MACOVA 2020

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BD

Effectiveness and sustainability of the PICC in ICU: EBM approach, Review of the literature and sharing of experiences.

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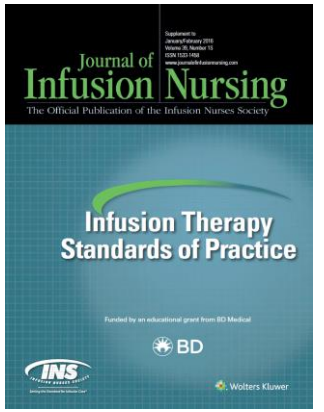
VADs NEEDS IN THE CRITICALLY ILL

- Solutions with pH <5 or pH>9 (vasoactive drugs, atb., etc.)
- Continuous multiple infusates (fluids, blood, electrolytes, drugs, etc.)
- Parenteral Nutrition >800 mOsm/l
- Hemodynamic Monitoring (CVP; CO; MvO_2Sat)
- Frequent blood samples



INS 2016

WHICH *VAD* ENSURES THE REQUIRED PERFORMANCE?

CVADs.

- 43–80% of patients in the ICU require central access.
- The CVAD most commonly inserted in ICU are nontunneled CVADs (CICC), PICCs, and hemo-dialysis catheters.

Takashima CCM 2018

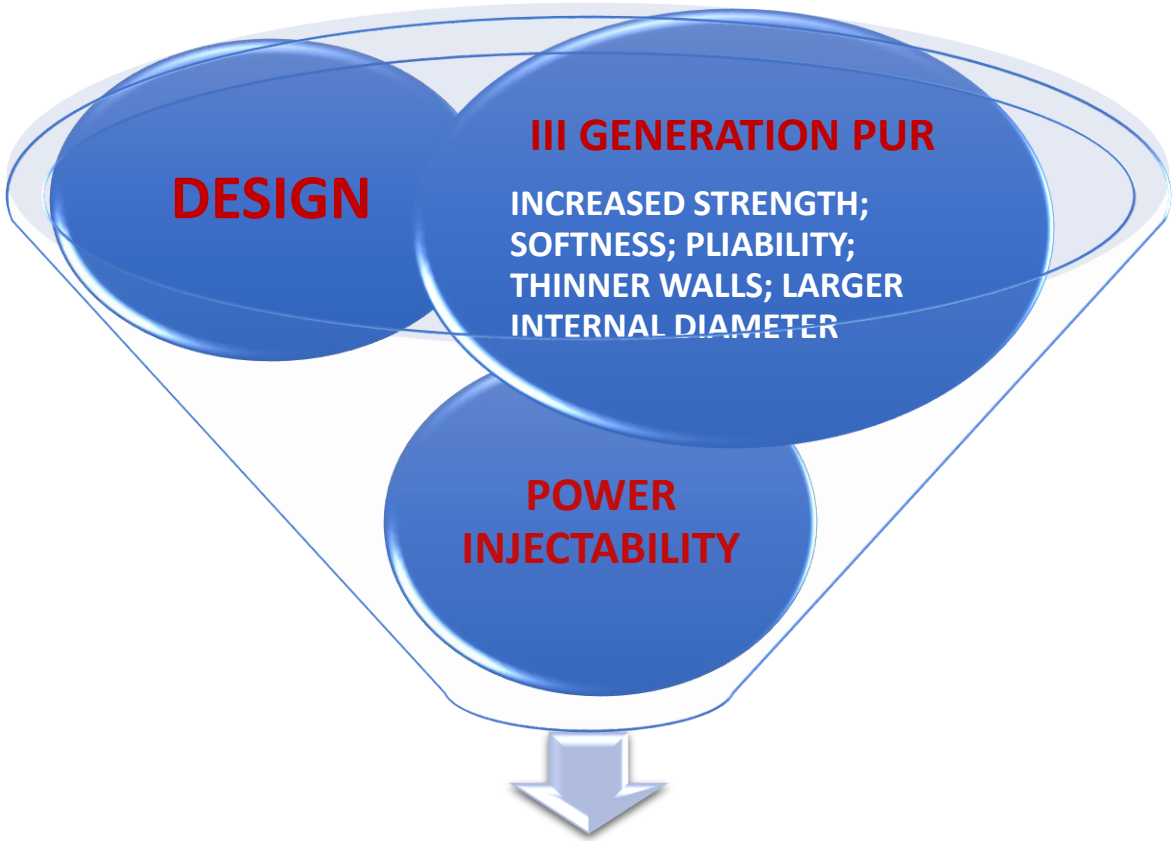
CICC or PICC in the Critically Ill?

