How to prevent infections

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NEVAT

Neonatal European Vascular Access Team

Blood stream infections

CLABSI – Central Line Associated Blood Stream Infection

Positive blood culture in a patient with a CVC

Catheter in place > 48 hours

Catheter in place at the moment of infection or 24 hours prior

Not related to an infection at another site

CRBSI - Catheter Related Blood Stream infection

Positive culture of blood from a peripheral vein and the catheter (same germ)

Blood culture from CVC must be positive at least 2/4h h before the peripheral culture

Blood culture from CVC bacterial load >10^3 CFU compared to peripheral one

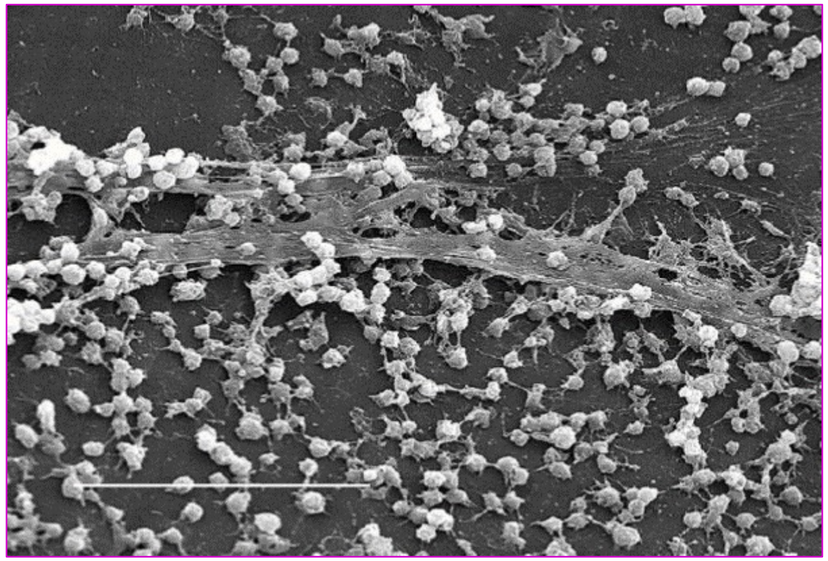
Colonisation of the catheter

Extraluminal colonization

from the skin, precocious

Intraluminal colonization

from infusions, late infection



Our enemy → The Biofilm

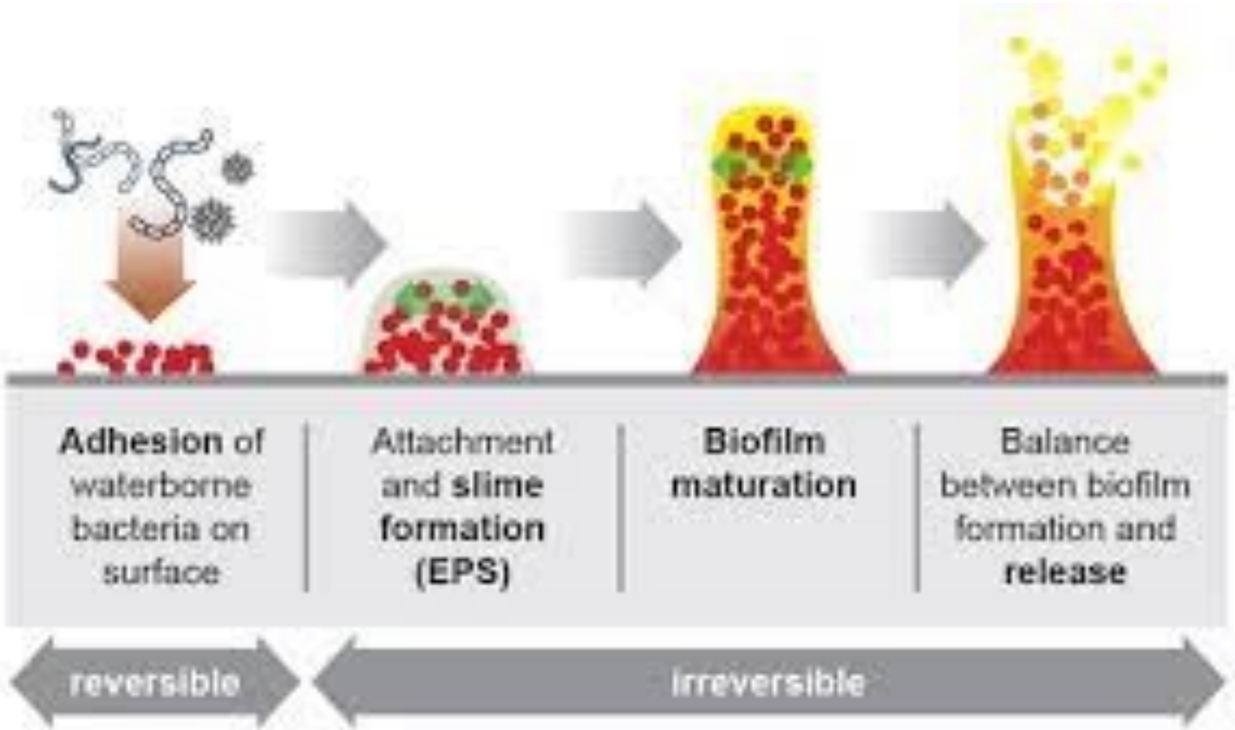
Forms in the first 24 hours

Extracellular matrix → Polysaccharides, lipids, proteins, DNA

The Biofilm

Protects bacteria from immune cells and antibiotics

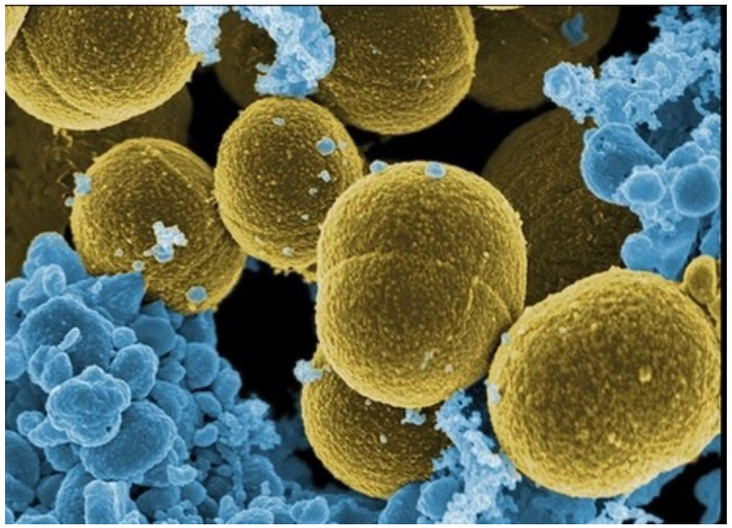
Reduced metabolism of bacteria leading to reduced sensitivity to antibiotics



