

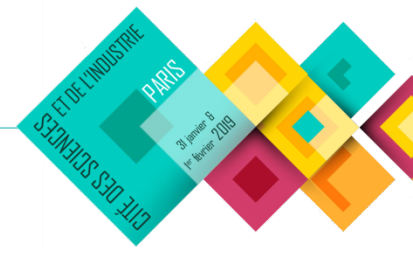
# A European experts' consensus on peripheral vascular access management

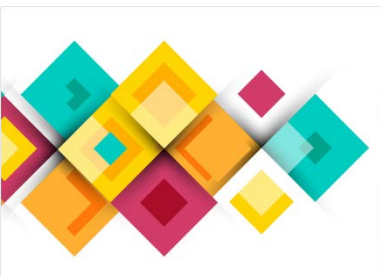


UNIVERSITÀ  
CATTOLICA  
del Sacro Cuore

*Mauro Pittiruti*

WoCova  
World Congress Vascular Access

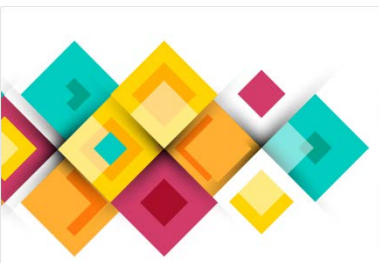




# ERPIUP

**E**uropean  
**R**ecommendations  
for the **P**roper **I**ndication  
and **U**se of **P**eripheral venous access

# WHY DID WE NEED A EUROPEAN CONSENSUS ON PERIPHERAL VENOUS ACCESS?



Mainly...

...because the peripheral VADs are the most commonly used, the most neglected and the most prone to complications

*The Art and Science of Infusion Nursing*

Robert E. Helm, MD  
Jeffrey D. Klausner, MD, MPH  
John D. Klemperer, MD  
Lori M. Flint, BSN, RN, CCRN  
Emily Huang, BA

Accepted but Unacceptable: Peripheral IV  
Catheter Failure

**Helms 2015**

**Catheter failure = 43-59%**

## Letter to the Editor

**Closed vs open systems: when should short peripheral intravenous catheters be the first choice?**

Madam,

We read with interest the COSMOS study by González López *et al.*, in which the authors compared closed-system (COS) peripheral intravenous catheters (PIVCs) with open-system (MOS) PIVCs in 631 patients in three medical and surgical wards.<sup>1</sup> Although indwelling time is considered to be a risk factor for the occurrence of catheter-related complications (CRCs), the need for routine replacement of PIVCs remains a subject of debate. The Centers for Disease Control and Prevention (CDC) recommend that PIVCs should be replaced every 72–96 h in adults in order to reduce the risk of infection and phlebitis.<sup>2</sup> However, this recommendation is based on dated studies with several methodological limitations, including the use of old PIVC technology.<sup>3–5</sup>

COSMOS, a prospective, randomized controlled trial, found that, in comparison with the use of COS PIVCs, patients who received MOS PIVCs showed a significant reduction in the rate of phlebitis (44.75 vs 31.01 per 1000 catheter-days;  $P = 0.004$ ), CRCs (135.57 vs 109.87;  $P < 0.001$ ) and infiltrations (66.9% vs 54.49%;  $P = 0.021$ ). There were no significant differences in catheter-related bacterial colonization and infection rates (21.3% vs 22.6% and 2.5% vs 2.2%, respectively). As 80.4% of the COS PIVCs were replaced after 144 h without any complications, the authors also highlighted the potential economic advantages of replacement based on clinical indication.

It is notable that the CDC guidelines recommend the use of a midline catheter (MC) or a peripherally inserted central venous catheter (PICC), instead of a short peripheral catheter, when the duration of intravenous therapy is likely to exceed six days (Category II). Our experience supports this suggestion.

We conducted a three-month survey in a general medical ward to detect the rates of mechanical and inflammatory complications associated with the use of traditional PIVCs. The results showed that 211 (59%) out of 365 monitored devices were replaced due to phlebitis (28%), dislocation (19%) or obstruction (12%). The overall mechanical complication rate was 133 per 1000 catheter-days. PIVCs complicated by phlebitis had a mean indwelling time of 3.8 [standard deviation (SD) 2.7]

days, and were placed after a mean of 3.8 (SD 2.1) previous devices.

Following the three-month survey, we began a surveillance programme to describe the use of MCs in the infectious diseases unit of the same hospital. During the first 12 months, 142 MCs were placed in 130 patients who needed prolonged intravenous antibiotic treatment. All the devices were placed using ultrasound-guided puncture, with a first-attempt success rate of 91.7%. The median indwelling time was 21.6 days (range 1–128 days). Catheter thrombosis occurred in 12 patients (7%), but all such episodes were attributed to the use of drugs that were not appropriate for peripheral infusion (i.e. vancomycin, acyclovir, ampicillin, mannitol). Only one exit-site infection was detected in a neoplastic patient.

Although new-generation PIVCs, such as COS PIVCs, may reduce the complication rate associated with the use of short-term venous devices, physicians should consider the use of other types of catheters, such as MCs or PICCs, based on the type and planned duration of intravenous therapy.

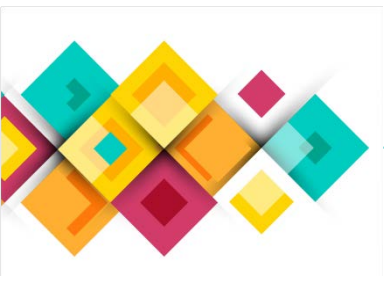
**Conflict of interest statement**

The authors declare they did not receive any funding.