CICC or PICC in the Critically Ill?

PICC Drawbacks

- «Time consuming» procedure
- Hemodynamic monitoring
- Increased risk of CRT (?)
- Reduced catheter flow rates
- Single/dual lumen

PICC: TECHNOLOGICAL IMPROVEMENTS



High flows, Multiple infusions, Contrast Media

5Fr Power Triple Lumen PICC:
High flows, Multiple Infusions, Contrast Media

PICC and HEMODYNAMIC MONITORING: CVP

Black CCM 2000

McLemore AVS 2006

Latham BMC 2010

Yun Korean J Anesth 2011

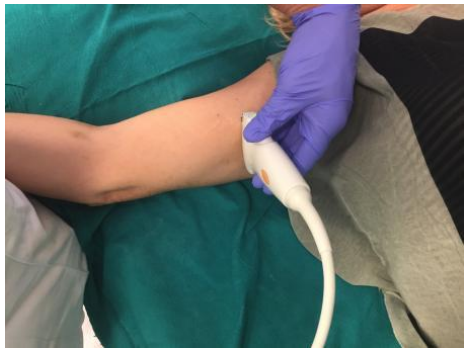
Sanfilippo JVA 2017

Polyurethane
Open ended catheters

Accurate measurements

CICC or PICC in the Critically Ill?

PICC IMPLANT TECHNIQUE IMPROVEMENTS



- CHOICE OF THE VEIN (diameter, position, depht)
- ASEPTIC TECHNIQUE
- ULTRASOUND GUIDANCE
- INTRAPROCEDURAL TIP LOCATION
- STABILIZATION OF THE DEVICE

ISP PROTOCOL

Gavecelt 2010

CICC or PICC in the Critically Ill?

- **RISK OF INFECTION**
- **RISK OF THROMBOSIS**

CICC or PICC in the Critically Ill?

- **RISK OF INFECTION**

PICC are theoretically associated with lower risk of infection

Why ?

- Exit site is distant from nasal/oral/tracheal secretions
- Low contamination of arm skin
- Physical characteristics of arm skin (dry, thin)
- Exit site allows better cleaning and better stabilization of the dressing
- PICCs are inserted according to more rigorous aseptic protocols

PICC inserted according to a well-defined insertion protocol have low risk of infection

- 0.4/1000 days (Pittiruti 2006 – pts on PN)
- 0/1000 days (Harnage 2006)
- 0.3/1000 days (Scoppettuolo 2010 – infect. dis. pts)
- 0/1000 days (Cotogni 2013 – cancer pts on HPN)
- 0.3/1000 days (Zerla 2015 – hosp. pts)
- 0.01/1000 days (Zerla 2015 – home care)
- 0/1000 days (Bolis 2017 – ICU pts)

Complication and Failures of Central Vascular Access Device in Adult Critical Care Settings

Mari Takashima, RN, BN, Grad Cert ICU, MEpi[1];
Jessica Schults, RN, GCert (Specialist Paed), MAppSci (Research)[1–3];
Gabor Mihala, MEng, GCert(Biostats)[1,4,5];
Amanda Corley, RN, BN, GradCertHSci, MAdvPrac (Research)[1];
Amanda Ullman, RN, MAppSci, PhD, Centaur Fellow[1,3]

63 studies involving 50,000 CVADs
(396,951 catheter days)

Takashima CCM 2018

ADULTS IN ICU

N^{O} OF COMPLICATIONS PER 1000 CATHETER DAYS

Catheter-related bloodstream infection					
Overall	36	228,999	621	3.35[d,e,h]	2.67–4.03
NTCVAD	29	214,012	600	3.92[d,e]	3.11–4.74
PICC	4	6,178	6	0.88[b,f]	0.00–1.83
Hemodialysis	3	8,809	15	1.69[b,e]	0.70–2.67
Central line-associated bloodstream infection					
Overall	10	149,018	343	4.59[d,e,g]	2.31–6.86
NTCVAD	8	139,082	299	5.28[d,e]	2.34–8.23
PICC	2	9,936	44	2.50[d,f]	0.00–7.19