Need for higher doses of antibiotic and for a longer duration

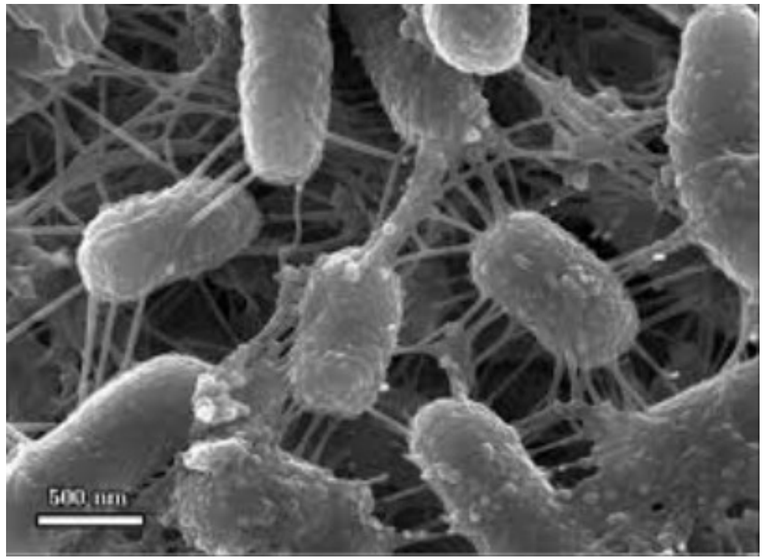
Formation of new bacterial colonies with increased resistance to antibiotics

Germs associated with biofilm formation

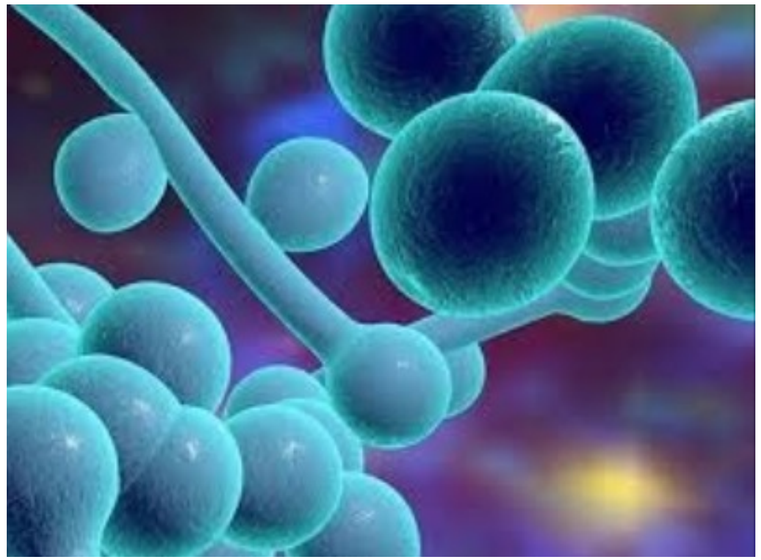


CONS

Staphylococcus aureus

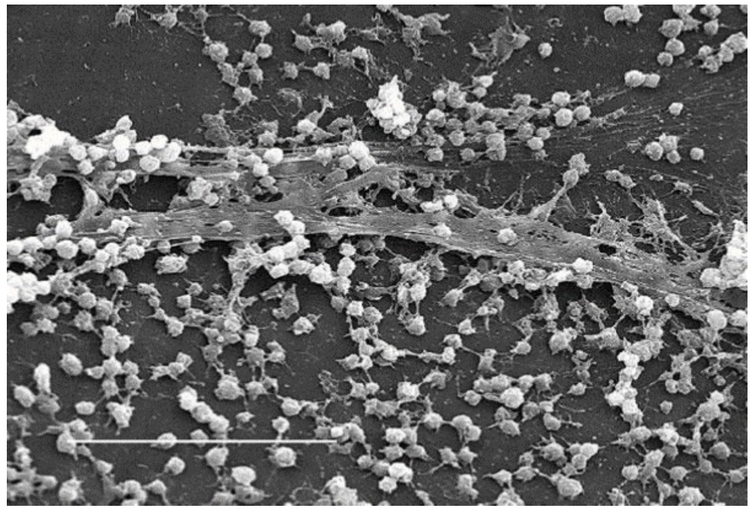


Gram negatives



Candida species

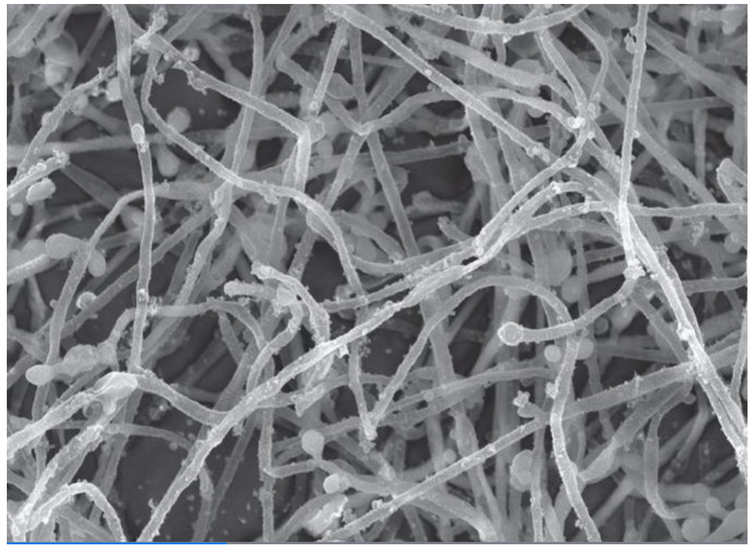
Does the central line need to be removed?



Removal highly suggested

Staph aureus
Pseudomonas
Gram negatives

If there is no rapid improvement after the initiation of antibiotic therapy



Removal recommended

Candida sepsis

How can we decrease infections?

Materials

Insertion technique

Bundles

CLABSI

Ultrasound

Stabilization

Exit-site

Desinfection of the Hub

The Bundles

A set of rules that have to be followed

ALWAYS

and

ALL TOGETHER

The use of bundle helps reduce the rate of infections

Insertion Bundles

THE LANCET
Infectious Diseases

Effectiveness of insertion and maintenance bundles to prevent central-line-associated bloodstream infections in critically ill patients of all ages: a systematic review and meta-analysis

Dr Erwin Ista, PhD • Ben van der Hoven, MD • René F Kornelisse, PhD • Cynthia van der Starre, PhD •

The use of insertion bundles has **reduced** the rate of Central Line Associated Blood Stream Infections (CLABSI)

Hand washing

Maximun barrier precautions

Alcohol based 2% Chlorhexidine solution

Hand washing

Always perform a surgical hand washing

before wearing gloves and gown

After soap hand washing

also wash with hydroalcoholic gel

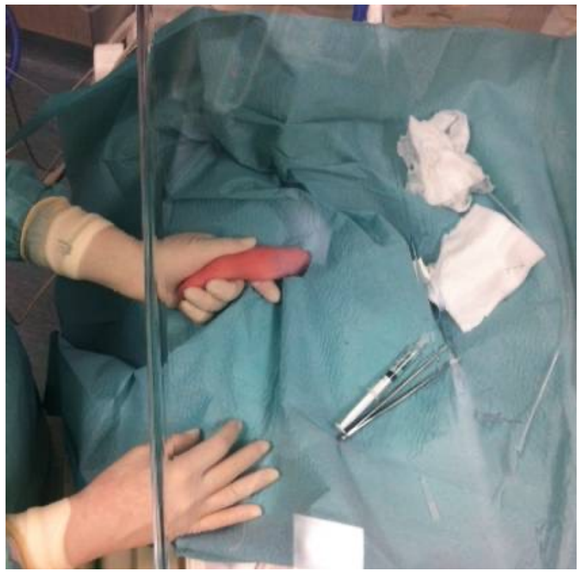
Maximal barrier precautions

Always wear hat, mask, sterile gloves and gown

Do not cover only the limb,

cover the baby completely

6 times higher incidence of CLABSI if the patient is not fully covered and if operator is not wearing a sterile gown