**References**

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M.S. Vallecocchia<sup>a</sup>G. De Pascale<sup>a,\*</sup>C. Taraschi<sup>b</sup>R. De Angelis Durante<sup>c</sup>L. Dolcetti<sup>d</sup>M. Pittiruti<sup>d</sup>G. Scoppettuola<sup>b</sup>**Vallecocchia 2015****315 short peripheral cannulas:****211 (59%) removed because of complications****28% phlebitis****19% dislodgement****12% occlusion**



# High incidence of 'catheter failure'

- 'phlebitis' or 'thrombophlebitis'
  - Due to bacteria
  - Due to mechanical injury
  - Due to chemical injury
  - Due to local obstruction of flow
- Dislodgement with infiltration/extravasation
- Lumen occlusion



## But also because many things have changed recently in this area in the last few years

- New recommendations for indication to peripheral venous access
- New types of short peripheral cannulas
- New types of devices (short midlines or 'mini-midline')
- New technologies for the insertion (ultrasound, NIR)
- New strategies of insertion (2% chlorhexidine, transparent membranes, etc.)
- New recommendations for removal
- .....



New recommendations...





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Available online at [www.sciencedirect.com](http://www.sciencedirect.com)

Journal of Hospital Infection

journal homepage: [www.elsevierhealth.com/journals/jhin](http://www.elsevierhealth.com/journals/jhin)



2014

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

H.P. Loveday<sup>a\*</sup>, J.A. Wilson<sup>a</sup>, R.J. Pratt<sup>a</sup>, M. Golsorkhi<sup>a</sup>, A. Tingle<sup>a</sup>, A. Bak<sup>a</sup>, J. Browne<sup>a</sup>, J. Prieto<sup>b</sup>, M. Wilcox<sup>c</sup>

Skin antisepsis with **2% chlorhexidine in 70% IPA**

Secure/cover with **transparent membranes**

Peripheral vascular catheters **should be re-sited when clinically indicated** and not routinely,

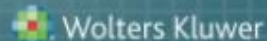
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**Infusion Nursing**

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January/February 2016  
Volume 39, Number 1S  
ISSN 1533-1458  
www.journalofinfusionnursing.com

The Official Publication of the Infusion Nurses Society

# Infusion Therapy Standards of Practice

Funded by an educational grant from BD Medical



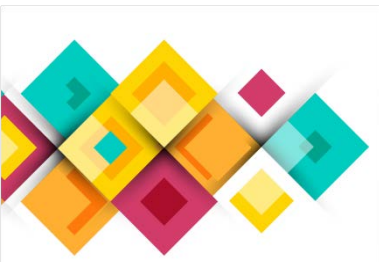
Skin antiseptics with **2% chlorhexidine in alcohol**

**2016**

Consider the use of **NIR technology** for superficial veins and of **ultrasound guidance** for deep veins

Do not secure with tapes: secure the peripheral access with **transparent membranes** and **sutures devices**

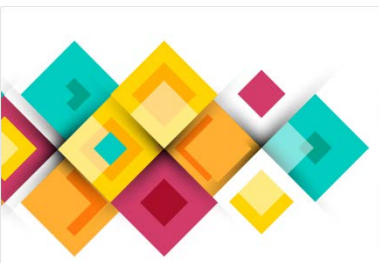
Do not replace the peripheral line routinely, but **only when clinically indicated.**



## Short cannulas: GAVeCeLT insertion bundle

1. Appropriate choice of insertion site (avoid flexion areas)
2. Skin antisepsis with 2% chlorhexidine in alcohol
3. Check blood return
4. Protect the exit site with semipermeable transparent dressing

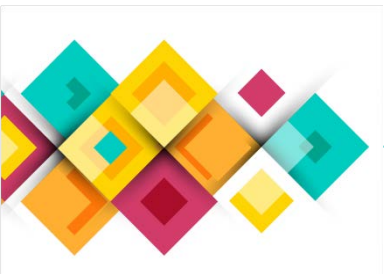
**2017**



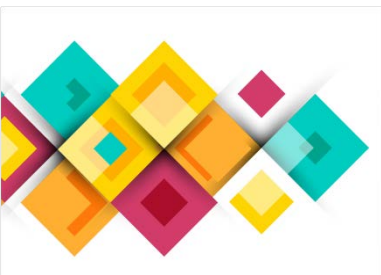
## Short cannulas: GAVeCeLT maintenance bundle

1. Disinfect the hub with 2% chlorhexidine in alcohol at each connection with the infusion line
2. Flush with saline only (5ml in adult patients) before and after the infusion of each solution
3. Use the infusion line exclusively for peripherally compatible solutions
4. Daily visual inspection of the exit site

**2017**



New definitions of old problems...



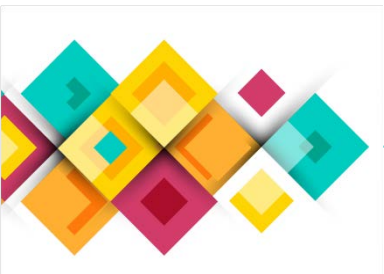
# New definitions of old problems...

