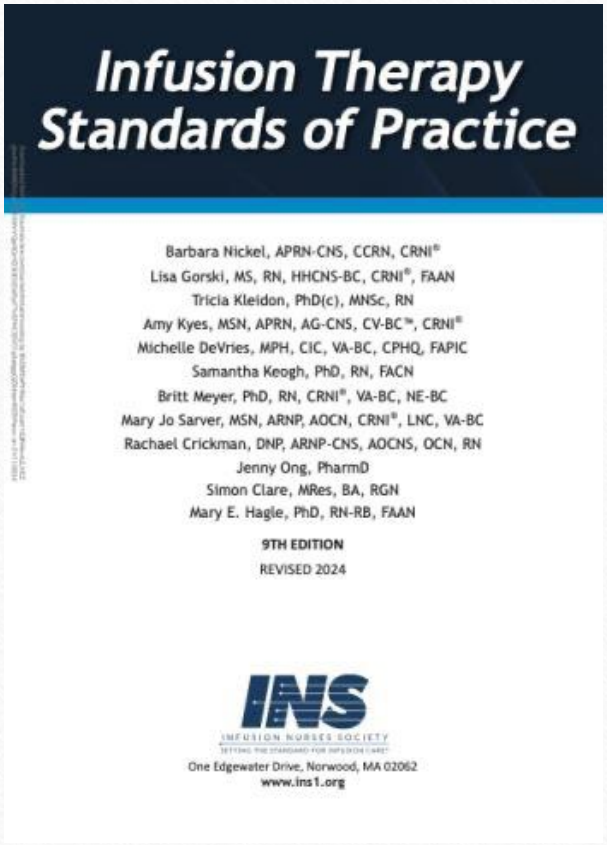
La Gestione corretta delle linee infusionali

Michela Bevilacqua
«Specialist Accessi Vascolari »
IRCCS Gaslini, Genova



As stated in INS' Mission ethics, "We are dedicated to advancing the delivery of quality infusion therapy to patients, enhancing the specialty through stringent Standards of Practice and professional ethics, and promoting research and education in the infusion nursing practice." Remaining true to that commitment, INS is proud to present the 9th edition of the *Infusion Therapy Standards of Practice*.

Come affermato nell'etica della missione dell'INS,
"Ci impegniamo a promuovere l'erogazione di una terapia infusionale di qualità ai pazienti, migliorando la specialità attraverso rigorosi standard di pratica ed etica professionale e promuovendo la ricerca e la formazione nella pratica infermieristica infusionale"

9TH EDITION

REVISED 2024

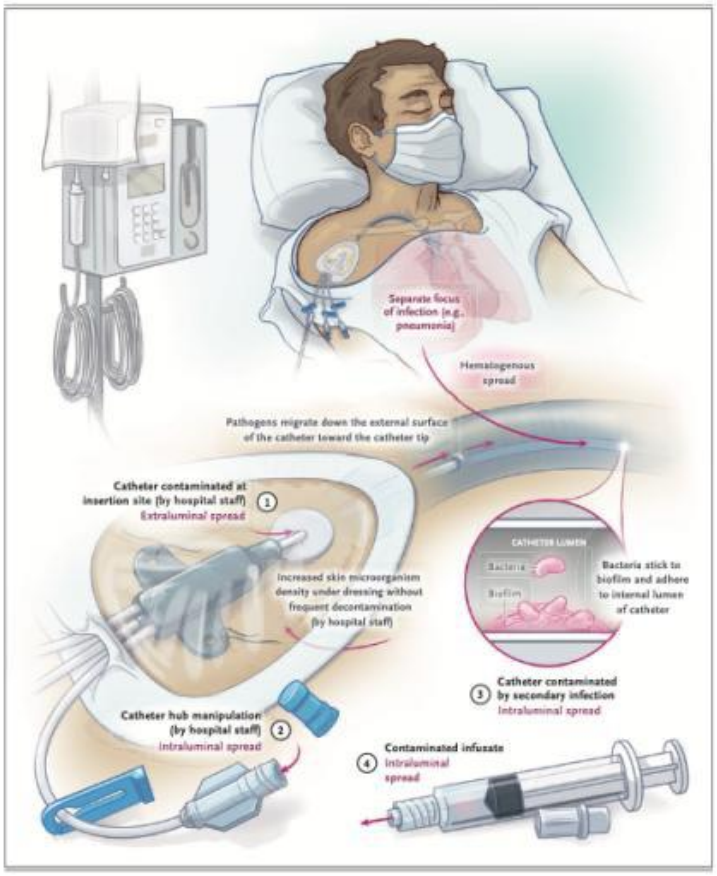
Review > N Engl J Med. 2023 Sep 21;389(12):1121-1131. doi: 10.1056/NEJMra2213296.