Raad et al. Prevention of central venous catheter related infections by using maximal sterile barrier precautions duriong insertion. Infec Control Hosp Epidemiol 1994; 15: 231

Chlorhexidine

Chlorhexidine 2% in 70% alcohol solution

Meta analysis: the use of chlorhexidine reduces by 50%

the risk of CLABSI compared to povidone iodine

Chaiyakunapruk N. et al. Chlorhexidine compared with povidone iodine solution for vascular catheter site care: a meta analysis. Ann Intern Med 2002

<u>In neonates with GA < 26 weeks</u>

Chlorhexidine in aqueous solution ⟷ Chlorhexidine alcohol solution
Just at the point of insertion, dab and not rub, rinse with saline solution after disinfection

Maintenance

Standard-Aseptic Non Touch Technique when accessing the catheter

Wear masks and sterile gloves in

case of:

Change of infusion sets

Multiple therapies

Remove the catheter as soon as it is not necessary anymore

Reduction of CLABSI when CVC is removed at

100ml/Kg enteral nutrition

Erdei C, McAvoy LL, Gupta M, Pereira S, McGowan EC (2015) Is zero central line-associated bloodstream infection rate sustainable? A 5-year perspective study. Pediatrics 135:e1485-1493

The choice of the material

Epicutaneo cava catheters
Neonatal PICCs

Preterm babies

without complications

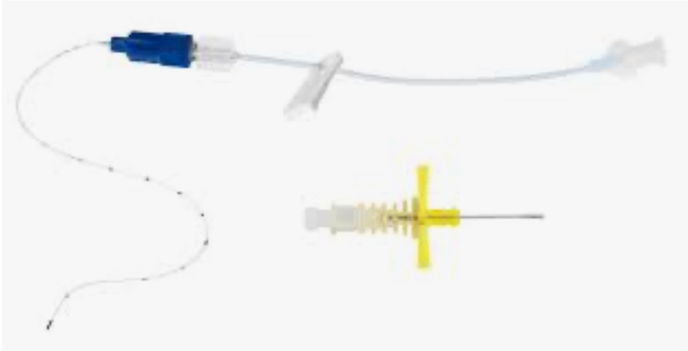
Parenteral nutrition

Limited number of drugs

The choice of the material

Discard older generation catheters

- Silicone
- Two pieces that are likely to log out



Give preferenze to new generation catheters

- Polyurethane
- Single unit

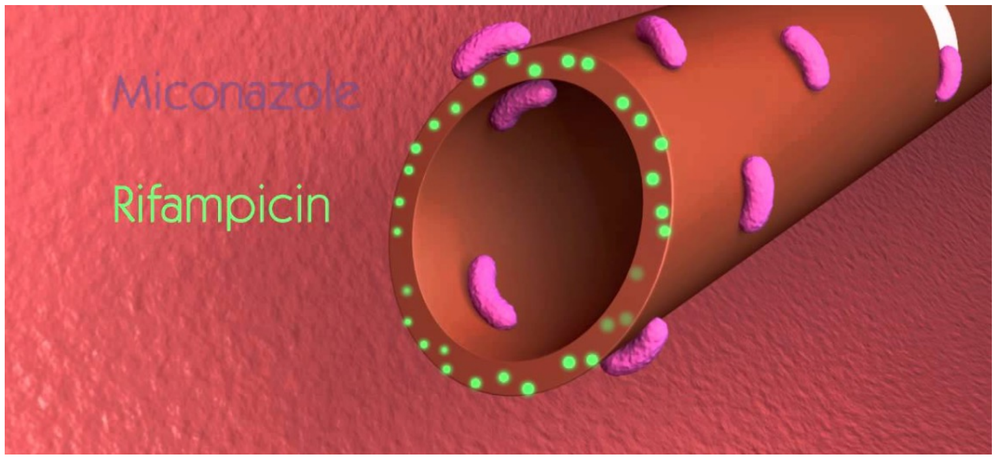
Reduce the number of lumen

The choice of the material

Antibiotic / silver coated catheters

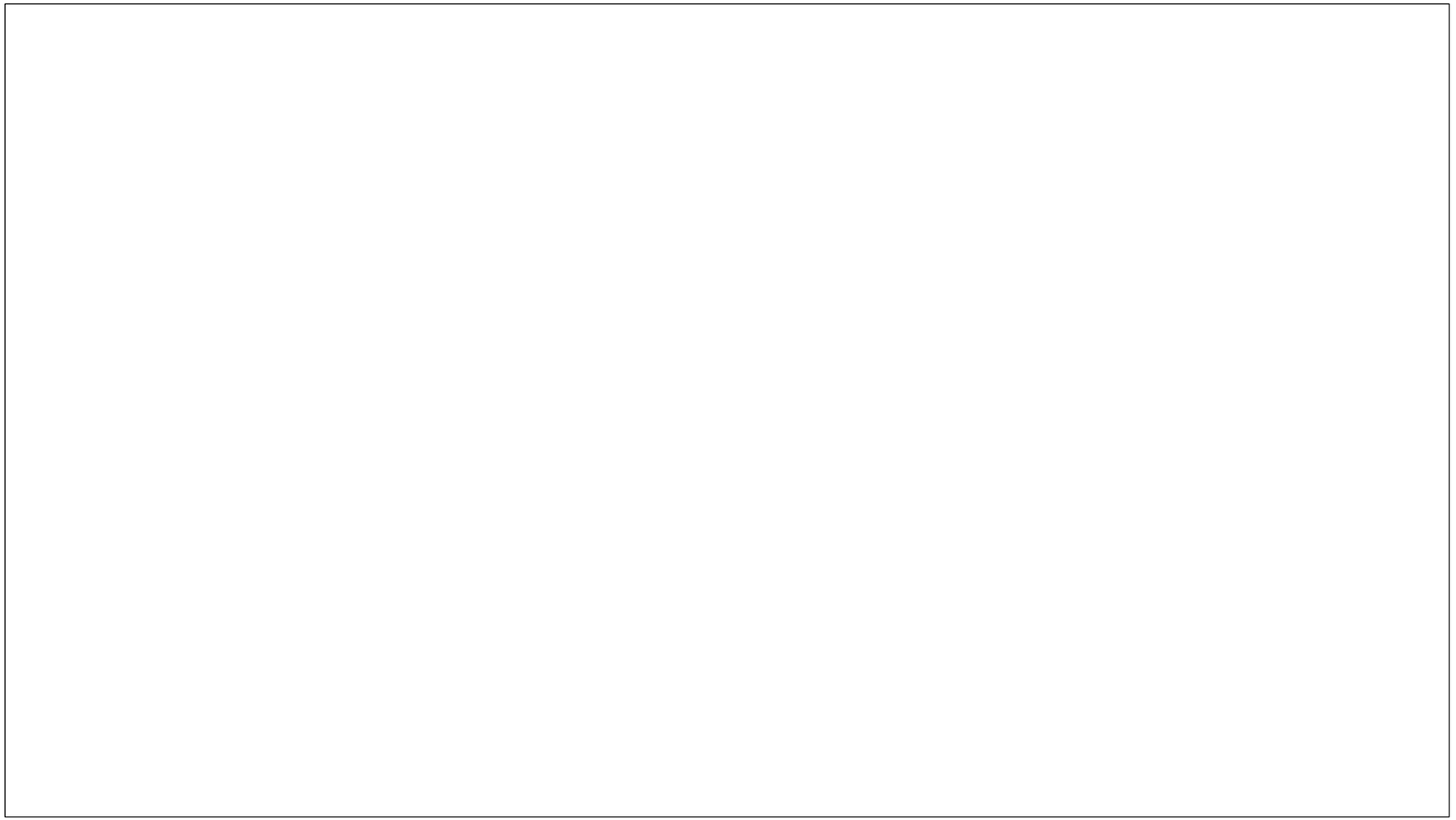
the NEW antimicrobial PICC for neonates

Developed specifically to fight against catheter-related bloodstream infections.