## The DIVA patient

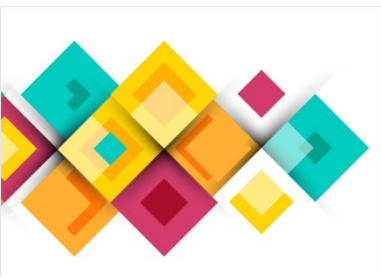
### Development of the A-DIVA Scale:

*A Clinical Predictive Scale to Identify Difficult Intravenous Access in Adult Patients Based on Clinical Observations*

*Fredericus H. J. van Loon, MSc, Lisette A. P. M. Puijn, RN, Saskia Houterman, PhD,  
and Arthur R. A. Bouwman, MD*



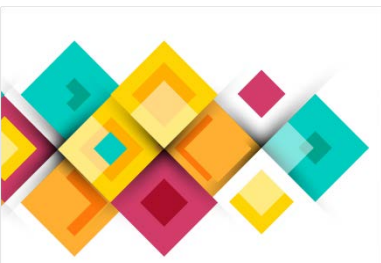
New types of short peripheral cannulas...



## Improved or 'advanced' short peripheral cannulas

- Improved safety for the operator
  - No-stick
  - Blood-stop
- Improved material
  - polyurethane
- Improved design
  - Large wing
  - Pre-assembled extension
  - Pre-assembled needle free connector



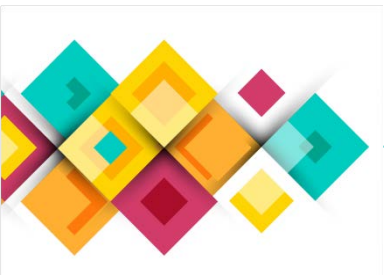


# Two different types of short cannulas

	Simple cannulas	Advanced new cannulas
Material	Usually teflon	Polyurethane
Design	Usually, no wing & no extension	Large wing + pre-assembled extension
Indication	Emergency/short time access	Access for prolonged i.v. treatment
Environment	Emergency room, OR, radiology suite	Ward
Expected duration	24-48 hrs	1-7 days
Cost	Low	high

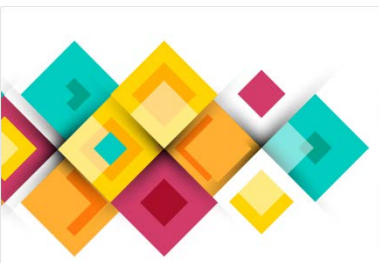


New types of peripheral devices...



# Peripheral VADs (European classification)

- **Stainless steel needles**
  - Appropriate only for bolus infusion
- **Short cannulas (3-6 cm)**
- **Long peripheral cannulas – ‘mini-midline’ (6-15 cm)**
- **Midline catheters – ‘midclavicular’ (15-25 cm)**



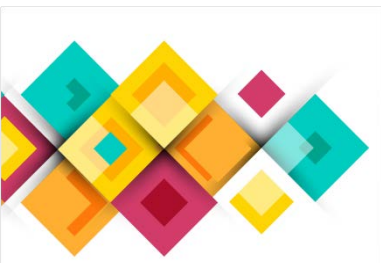
# Peripheral VADs (Australian classification)

**Table 1.** Comparison of peripheral venous access devices.

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

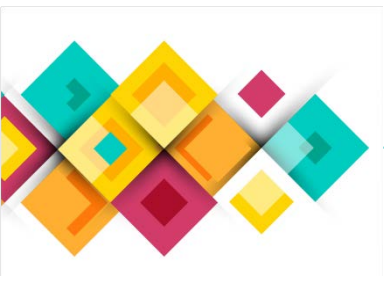
PTFE: polytetrafluoroethylene; PUR: polyurethane; PEBA: poly-ether-bloc-amide.

<sup>a</sup>At our institution (in 2018 Australian Dollars).



# Peripheral VADs today

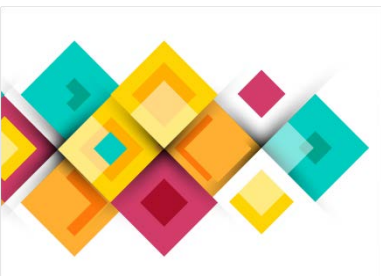
	Short cannulas	Long cannulas	Midline
Length	< 6 cm	6-15 cm	> 15 cm
Material	Teflon, PUR	Polyurethane, PEBA	PUR, silicon
Insertion	blind	Blind or US	Blind or US
Technique	Direct cannulation	Simple Seldinger	Modified Seldinger
Ok for emergency	yes	yes	no
Duration	days	weeks	months
Power injectability	if 20G or >	yes	Not always
Extra-hospital use	no	Yes (short time)	yes



## A new peripheral device

There is some uncertainty of terminology: **long peripheral cannulas** or **'mini-midline'** or **'short midline'** ?

- In USA, the so-called 'mini-midline' has replaced traditional midlines, becoming the only kind of 'midline'
- In Europa, the 'mini-midline' has extended the possibility of peripheral venous access, without cancelling the 'traditional' midline



# A new peripheral device

*Editorial*

**JVA** | The Journal of  
Vascular Access

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

**Kirby R Qin<sup>1</sup>, Ramesh M Nataraja<sup>1,2</sup> and Maurizio Pacilli<sup>1,2</sup>**

The Journal of Vascular Access  
1–4

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DOI: 10.1177/1129729818819730

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## 'Traditional' midline catheter (15-25cm)

- Also called 'midclavicular' (since the adoption of US guidance, it is inserted at the middle third of the upperarm so that its tip is in the axillary-subclavian vein)
- Abandoned in USA since the beginning of this century
- Still much used in Europe (particularly for palliative care and for short term home treatments with peripherally compatible drugs)
  - Italy
  - UK
  - Spain