Prevention of Central Line-Associated Bloodstream Infections

Naomi P O'Grady [1]

Esistono 4 vie di contaminazione del catetere

1. All'inserzione e durante la gestione
    a. Gli agenti patogeni della pelle nel sito di inserimento possono entrare nel tratto cutaneo del catetere e migrare lungo la superficie esterna del catetere verso .
    b. La contaminazione del sito di inserimento può verificarsi anche quando la densità dei microrganismi cutanei aumenta nel tempo sotto la medicazione del catetere, se l'area non viene decontaminata frequentemente.
2. Durante la manipolazione degli Hub
3. Meno comunemente, i cateteri vengono contaminati per via ematogena da un'infezione secondaria del flusso sanguigno che si sviluppa da un altro focolaio di infezione (adesione al biofilm)
4. L'infuso contaminato




CVAD selection and Healthcare Workes Education and Training
Insertion
Prevention of Complications
Care of Exit Site
Disinfection of Catheter Hubs Connectors and Injection Ports

CVAD selection and Healthcare Workes Education and Training

Editorial > Eur J Pediatr. 2023 Aug;182(8):3385-3395. doi: 10.1007/s00431-023-04984-4. Epub 2023 May 17.

The neonatal DAV-expert algorithm: a GAVeCeLT/GAVePed consensus for the choice of the most appropriate venous access in newborns

Giovanni Barone [1], Vito D'Andrea [2], Gina Ancora [3], Francesco Cresi [4], Luca Maggio [5], Antonella Capasso [6], Rossella Mastroianni [7], Nicola Pozzi [8], Carmen Rodriguez-Perez [9], Maria Grazia Romitti [10], Francesca Tota [11], Ferdinando Spagnuolo [12], Francesco Raimondi [6], Mauro Pittiruti [13]

Review > J Vasc Access. 2024 Jun 10:11297298241256999. doi: 10.1177/11297298241256999. Online ahead of print.

The pediatric DAV-expert algorithm: A GAVeCeLT/GAVePed consensus for the choice of the most appropriate venous access device in children

Mauro Pittiruti [1], Alessandro Crocoli [2], Clelia Zanaboni [3], Maria Giuseppina Annetta [4], Michela Bevilacqua [5], Daniele G Biasucci [6], Davide Celentano [7], Simone Cesaro [8], Antonio Chiaretti [9], Nicola Disma [10], Aldo Mancino [11], Cristina Martucci [2], Lidia Muscheri [11], Alessio Pini Prato [12], Alessandro Raffaele [13], Simone Reali [2], Francesca Rossetti [14], Giancarlo Scoppettuolo [15], Luca Sidro [16], Geremia Zito Marinosci [16], Gilda Pepe [1]

> Br J Anaesth. 2013 Mar;110(3):347-56. doi: 10.1093/bja/aes499. Epub 2013 Jan 29.

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

N Moureau [1], M Lamperti, L J Kelly, R Dawson, M Elbarbary, A J H van Boxtel, M Pittiruti

Insertion

Editorial > J Vasc Access. 2024 Jan;25(1):5-13. doi: 10.1177/11297298221099838. Epub 2022 May 27.

The SIP protocol update: Eight strategies, incorporating Rapid Peripheral Vein Assessment (RaPeVA), to minimize complications associated with peripherally inserted central catheter insertion

Fabrizio Brescia [1], Mauro Pittiruti [2], Timothy R Spencer [3], Robert B Dawson [4]

Editorial > J Vasc Access. 2021 Nov;22(6):863-872. doi: 10.1177/1129729820965063. Epub 2020 Oct 16.