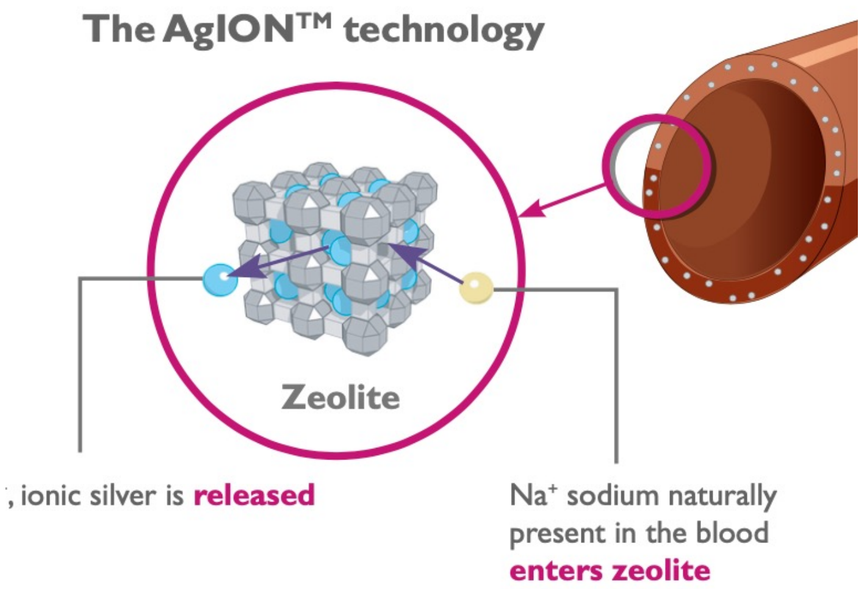
Epicutaneo cava 1 Fr

Could induce increased resistance?



The choice of the material

Antibiotic / Silver coated catheters



Silver coated umbilical catheters

Reduction of infections,
but only for long term use

High costs

Latest guidelines recommend the removal of the umbilical catheter after a maximum of 7 days !

La scelta del materiale

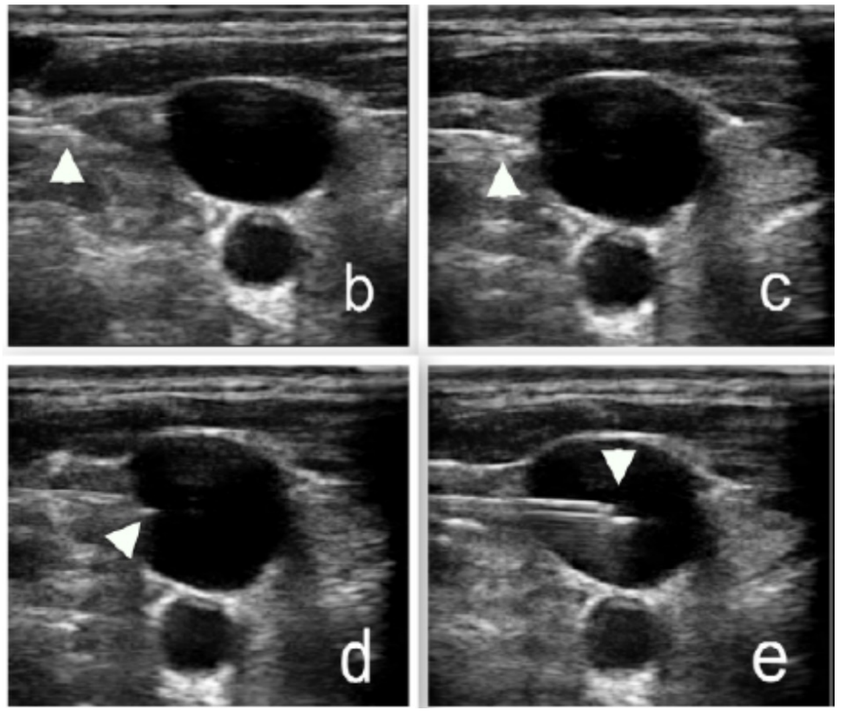
In caso di un bambino altamente instabile, con numerose infusioni

Catetere venoso ad inserzione centrale

Prelievo ematico
Infusioni ad elevate velocità
Trasfusioni
Monitoraggio emodinamico (PVC)
Ridotto rischio di occlusione o rottura meccanica

Tecnique of insertion

Ultrasound



Ultrasound-Guided Percutaneous Central Venous Access in Low Birth Weight Infants: Feasibility in the Smallest of Patients

Seth D. Goldstein, MD, MPhil,[1] Howard Pryor, MD,[1] Jose H. Salazar, MD,[1] Nicholas Dalesio, MD,[2] F. Dylan Stewart, MD,[1] Fizan Abdullah, MD, PhD,[1] Paul Colombani, MD, MBA,[1] and Jeffrey R. Lukish, MD, FACS[1]