# LÍNEA MEDIA CLAVICULAR, OPCIÓN DE ACCESO VENOSO SEGURO: CUATRO AÑOS DE EXPERIENCIA

**Victoria Armenteros Yeguas**

Enfermera del Equipo de Terapia Intravenosa

OSI Araba-Hospital Universitario

Vitoria-Gasteiz

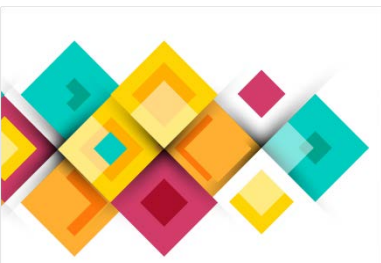


**Osakidetza**

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ORGANIZACIÓN SANITARIA INTEGRADA ARABA

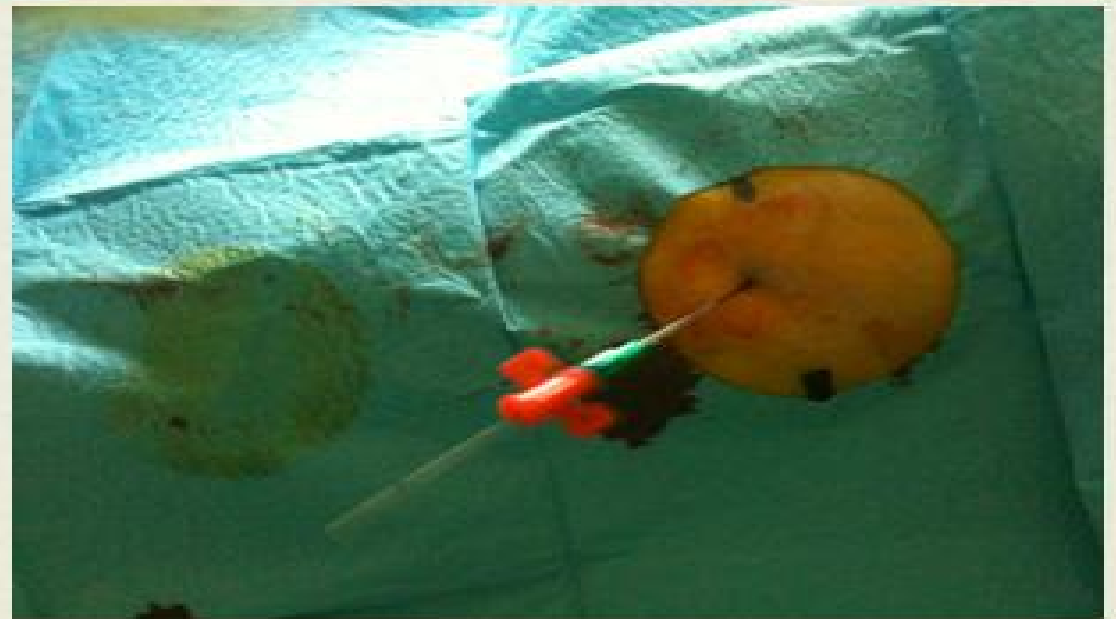
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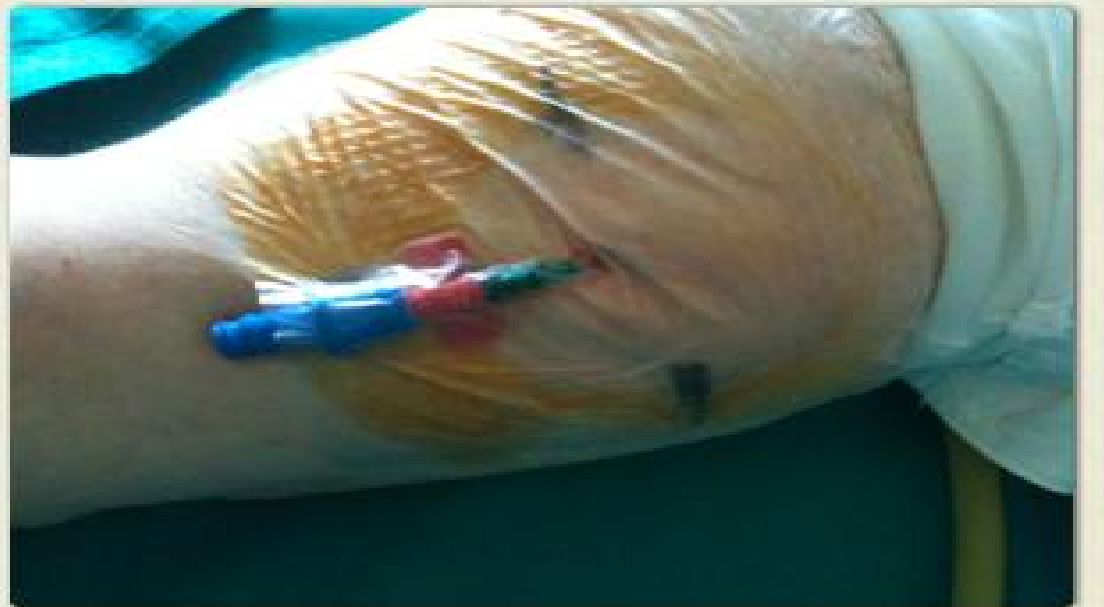
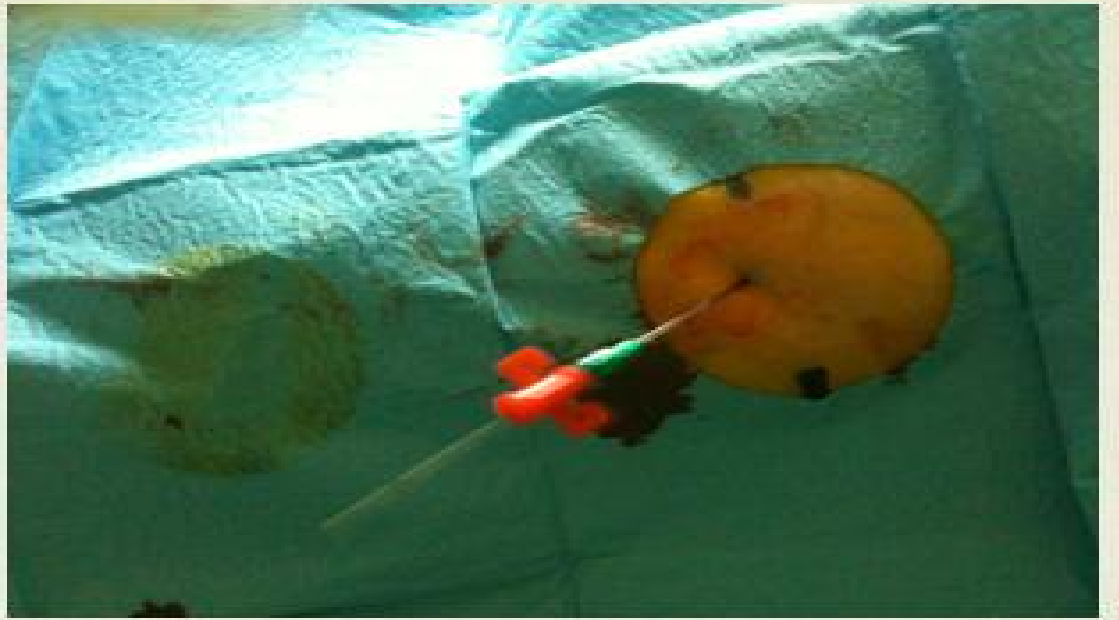
**GruMAV 2017 – GAVeCeLT 2017**