Rapid Femoral Vein Assessment (RaFeVA): A systematic protocol for ultrasound evaluation of the veins of the lower limb, so to optimize the insertion of femorally inserted central catheters

Fabrizio Brescia [1], Mauro Pittiruti [2], Matthew Ostroff [3], Daniele G Biasucci [4]

Review > J Vasc Access. 2019 May;20(3):239-249. doi: 10.1177/1129729818804718. Epub 2018 Oct 4.

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

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

Care of Exit Site

J Infect Prev. 2024 May;25(3):73-81. doi: 10.1177/17571774241232063. Epub 2024 Feb 8.

The use of procedural kits may reduce unscheduled central line dressing changes: A matched pre-post intervention study

Amit Bahl [1], Nicholas Mielke [2], Steven Matthew Gibson [1], Julie George [1]

Review N Engl J Med. 2023 Sep 21;389(12):1121-1131. doi: 10.1056/NEJMra2213296.

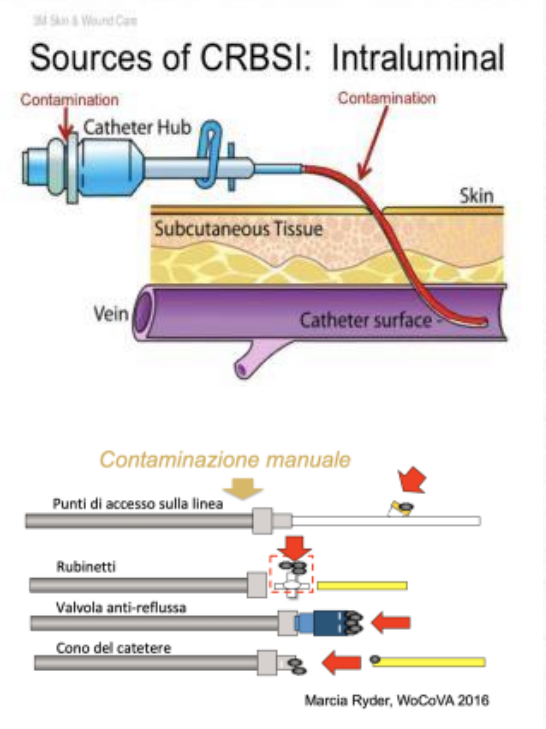
Prevention of Central Line-Associated Bloodstream Infections

Naomi P O'Grady [1]

We need to engineer resilient infection-prevention processes that can withstand changing environmental conditions and uncertain events. Although consistent reinforcement of preventive practices such as checklists is effective, it relies on limited staff who may have competing priorities when the health care system is strained. It is time to consider combining routine use of all available CLABSI preventive strategies that do not depend on providers in order to be effective. Rely-