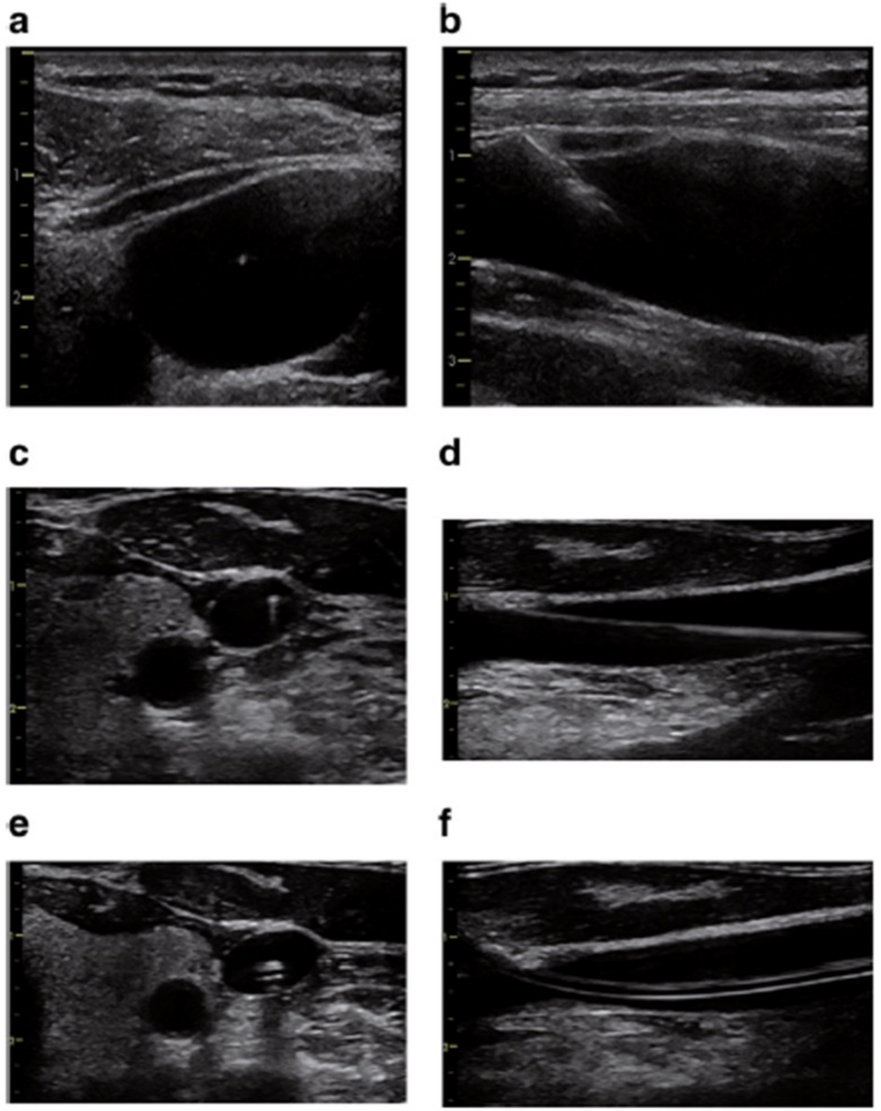
The ultrasound

Why does it reduce infections

Direct visualization of the vein

Decrease in the number of attempts

The more the number of attempts, the bigger the infectious risk



The insertion site

Peripherally Inserted Central Catheter Complications in Neonates With Upper Versus Lower Extremity Insertion Sites

Wrightson, Della Daugherty MSN, RNC-NIC

Advances in Neonatal Care: June 2013 - Volume 13 - Issue 3 - p 198-204
doi: 10.1097/ANC.0b013e31827e1d01

Epicutaneo Cava Catheters

Always choose the best available vein,

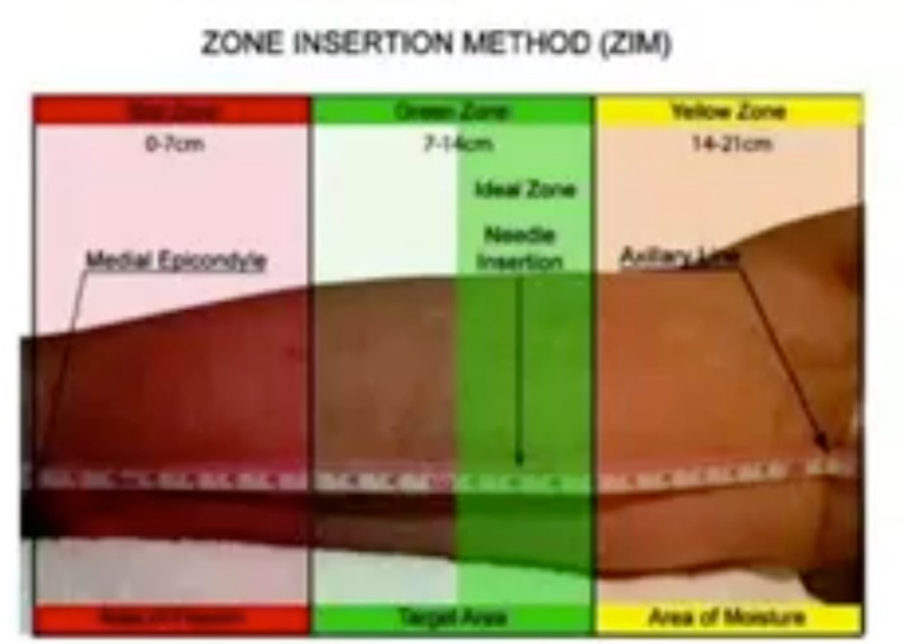
regardless of the insertion site

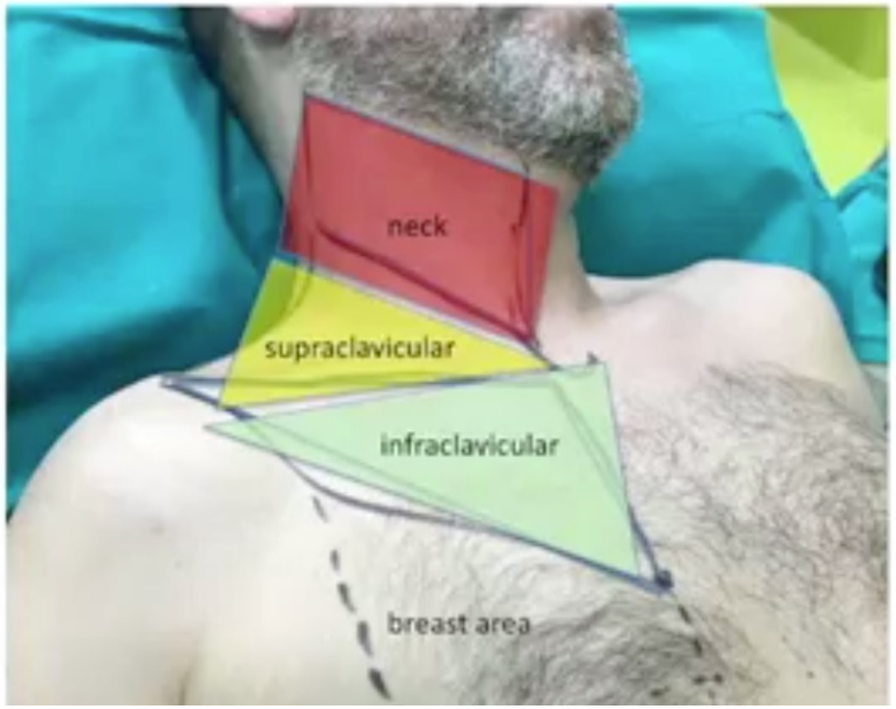
The exit site

CICC – centrally inserted central catheter

PICC Zone Insertion Method™ (ZIM™): A Systematic Approach to Determine the Ideal Insertion Site for PICCs in the Upper Arm