# Features of 'mini-midlines'

- Length 6-15 cm
- Material: polyurethane, but also polyethylene or PEBA (poly-ether-block- amide)
- Power injectable (most of them)
- To be inserted in superficial/deep veins of either forearm or upper arm
- Cost: between short cannulas and midline catheters
- More rapid insertion than midlines – ideal for emergency
- Expected duration: 2-4 weeks
- Technique of insertion: three types
  - 'cannula over needle'
  - Simple Seldinger technique ('catheter over guidewire')
  - Accelerated Seldinger technique (Seldinger but 'coaxial')







Scoppettuolo et al. *International Journal of Emergency Medicine* (2016) 9:3  
DOI 10.1186/s12245-016-0100-0

 International Journal of Emergency Medicine  
a SpringerOpen Journal

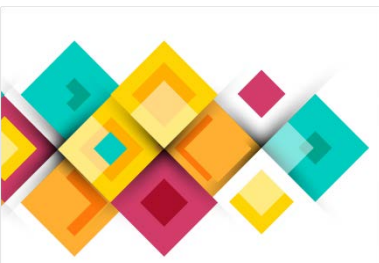
**ORIGINAL RESEARCH**

**Open Access**



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

Giancarlo Scoppettuolo<sup>1\*</sup>, Mauro Pittiruti<sup>2</sup>, Sara Pitoni<sup>3</sup>, Laura Dolcetti<sup>1</sup>, Alessandro Emoli<sup>4</sup>, Alessandro Mitidieri<sup>5</sup>, Ivano Migliorini<sup>2</sup> and Maria Giuseppina Annetta<sup>3</sup>



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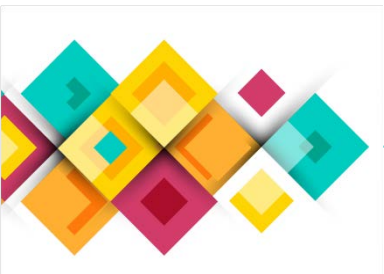
Original article

**BMJ  
Paediatrics  
Open**

# Ultrasound-guided placement of long peripheral cannulas in children over the age of 10 years admitted to the emergency department: a pilot study

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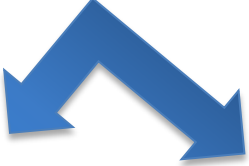
Angela Paladini,<sup>1</sup> Antonio Chiaretti,<sup>1</sup> Kidane Wolde Sellasie,<sup>2</sup> Mauro Pittiruti,<sup>3</sup> Giovanni Vento<sup>1</sup>



# New algorithms for choosing the device



# Peripheral venous access



For less than 4 weeks

For more than 4 weeks  
(extrahospital use)



< 1 week

> 1 week



Superficial veins  
available

Superficial veins  
not available

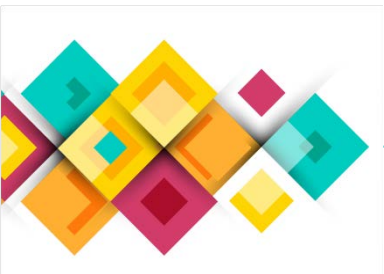


MIDLINE

LONG PERIPHERAL CANNULA  
(MINI-MIDLINE)

SHORT PERIPH. CANNULA





New techniques of insertion...