Colonizzazione intraluminale

Disinfection of Catheter Hubs Connectors and Injection Ports



Pedivan
Pediatrics Vascular Access Network

AVA
Association for Vascular Access

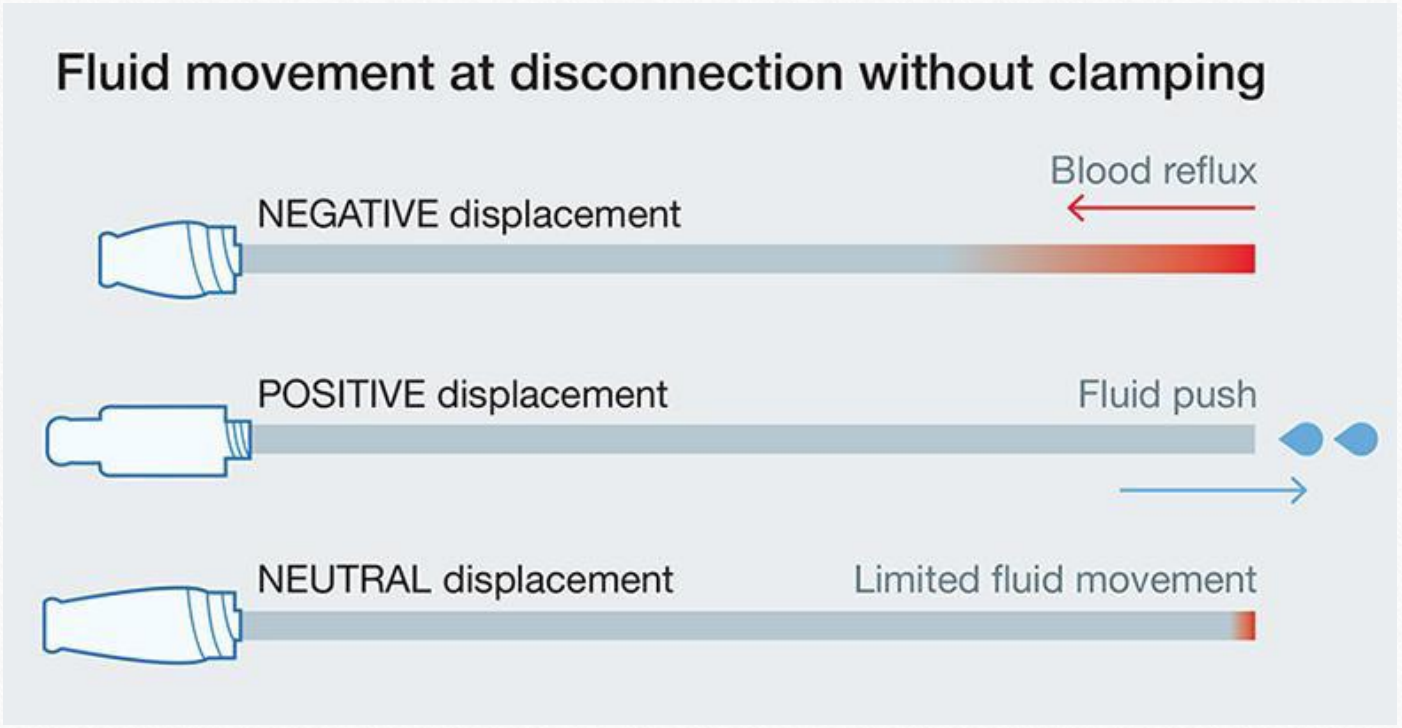
- **Size and profile**: The large size and bulk of some connectors makes securement to the child difficult and may also be uncomfortable.
- **Internal**: Internal fluid volumes of connectors vary by design. Priming volume is not always indicative of flush clearance. Careful attention needs to be given when administering small-volume medication.
- **Color**: The device may be transparent or clear, opaque, or colored.
- **Surface features**: Irregular, raised, or concave surfaces or gaps may affect the ability to adequately disinfect the surface.[175]
- **Internal parts**: Movable parts inherent in mechanical valves may alter the path of fluid flow, thereby creating stagnation and potential reservoirs for microbial growth.

- **Flushing**: The ability to adequately flush blood cells from the fluid path within the device, specific priming volume and design determine flush and lock techniques and protocols for the device.
- **Locking ability**: Use of a Luer-lock for the connector on the catheter hub or tubing is an important consideration in children.
- **Flow rate**: Restrictions of flow through the device may limit its use in patients requiring high infusion rates and these vary by design.
- **Fluid displacement**: The pattern of fluid movement (positive, negative, or neutral) upon disconnection of a syringe needs to be identified.