Robert B. Dawson
MSA, BSN, RN, CRNI, CPUI, VA-BC

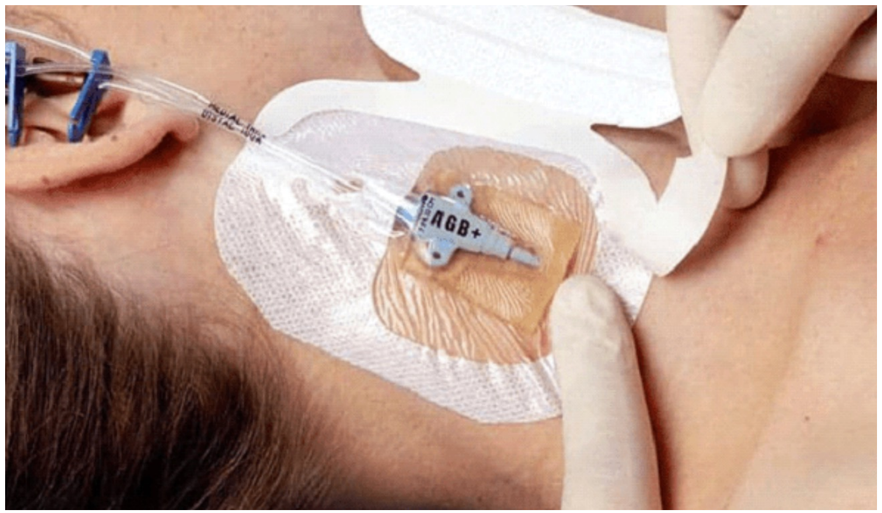




The exit site

CICC – centrally inserted central catheter

Avoid the neck
the area near the ear



Avoid the femoral veins in the neonate

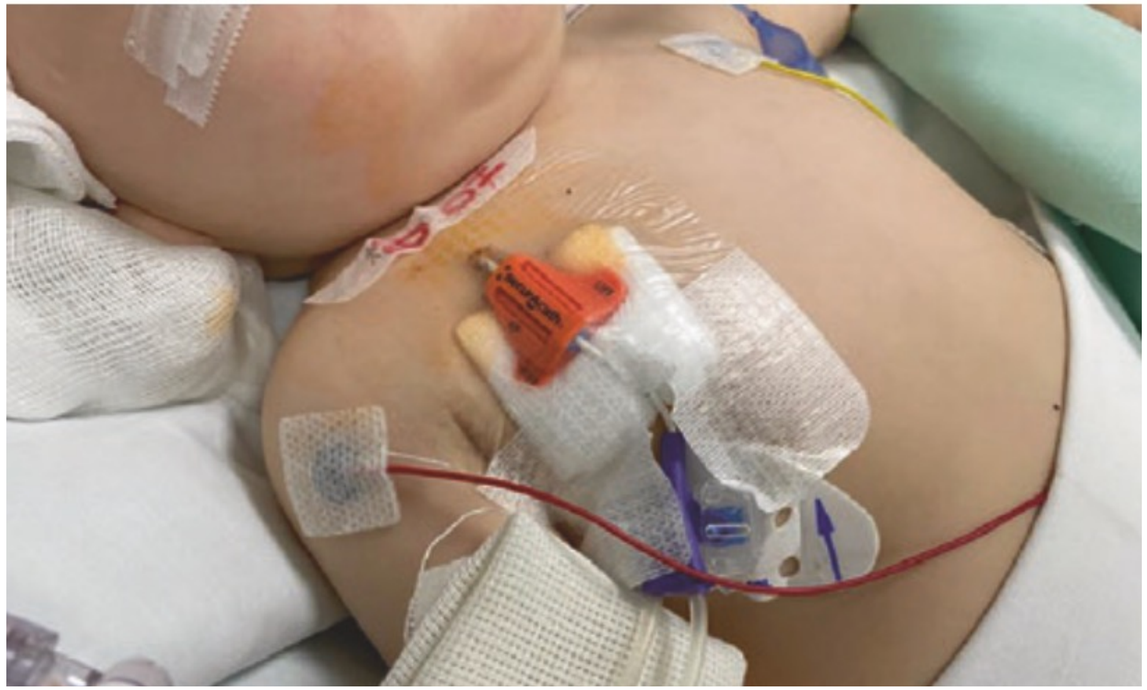
Increased thrombotic risk

Increased infection risk

(diaper area)