# New techniques of insertion...

Review

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

Grace Egan,<sup>1,2</sup> Donagh Healy,<sup>1</sup> Heidi O'Neill,<sup>2</sup> Mary Clarke-Moloney,<sup>1</sup>  
Pierce A Grace,<sup>2</sup> Stewart R Walsh<sup>1,2</sup>

*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<sup>1\*</sup> and M. Pittiruti<sup>2</sup>

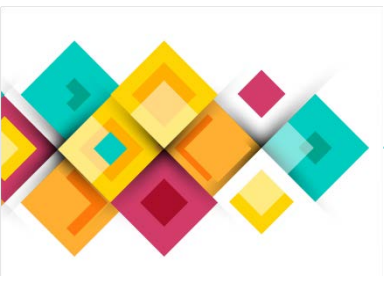
<sup>1</sup> Department of Neuroanaesthesia, National Neurological Institute Besta, Via Celoria, 11, 20136 Milan, Italy

<sup>2</sup> Department of Surgery, Catholic University, Rome, Italy

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

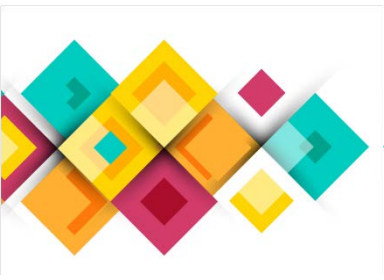


A lot of novelties...



# That explains the ERPIUP project!

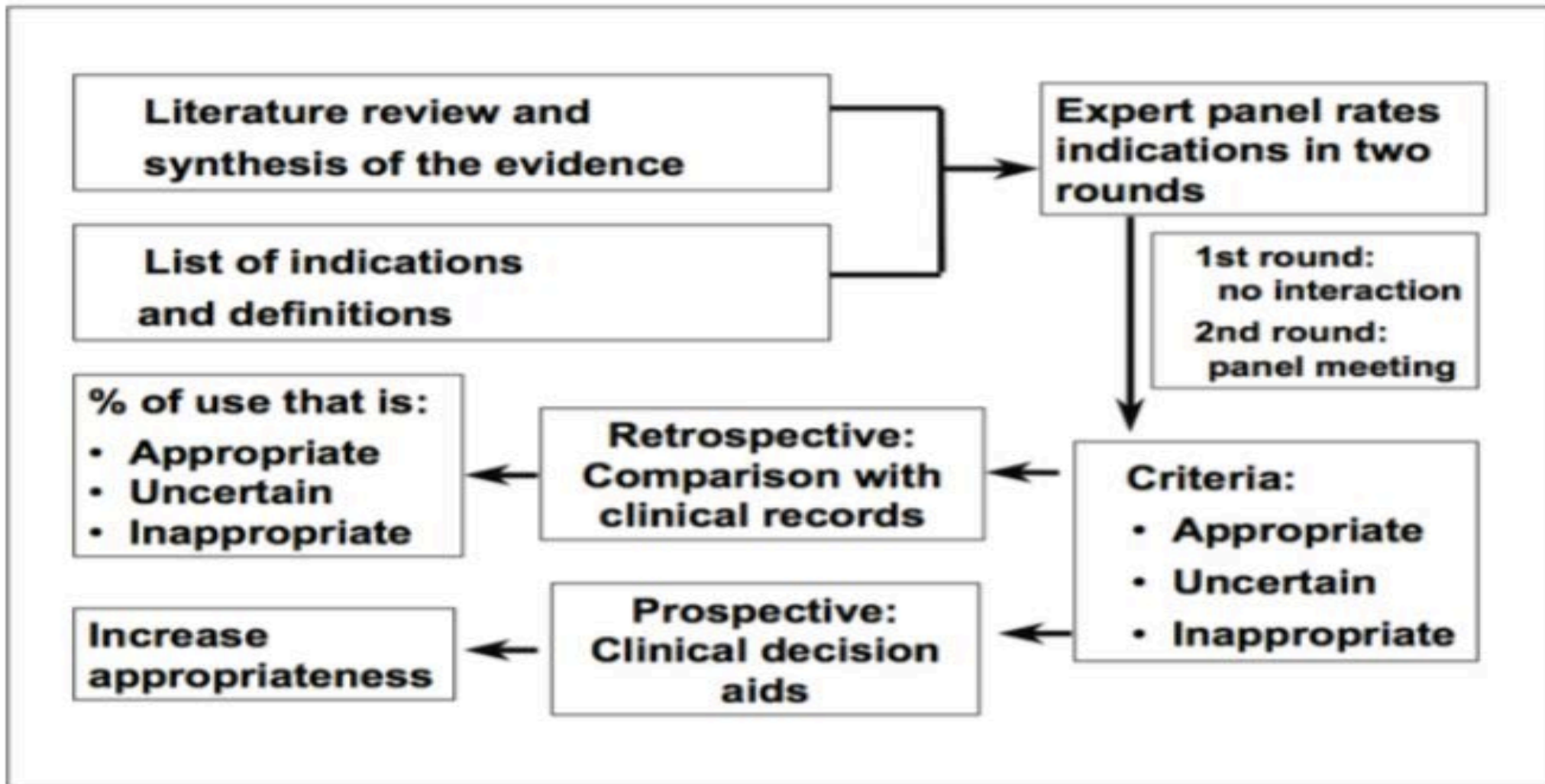
- Clarify the INDICATION of the different venous access devices
  - Central vs peripheral devices
  - Short cannulas vs mini-midline vs midline
- Clarify the proper techniques of INSERTION
- Clarify the proper MANAGEMENT
- Adopt a European point of view (considering the limitations of devices in USA)

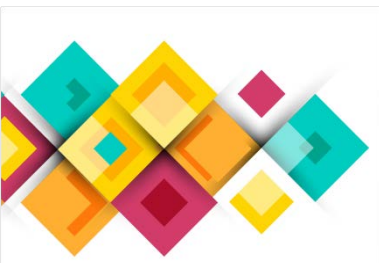


# Methodology

We adopted the Rand/UCLA method, ideal when randomized clinical studies are difficult to carry out or to interpret, or when RCT cannot cover all the details and the variants of the clinical practice.