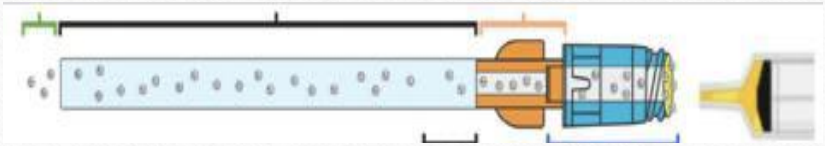
34. NEEDLELESS CONNECTORS

Standard

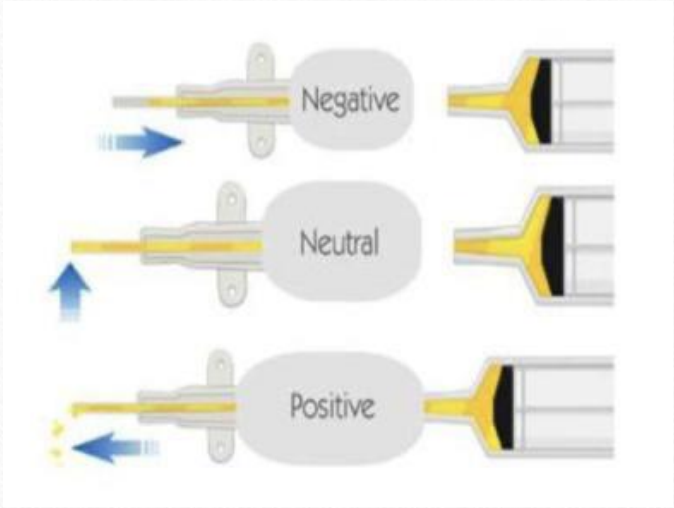
34.1 A luer-locking needleless connector is used to connect syringes and/or administration sets to a vascular access device (VAD) hub or other injection site to eliminate use of needles and reduce needlestick injuries.


Fluid movement at disconnection without clamping
Blood reflux
NEGATIVE displacement
POSITIVE displacement
Fluid push
NEUTRAL displacement
Limited fluid movement

Procedure per la disconnessione della siringa



KEY POINT
disconnessione della siringa



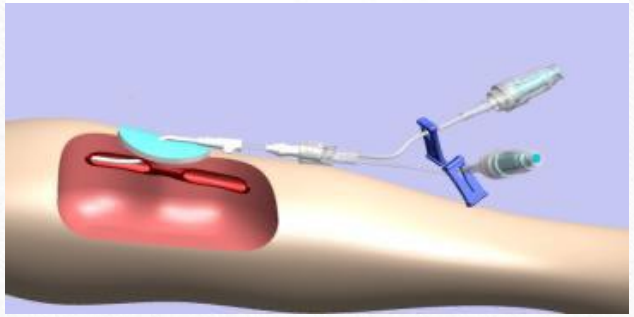
Spostamento negativo: flush, chiusura morsetto, scollegamento

Neutro : nessuna sequenza specifica necessaria

Spostamento positivo: flush, disconnessione, chiusura morsetto

Infusion Therapy Standards of Practice

G. Change the needleless connector in the following circumstances: if the needleless connector is removed for any reason; prior to drawing a sample for blood culture from a CVAD; as per local policies, procedures, and/or practice guidelines; and per manufacturers' directions for use or when clinically indicated (eg, any loss of product integrity such as contamination, dysfunction, or any residual blood or debris within the needleless connector), whichever occurs sooner (see Standard 47, *Vascular Access Device-Related Infection*).[2] (V)

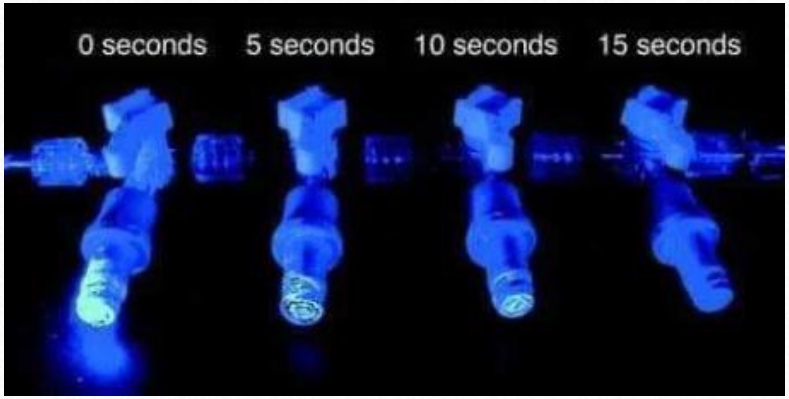


Quando cambiarli?

- Disconnessione
- Residui di sangue
- Per emocoltura
- Contaminazione

Se non utilizzato a 7gg con medicazione

Disinfezione dei NFC



J Vasc Access. 2019 Nov;20(6):604-607. doi: 10.1177/1129729819826036. Epub 2019 Feb 5.