The exit site

Tunnelization

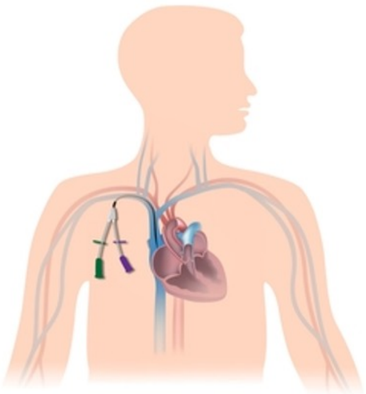


The exit site is different

from the insertion site

Maintainance bundles

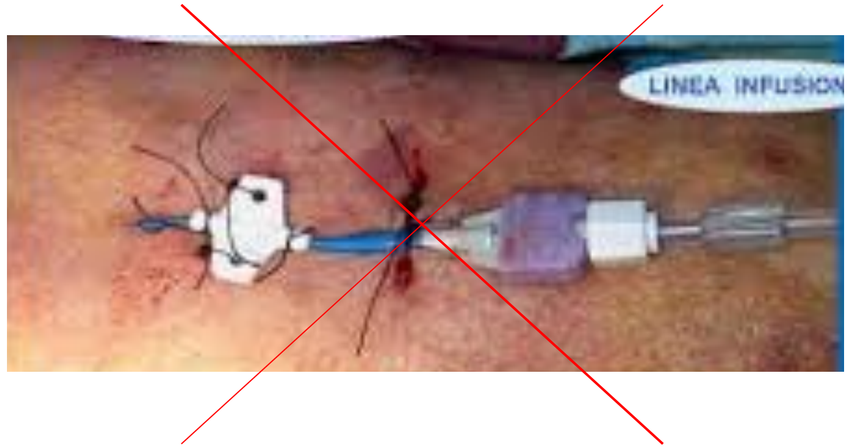
Exit site



Stabilisation

Dressing

Stabilization of the catheter



Sutureless device

Increased stabilization of the device

Avoids the in/out movement of the catheter

Easier to clean

Stabilization of the catheter

Sutureless devices

Transparent dressing

Reduced rate of infection

Reduced rate of thrombosis

Reduction of accidental dislocation

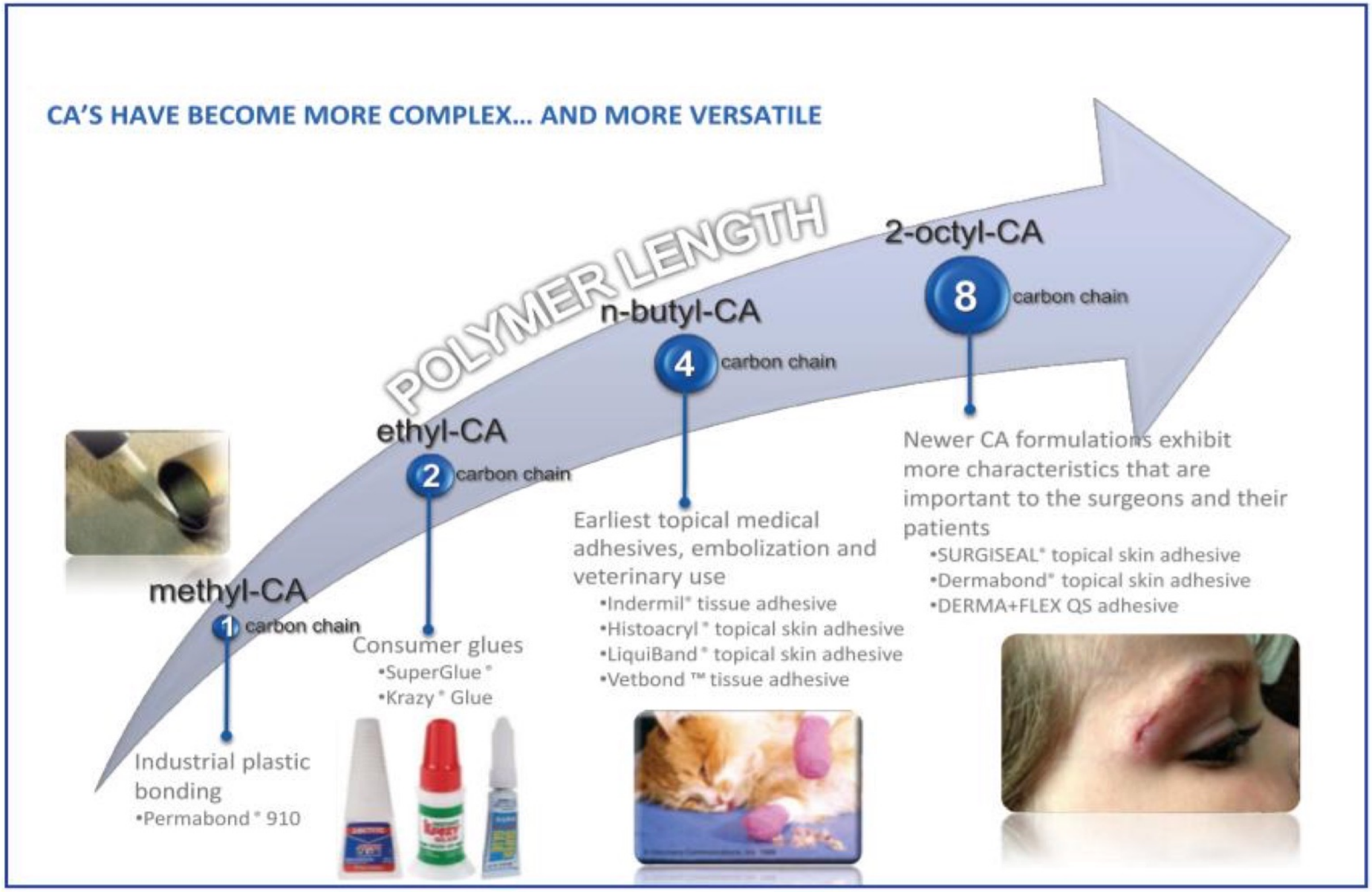
Stabilization of the catheter

Trasparent dressing

The point of insertion must remain always visible

Check the insertion site to assess presence of redness, swelling or discharge

Histoacryl glue



Cyanoacrylate glue

Stabilizes

Hemostatic

Anti infective

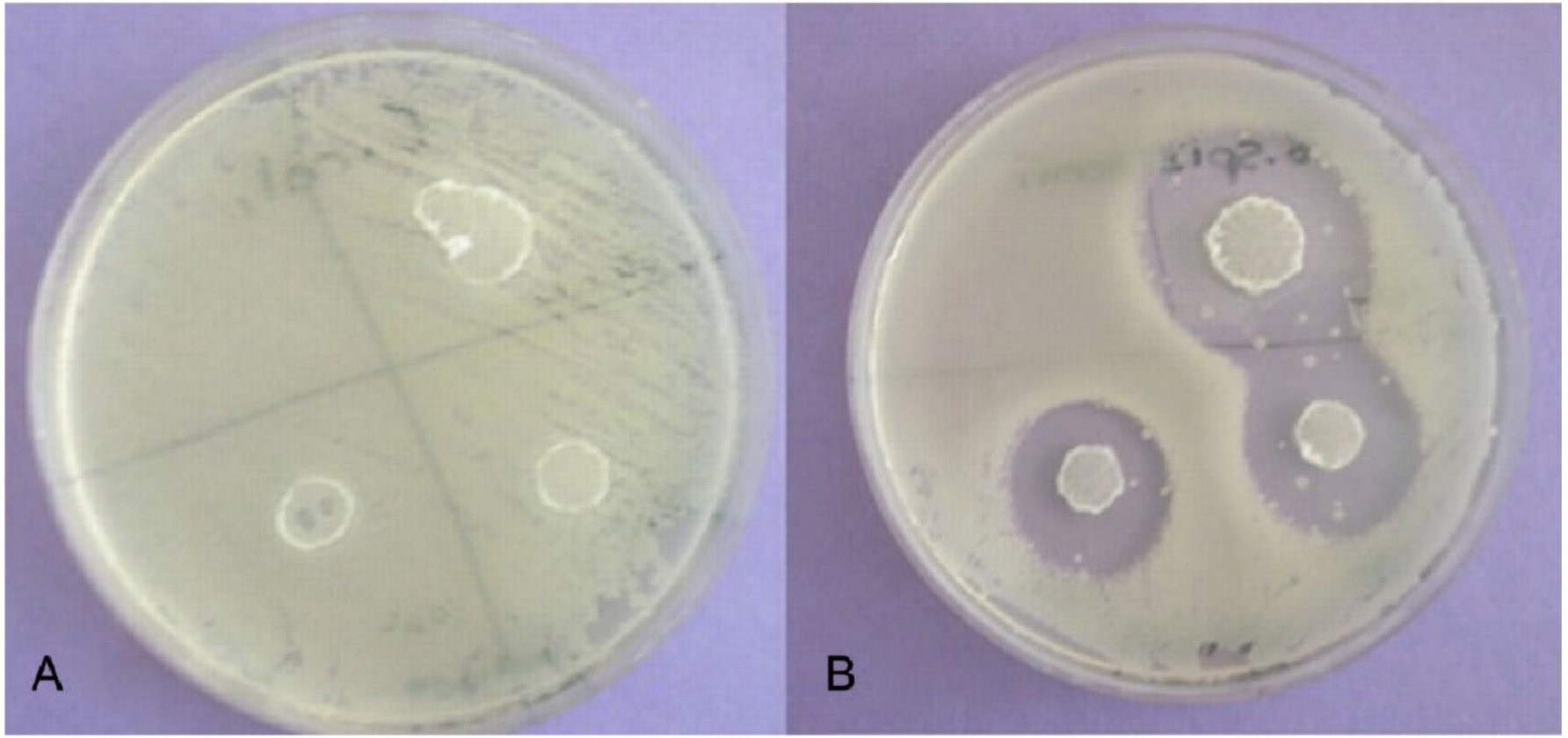


Figure 2. Photograph showing no inhibition of growth of a Gram-negative bacteria (A) and inhibition of growth of a Gram-positive bacteria (B) around the pellets of Dermabond®

Published in Journal of infection prevention 2014

The antibacterial effect of 2-octyl cyanoacrylate (Dermabond®) skin adhesive

J. Rushbrook, Grace White, Lizi Kidger, P. Marsh, T. Taggart

Cyanoacrylate glue

Central venous catheters

2020 Gilardi et al. – The Journal of Vascular Access

"Reduction of bacterial colonization at the exit site of peripherally inserted central catheters: a comparison between chlorhexidine-releasing sponge dressings and cyano-acrylate"

51 patients

As effective as chlohexidine as antimicrobial barreer, but less bleedings

Secureport IV

Approved and licensed to secure catheters

DEPARTMENT OF HEALTH AND HUMAN SERVICES
Food and Drug Administration

Indications for Use

Form Approved: OMB No. 0910-0120
Expiration Date: January 31, 2017
See PRA Statement below.