# The RAND/UCLA appropriateness method

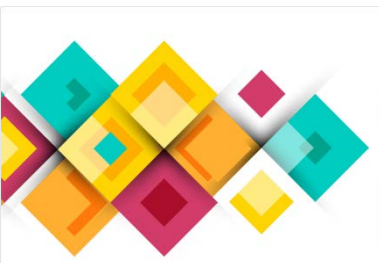




# The ERPIUP project

It started as a project of the **WoCoVA Foundation**, in collaboration with different national societies:

- GAVeCeLT (Italy)
- GruMAV (Spain)
- Infusion Therapy Society (The Netherlands)
- BeVaNet (Belgium)
- GIFAV (France)
- NIVAS (UK)
- .....



# An international panel of experts

Sergio Bertoglio (I)

Peter Carr (Au)

Christian Dupont (F)

Lieve Goossens (B)

Sheila Inwood (UK)

Evangelos Kostantinou (G)

Massimo Lamperti (EAU)

Jackie Nicholson (UK)

Gloria Ortiz Miluy (E)

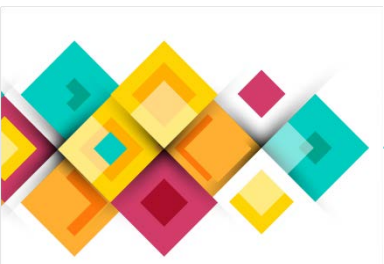
Mauro Pittiruti (I)

Giancarlo Scoppettuolo (I)

Liz Simcock (UK)

Ton Van Boxtel (N)





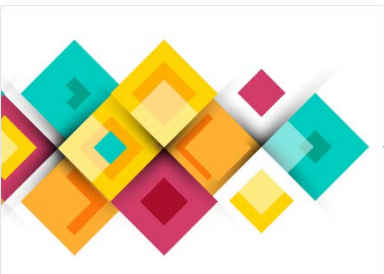
# Bibliography search

All peripheral VADs in adult patients

Guidelines, consensus and clinical studies 2013-2016 (ext. 2017)

Search divided into five groups of topics

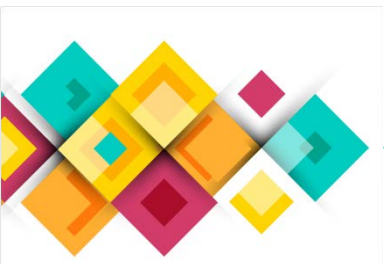
- *Indication to peripheral vs central VADs*
- *Classification and indication of peripheral VADs*
- *Insertion: techniques, complications, training*
- *Management: strategies for complication prevention*
- *Removal: indication, technique, complications*



## Topic 1

Which are the indications for peripheral vs central venous access, considering (a) the different clinical performances, (b) the expected risk of complications, (c) cost-effectiveness and (d) patient's satisfaction?

*(Goossens – Kostantinou)*



## Topic 2

Which is the most appropriate classification of peripheral VADs in terms of technical characteristics and clinical performance?

Which are the most appropriate indications of the different types of peripheral VADs in the adult patient?

*(Inwood – Pittiruti)*



## Topic 3

Which is the role of site selection in reducing insertion-related complications?

Which is the most appropriate insertion strategy for reducing the risk of infection?

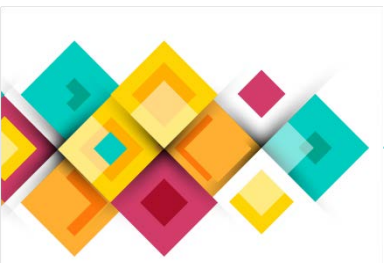
Which is the most appropriate strategy for securing the peripheral VAD?

Which is the role of ultrasound guidance when inserting a peripheral VAD?

Which is the role of NIR technology when inserting a peripheral VAD?

Which is the most appropriate model of training?

*(Carr – Lamperti – Van Boxtel)*



## Topic 4

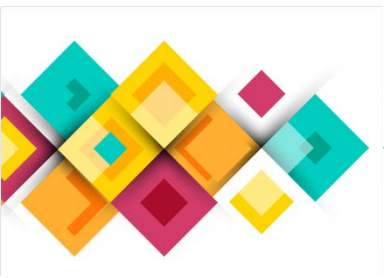
Which is the most appropriate maintenance strategy for reducing the risk of infection?

Which is the most appropriate maintenance strategy for reducing the risk of lumen occlusion?

Which is the most appropriate maintenance strategy for reducing the risk of dislodgment ?

Which is the most appropriate maintenance strategy for reducing the risk of phlebitis/thrombosis?