The colonization rate of needleless connector and the impact of disinfection for 15 s on colonization: A prospective pre- and post-intervention study

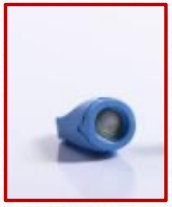
İlker Devrim [1], Nevbahar Demiray [2], Yeliz Oruç [2], Kenan Sipahi [2], İlknur Çağlar [1], Ferhat Sarı [3], Nuriye Turgut [3], Gülhan Atakul [3], Nihal Özdamar [3], Vecihe Dursun [4], Yelda Sorguç [4], Nuri Bayram [1], Hasan Agın [3]

Infusion Therapy Standards of Practice

c. Compared to active disinfection, passive disinfection has been associated with increased clinician compliance largely due to the continuous dwell nature of the device.[46,47] (IV)
   i. However, other studies show no difference between passive decontamination with caps and active decontamination with swabs. More high-quality trial research is required.[48,49] (III)

Attiva

Passiva



Tempi di sostituzione delle linee infusionali

40. ADMINISTRATION SET MANAGEMENT

KEY DEFINITIONS

Sorption. A complex process including both adsorption and absorption that varies greatly with components within the infusion container, the administration set, type of infusate, the flow rate of infusates, and the contact duration and conditions during storage, preparation, and administration.

- **Absorption.** Drug penetration inside of the infusion system.
- **Adsorption.** Interaction of the drug with the surface of the infusion container and/or administration set; results in patient receiving a smaller amount of the drug.

Leaching: Process of a solute becoming detached or extracted from its carrier substance.

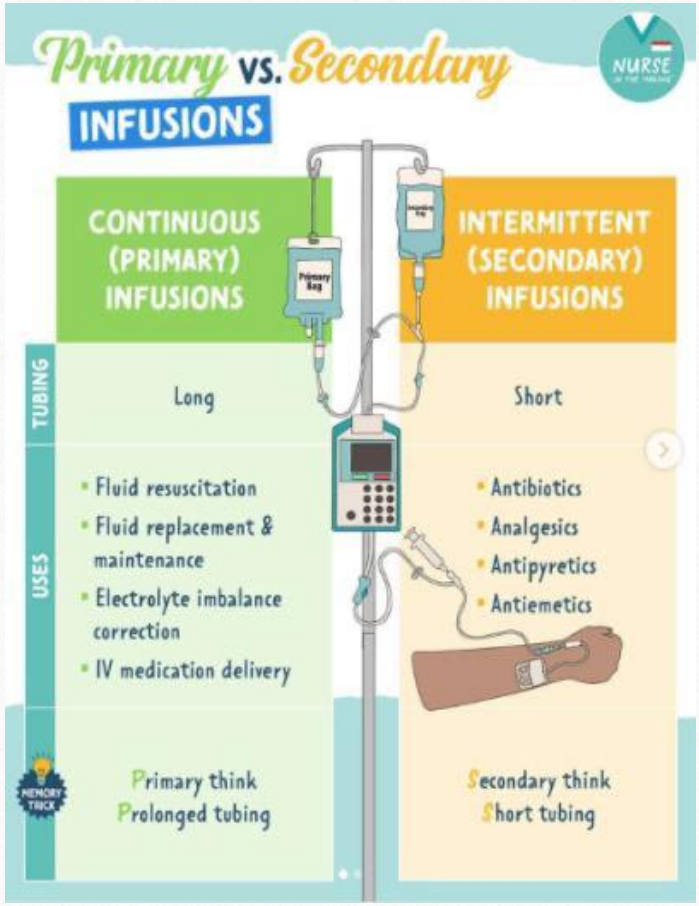
Shedding: Particle release (solids) from an infusate container, administration set, or filter.

Intermittent administration set: A primary or secondary administration set that has been disconnected from the initial access point (eg, needleless connector, vascular access device [VAD] hub) and left disconnected due to completion or a pause in an infusion. It must be disconnected aseptically, with the distal tip protected by a new sterile end cap.

Continuous administration set: A primary or secondary administration set that remains connected to the vascular access device (VAD) for the duration of an infusion or until the scheduled administration set change occurs. This set may be disconnected from the VAD for a brief period (eg, blood sampling, transition to a new VAD lumen) and reconnected to the VAD with adherence to ANTT and needleless connector cleansing.