510(k) Number *(if known)*
K170505

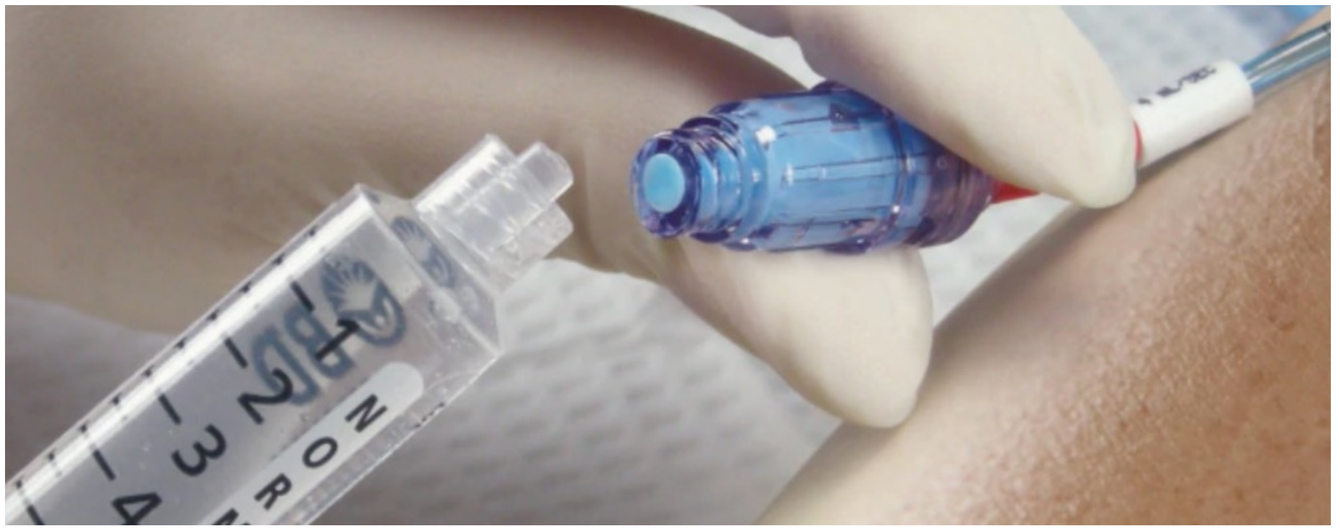
Device Name
SecurePortIV Catheter Securement Adhesive

Needle free connector

Risk of increased infection rate because of inadequate sterilization

Needle free connector

Disinfection for **5-15 sec**
with chlorhexidine



Allow time for the alcohol to dry

Port protectors

Protectors containing 70% isopropyl alcohol

Single use

40% decrease of CLABSI

Merrill KC, Sumner S, Linford L, Taylor C, Macintosh C. (2014) Impact of universal disinfectant cap implementation on central line-associated bloodstream infections. American Journal of Infection Control 42: 1274–1277.

Should we use antibiotic prophylaxis?

CDC Guidelines

Do not administer systemic *antimicrobial* prophylaxis routinely before insertion or during the use of an intravascular catheter to prevent catether colonization or CRBSI

Take home message

No magic bullets!!

Insertion bundles

Correct management of the exit site

Maintenance bundles

Grazie per l'attenzione

fiammetta.piersigilli@saintluc.uclouvain.be

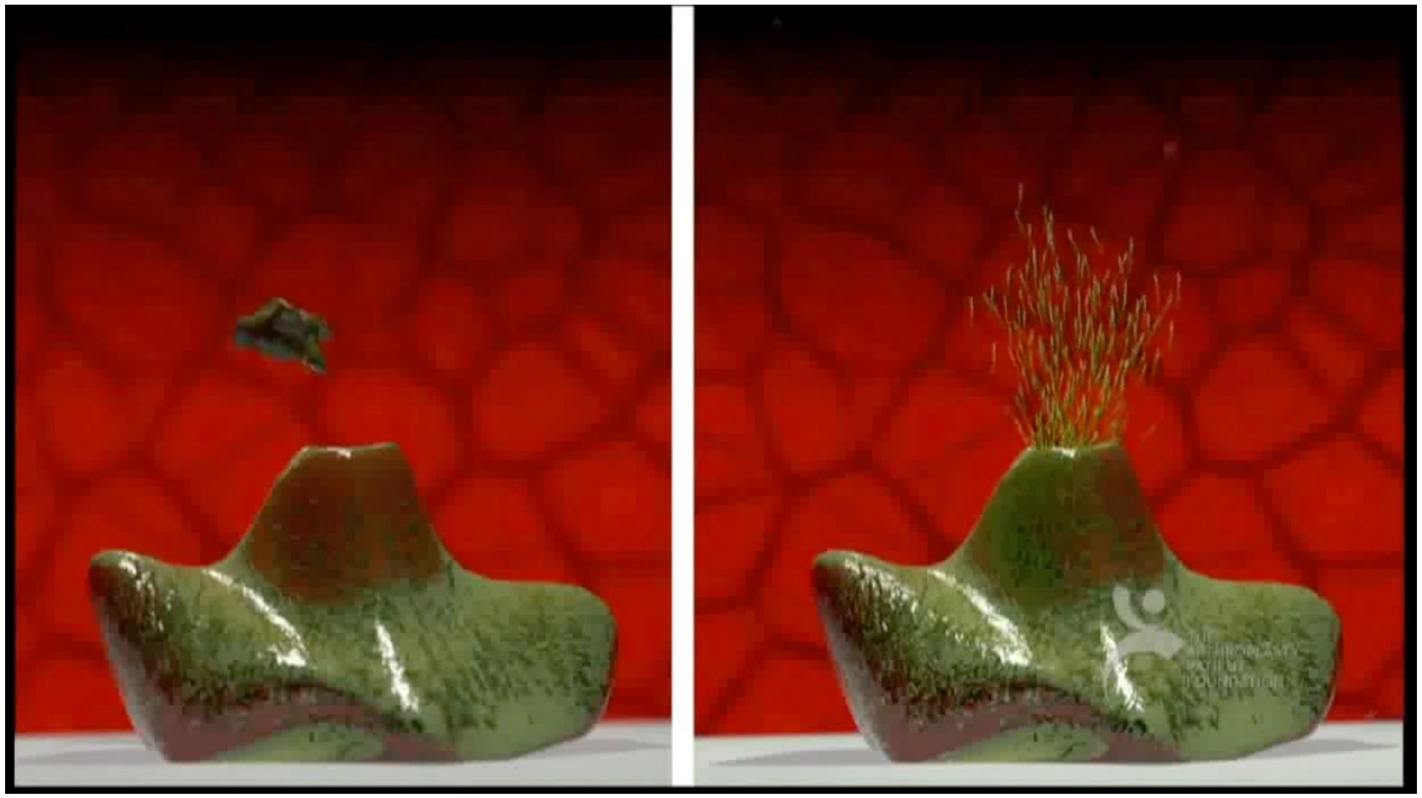
https://neonat.org

Il Biofilm

Protegge i batteri da cellule immunitarie e antibiotici

Ridotto metabolism batterico
Ridotta sensibilità agli antibiotici

Il Biofilm



Necessità di dosi maggiori di antibiotici e per piu lunga durata

Formazione di nuove colonie batteriche con elevate resistenza agli antibiotici