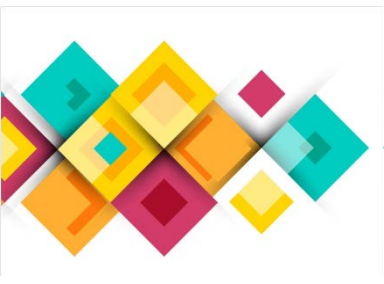
*(Scoppettuolo - Simcock)*



## Topic 5

Which are the proper indications for removing a peripheral VAD?  
Are there any complications potentially related to removal?  
Is there any special strategy to minimize such complications?

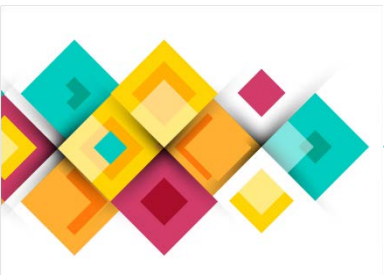
*(Dupont – Ortiz Miluy)*



## Final manuscript

Each topics has been developed as recommendations of different grading, after evaluation of the quality of evidence and the clinical impact.

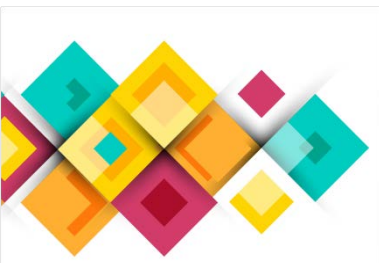
After revision by the panel and by external reviewers, we will publish the document on Journal of Vascular Access within the end of 2019.



## A sneak preview

Some highlights from the final document





# Topic 1 – Peripheral vs central

## Proper indication to peripheral access:

Short-medium term Infusion of peripherally compatible solutions

I.V. solutions with pH 5 - 9

Drugs with osmolarity < 600 mOsm/L

Parenteral nutrition < 800-850 mOsm/L

Non-vesicant drugs and drug not associated with potential endothelial damage

Some special situations of apheresis/ultrafiltration

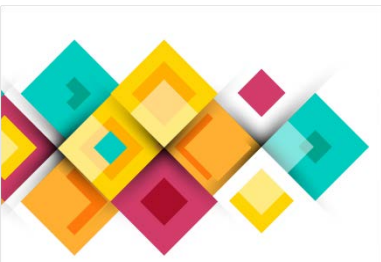
## Contraindication to peripheral access:

Infusion of non-peripherally compatible solutions

Repeated blood samples

Dialysis

Need for medium or long term i.v. line (months or years)



## Topic 2 - classification

### **Short peripheral cannulas (< 6 cm)**

simple cannulas – for 24-48 hrs

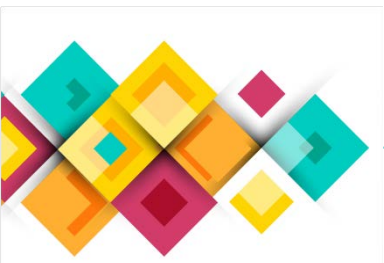
'advanced' cannulas – for 2-7 days

### **Long peripheral cannulas or 'mini-midlines' (6-15 cm)**

appropriate for 2-4 weeks

### **Midline catheters or 'midclavicular' (> 15 cm)**

appropriate for > 4 weeks and/or in an extrahospital setting



## Topic 3 - Insertion

**Proper site selection** – flexion areas, ext.jugular, lower limb: only if < 24-48hrs

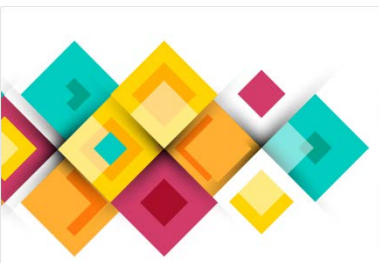
Skin antiseptis with **2% chlorhexidine in alcohol**

In DIVA patients, use **NIR guidance** for access to superficial veins of the arm and/or **ultrasound guidance** for access to deep veins of the arm

Cover with **semipermeable transparent dressing**

Apply **cyanoacrylate glue** in patients with bleeding risk

Secure with **sutureless devices** if peripheral access > 2 days



## Topic 4 – Management

### **Minimize the risk of infection**

2% chlorhexidine – transparent membranes – port protectors  
daily visual inspection

### **Minimize lumen occlusion**

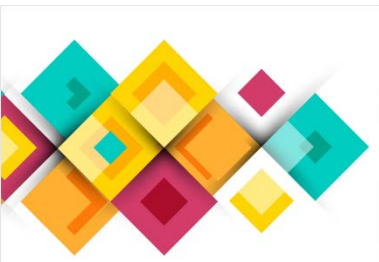
saline flushing – needle free connectors – avoid mixing drugs

### **Minimize the risk of dislodgment**

proper site selection – sutureless devices – transparent membranes

### **Minimize the risk of phlebitis/thrombosis**

use the device only for peripherally compatible infusions



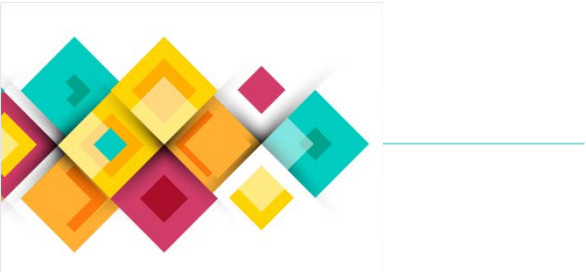
## Topic 5 - Removal

**Proper indications for removal include:**

1. end of use
2. device not appropriate anymore
3. catheter failure
4. refusal of the patient

**Potential complications include:**

local bleeding – to be prevented by compression and glue



More details as soon as we get to the publication on JVA !





**Thank you for your attention**



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