Continuous infusion: A controlled method of intravenous administration given over at least several hours or longer without interruption.

Intermittent infusion: A small volume given by manual push or short infusion (eg, 30 or 60 minutes); an infusion technique that would easily allow for patency assessment before, during, and after the medication infuses.



- Set di somministrazione primaria.
  L'infusione è collegata direttamente il contenitore dell'infuso al dispositivo di accesso vascolare (VAD); può essere continuo o intermittente.

- Set di somministrazione secondaria
  L'infusione è collegata ad un punto di accesso sul set primario (Rampa o altro) può essere utilizzato per somministrare infusioni:
  - per infusioni intermittenti
  - infusioni continue secondarie.

- Infusione continua.
  Somministrazione endovenosa per diverse ore senza interruzione.

- Infusione intermittente.
  Un volume ridotto o infusione breve (ad esempio, 30 o 60 minuti

Sostituzione delle linee infusionali

SOLUZIONE	TEMPO SOSTITUZIONE
Infusioni primarie o secondarie continue	72/96h
Infusioni primarie o secondarie intermittenti	24h
Sangue ed emoderivati	Non oltre le 4h (ogni cambio sacca)
NPT	24h o cambio sacca
Propofol	6-12 h
Farmaci	24h o secondo indicazione produttore
Set di monitoraggio circuito chiuso	96h

Malfunzionamento / Occlusione

Nei **pazienti pediatrici** il rischio di occlusione è molto elevato per almeno 3 motivi:

- I cateteri sono molto piccoli
- Le infusioni sono lente
- I volumi infusi sono bassi

L'occlusione è una complicanza comune che accade in più del 36% dei CVC nei primi 2 anni dall'impianto e può determinare

- interruzione di terapia
- riposizionamento di catetere
- Aumento dell'ospedalizzazione del paziente

Canadian Vascular Access Association
Association Canadienne d'Accès Vasculaire

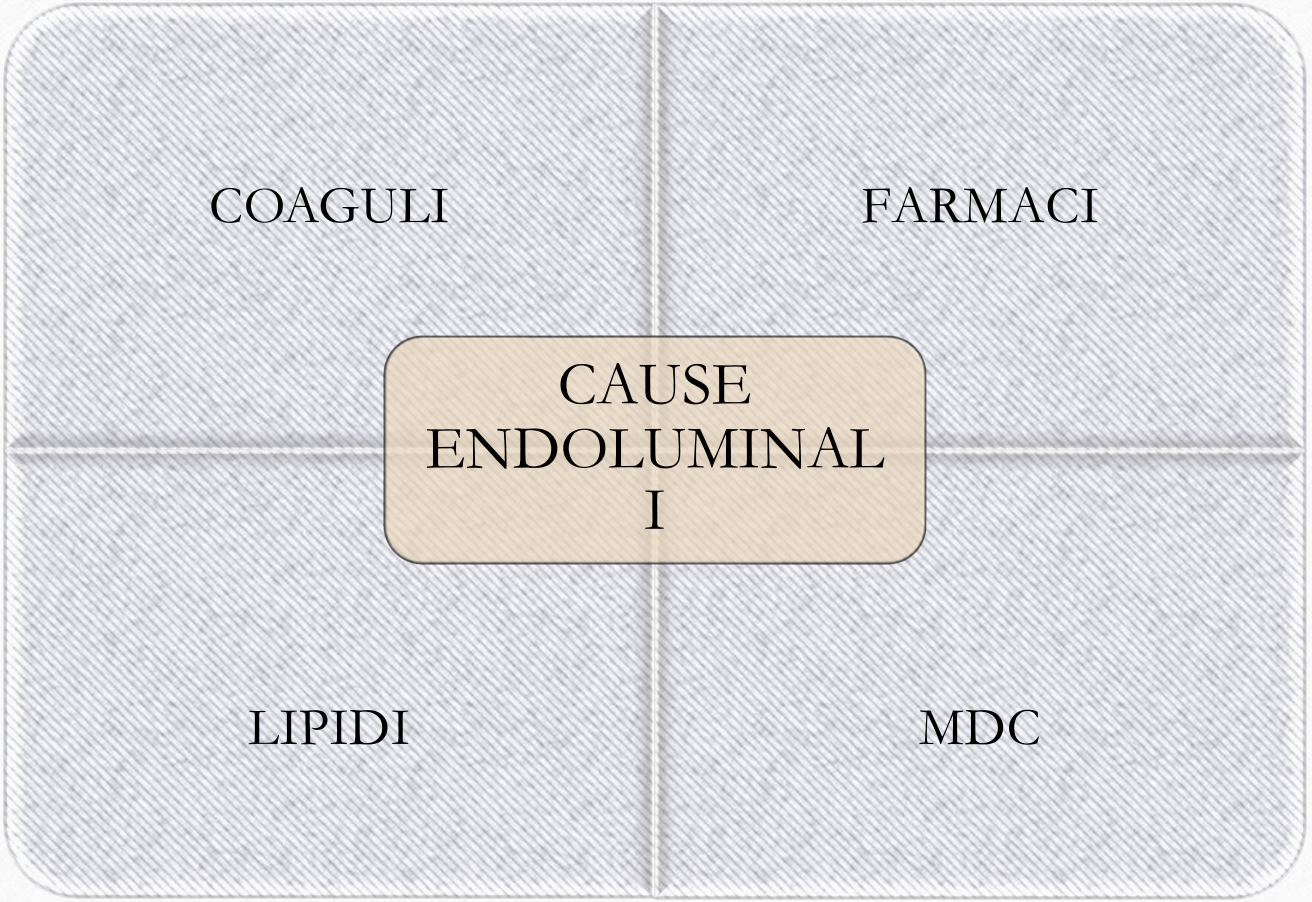
Table 2. Degrees/Types of Occlusion		
Degree/Type of Occlusion	**Symptoms/Signs**	**Causes**
Partial	Decreased ability to infuse fluids into the CVAD; resistance with flushing and aspiration Sluggish flow through catheter Increased pressure during infusion (as displayed on the infusion device)	Mechanical, chemical, or thrombotic occlusion
Withdrawal	Inability to aspirate blood but ability to infuse without any resistance Lack of free-flowing blood return	Mechanical or thrombotic occlusion
Complete	Inability to infuse or withdraw blood or fluid through CVAD	Mechanical, chemical, or thrombotic occlusion