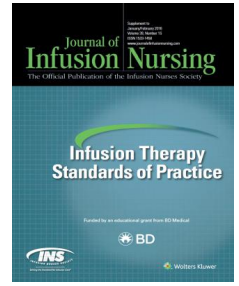
CRBSI

CLABSI

Takashima CCM 2018

CICC is the better choice in:

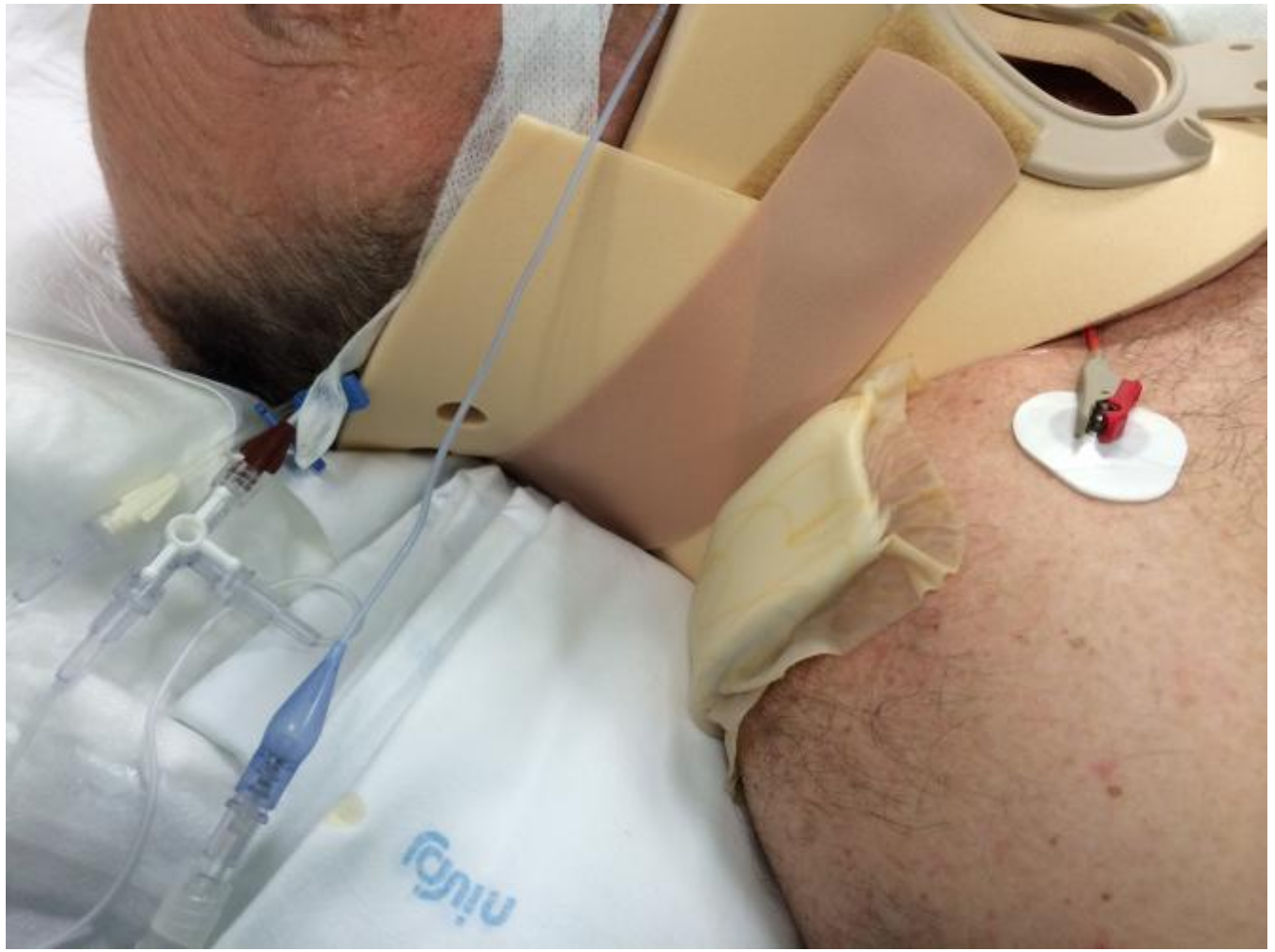
- Emergency situations
- More than 3 lumen required
- Arm veins unavailable or too small
- Arm plegia
- CHRONIC KIDNEY DISEASE (AV fistula)
- Sedation IS NOT a contraindication to PICC



INS 2016

Wouldn’t a PICC have been a better choice?

