in a pediatric intensive care unit*

Curt D. Froehlich, MD; Mark R. Rigby, MD, PhD, FAAP; Eli S. Rosenberg, BS; Ruosha Li, BS; Pei-Ling J. Roerig, BS, CCRC; Kirk A. Easley, MS; Jana A. Stockwell, MD, FAAP, FCCM

Crit Care Med 2009 Vol. 37, No. 3

Table 3. Clinical outcomes by catheter placement method and operator experience

	Resident, n = 35						Fellow, n = 147						Attending, n = 14						PNP, n = 16					
	Landmark		Ultrasound				Landmark		Ultrasound				Landmark		Ultrasound				Landmark		Ultrasound			
	%	Count	%	Count	OR	*p*	%	Count	%	Count	OR	*p*	%	Count	%	Count	OR	*p*	%	Count	%	Count	OR	*p*
Success	100.0	(11/11)	91.6	(22/24)	—	1.00	87.9	(58/66)	90.1	(73/81)	1.26	0.66	77.8	(7/9)	80.0	(4/5)	1.14	1.00	85.7	(6/7)	100.0	(9/9)	<.001	0.43
Placement attempts					.001						0.04						0.25						0.28	
1	9.1	(1/11)	41.7	(10/24)	1.00		40.9	(27/66)	56.8	(46/81)	1.00		22.2	(2/9)	60.0	(3/5)	1.00		28.6	(2/7)	66.7	(6/9)	1.00	
2	9.1	(1/11)	33.3	(8/24)	0.80		13.6	(9/66)	14.8	(12/81)	0.78		11.1	(1/9)	0.0	(0/5)	—		42.9	(3/7)	11.1	(1/9)	0.11	
3	18.2	(2/11)	12.5	(3/24)	0.15		12.1	(8/66)	6.2	(5/81)	0.37		0.0	(0/9)	0.0	(0/5)	—		0.0	(0/7)	11.1	(1/9)		
4+	63.6	(7/11)	12.5	(3/24)	0.04		33.3	(22/66)	22.2	(18/81)	0.48		66.7	(6/9)	40.0	(2/5)	0.22		28.6	(2/7)	11.1	(1/9)	0.17	
Complications																								
Art puncture	18.2	(2/11)	12.5	(3/24)	0.64	0.64	21.2	(14/66)	5.0	(4/80)	0.20	.003	0.0	(0/9)	40.0	(2/5)	—	0.11	28.6	(2/7)	11.1	(1/9)	0.31	0.55
Other	9.1	(1/11)	8.3	(2/24)	0.91	1.00	16.7	(11/66)	13.6	(11/81)	0.79	0.60	33.3	(3/9)	20.0	(1/5)	0.50	1.00	14.3	(1/7)	11.1	(1/9)	0.75	1.00
	Med.	(Q1, Q3)	n	Med.	(Q1, Q3)	n	*p*	Med.	(Q1, Q3)	n	Med.	(Q1, Q3)	n	*p*	Med.	(Q1, Q3)	n	Med.	(Q1, Q3)	n	*p*	Med.	(Q1, Q3)	n	Med.	(Q1, Q3)	n	*p*
Time to wire (sec)	919	(268, 1606)	11	405	(133, 512)	22	0.02	153	(48, 619)	58	124	(62, 278)	73	0.67	340	(89, 1470)	7	100	(50, 989)	4	0.32	314	(182, 335)	6	114	(86, 317)	9	0.20

OR, odds ratio; Med., median; PNP, pediatric nurse practitioner.

Il documento più recente e completo…

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

2012

Expert Panel

Task Force di Esperti riuniti nel2010 al WoCoVA ad Amserdam 47 raccomandazioni formali sull'utilizzo dell'ecografo durante il posizionamento di accessi vascolari di cui 8 raccomandazioni pediatriche

Nel paziente pediatrico e nel neonato la venipuntura richiede piu' training e una curva di apprendimento piu' lunga rispetto all'adulto

…nel bambino e nel neonato…

Ultrasound vascular access in neonates and children		
Domain code	Suggested definition	Level of evidence
D4.SD1.S1–2	Ultrasound guidance should be routinely used for short- and long-term central venous access in children and neonates	A
D4.SD1.S3	Ultrasound vessel imaging with ultrasound assistance as "a minimum" should be routinely performed before internal jugular vein puncture in neonates	A
D4.SD1.S4	In neonates, ultrasound screening should be used before subclavian vein puncture. Ultrasound-guided puncture should be considered for catheterization using the supra-clavicular route, but this technique requires experienced operators	C
D4.SD1.S5	Ultrasound vessel screening should be routinely used before femoral vein puncture. Ultrasound-guided femoral puncture is recommended to decrease inadvertent arterial puncture	B
D4.SD1.S6	Ultrasound guidance can be considered when difficult peripheral venous access is required in areas such as the antecubital fossa and ankle. Blind deep antecubital fossa puncture should disappear	C
D4.SD1.S7	Ultrasound-guided arterial catheterization improves first-pass success and should be used routinely in children and neonates	A
D4.SD1.S8	After central venous catheter placement in paediatric patients including neonates, the ultrasound equipment should remain easily accessible at the patient's bedside to detect early life-threatening catheter-related complications such as pneumothorax, cardiac tamponade and hemothorax	B
D4.SD1.S9	There is no ideal site for cannulation in children; the best site should be determined after ultrasound examination	A

Il nuovo concetto che emerge dalla letteratura e dalla pratica clinica è:

USO *'CLINICO - INTEGRATO'* DELL'ECOGRAFO

- ✓ Per la scelta della vena
- ✓ Per la venipuntura
- ✓ Per la corretta direzione del catetere
- ✓ Per l'esclusione di complicanze immediate
- ✓ Per la verifica della posizione della punta
- ✓ Diagnosi di complicanze tardive non infettive

Dalla pratica clinica all'evidence based medicine

La consensus GAVeCeLT-WINFOCUS-WoCoVA 2012 ingloba e sistematizza una serie di nozioni e osservazioni emerse dalla pratica clinica degli ultimi anni.

1)Estensione della ecoguida a TUTTE le situazioni in cui è necessario pungere o incannulare vasi venosi o arteriosi, in QUALUNQUE paziente

2)Uso 'GLOBALE' dell'ecografo, non soltanto per la venipuntura ma anche per altri aspetti cruciali, quali la scelta della vena, la diagnosi precoce di complicanze, la verifica della posizione della punta, etc.

Take Home Messages

- La puntura ecoguidata è quella più sicura

-La puntura ecoguidata è quella più efficiente

- La puntura ecoguidata è costo-efficace

- Ad oggi non è più giustificabile chi non la utilizza

- Bisogna prevedere un periodo di training

- La cosa più difficile da cambiare è la nostra abitudine

Grazie dell’attenzione