Wouldn’t a PICC have been a better choice?



Courtesy of M. Pittiruti

AT LEAST…A TUNNELLED CICC…

Risk of Infection

There is no clear evidence-based difference (no RCT) between CICCs and PICCs in this regard.

Though, CICC have certainly a high risk of infection:

Especially:

- in patients with tracheostomy;
- when the emergency site of CICC's neck;
- when the CICC is positioned without a proper insertion protocol

CICC or PICC in the Critically Ill?

- **RISK OF THROMBOSIS**

Are CICC particularly at risk of CRT ?

- It depends on the caliber, the route and the technique of insertion
  - Larger catheters (dialysis) = more risk
  - Supraclavicular route = more risk
  - Ultrasound guided puncture = less risk
- No hard data about the actual incidence, probably less than **3-5%**

Are PICC particularly at risk of CRT ?

Original research article

Peripherally inserted central catheter–related thrombosis rate in modern vascular access era—when insertion technique matters: A systematic review and meta-analysis

Paolo Balsorano[1], Gianni Virgili[2], Gianluca Villa[3], Mauro Pittiruti[4], Stefano Romagnoli[1], Angelo Raffaele De Gaudio[3] and Fulvio Pinelli[1]

JVA 2019

PICC-related thrombosis rate in modern vascular access era: when insertion technique matters. A systematic review and meta-analysis

Paolo Balsorano, MD[1]; Prof. Gianni Virgili[2]; Gianluca Villa, MD, PhD[3]; Mauro Pittiruti, MD[4]; Stefano Romagnoli, MD, PhD[1]; Prof. Angelo Raffaele De Gaudio[3]; Fulvio Pinelli, MD[1]

Only prospective

Insertion bundle

Tip location verified

Only symptomatic

PICC-related thrombosis rate in modern vascular access era: when insertion technique matters. A systematic review and meta-analysis

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Incidence of CRT for PICCs:

- Onco-hematological = 5.9%
- Oncological = 2.2%
- Overall = 2.4%

What about other VADs in cancer patients?

CRT in cancer patients with **ports**:

3.8 % (Decousus 2018)

2.3 % (Hong 2018)

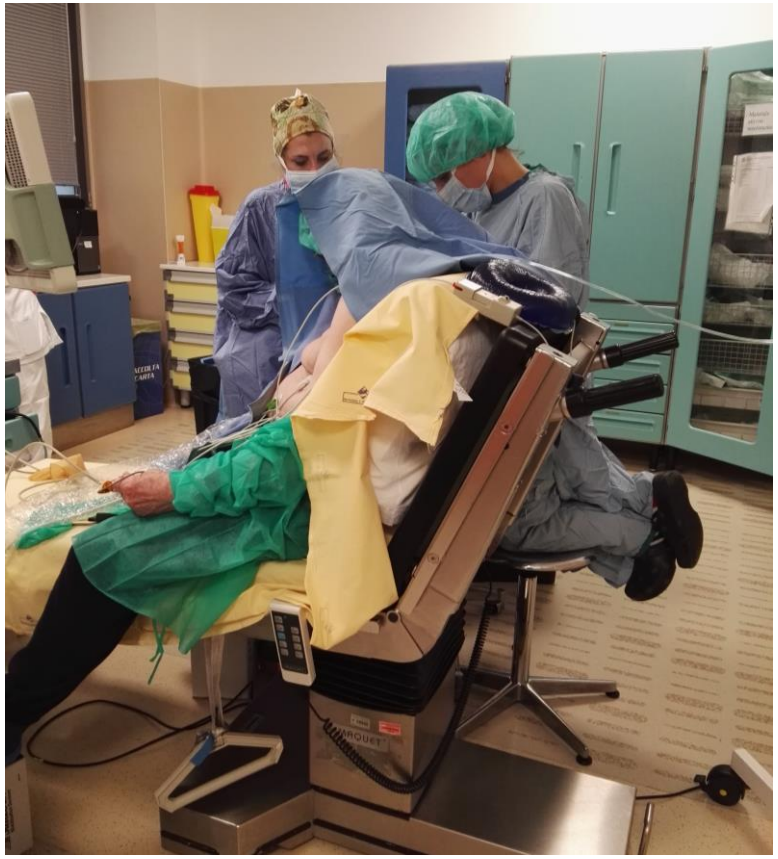
Are PICC particularly at risk of CRT ?

- There is no clear evidence-based difference between CICCs and PICCs.

Though, PICC have a higher risk of thrombosis:

  - In ICU hematologic patients (leukemia)
  - When PICCs are inserted in veins which are too small for the ideal catheter/vein ratio
  - When PICCs are inserted without a proper insertion protocol

- The risk of pulmonary embolism is minimal or absent.



OTHER ADVANTAGE OF PICCs: SAFETY

- No significant risks at the insertion
- Feasible even in «fragile» patients (cardio-respiratory), altered hemostasys, tracheostomy, neck and thorax abnormalities

OTHER ADVANTAGES OF PICCs

- Low cost procedure: a) by nurses; b) bedside
- Best nursing of exit site
- Greater patient acceptance
- Medium term
- The patient may be discharged with the PICC
- Easy to removal, easy replacement

A SIAARTi-SITI-GAVeCeLT Project: a Consensus for the Choice, Implantation and Management of Venous Access in Intensive Care

Why a Consensus?

1. The acute patient admitted to ICU has particular characteristics
    - Choice of devices, implantation techniques, management peculiar to the general population of hospitalized patients
2. The issue of vascular access in intensive care has never been specifically explored
    - Just in general, including both the ICU patients and the non ICU patients

Purpose of the Consensus

1. Identify the current certainties of the literature in terms of choice, implantation and management of the vascular access devices (arterial and venous) currently used in the adult patient admitted to intensive care;
2. Suggest appropriate clinical studies aimed at defining the unresolved aspects regarding the use of these devices.

CONCLUSION: CICC vs PICC in ICU

There is no evidence of difference between CICC and PICC in terms of infection or thrombosis.

Adopting a proper insertion protocol (both for PICC and CICC), both risks can be minimized.

The preference between PICC and CICC in ICU is based on other considerations.

DEFINITE INDICATION FOR A PICC

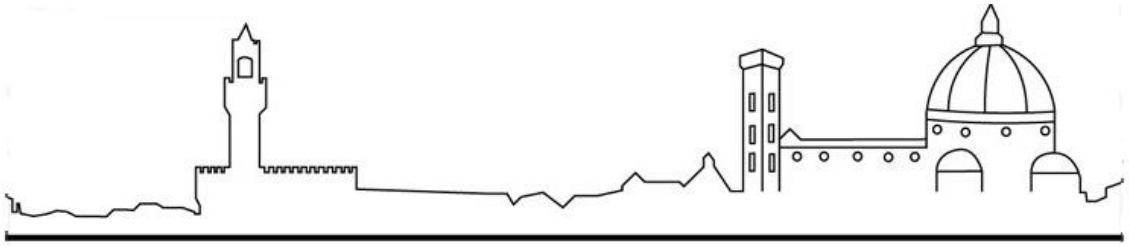
- ✓ Tracheostomy
- ✓ High risk of infection of the exit site
- ✓ Coagulopathy
- ✓ Unavailability of the neck/clavicle area (NIV; collars, etc.)
- ✓ Prolonged ICU stay

DEFINITE INDICATION FOR A CICC

- ✓ Emergency vascular access
- ✓ More than three lumens required
- ✓ Arm veins unavailable
- ✓ Arm plegia
- ✓ Chronic renal failure (AV fistula)

PICC = an important alternative option to CICC in ICU

1. Specific situations in which PICC are safer and more cost-effective than CICC
2. Not for every patient (specific contraindications to PICC)
3. Maximal benefit if inserted using a well defined insertion bundle



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Thank you

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