Manifestazione del malfunzionamento del VAD

- **OCCLUSIONE PARZIALE**
  - RIDOTTA CAPACITÀ DI INFONDERE FLUIDI; RESISTENZA AL LAVAGGIO E ALL'ASPIRAZIONE
  - FLUSSO LENTO

- **PWO – 'PERSISTENT WITHDRAWAL OCCLUSION'**
  - INCAPACITÀ DI ASPIRARE IL SANGUE MA CAPACITÀ DI INFONDERE SENZA ALCUNA RESISTENZA
  - NO RITORNO DI SANGUE E FLUSSO LIBERO

- **OCCLUSIONE TOTALE**
  - INCAPACITÀ DI INFONDERE E PRELEVARE SANGUE


COAGULI
FARMACI
CAUSE ENDOLUMINALI
LIPIDI
MDC

Come fare diagnosi di malfunzionamento /occlusione

- Identificare il tipo di malfunzionamento (incompleta, completa, PWO)
- Identificare la causa
  - Set infusionale
  - Decorso catetere
  - Rimuovere NFC, sostituire filtri in linea
  - Cambio medicazione
- Anamnesi precisa degli eventi precedenti
  - MDC-NPT-cocktail di farmaci-prelievi-trasfusioni
- RX / ECO (punta e decorso endoluminale)

Prevenire il malfunzionamento e le occlusioni

Ostruzione da coaguli		Lavaggio con SF con tecnica stop and go Dopo infusione di sangue ed emoderivati Dopo prelievo Quando utilizzo discontinuo
Ostruzione da lipidi		Lavare con SF ad ogni cambio di sacca o NP Somministrare la NP con pompe infusionali Controllare il funzionamento del catetere Non utilizzare eparina per il lock
Ostruzione da farmaci		Lavare con SF tra un farmaco e l'altro Evitare mix di farmaci Utilizzo corretto dei lumi
Ostruzione da mezzo di contrasto		Lavare con SF dopo MDC Controllare funzionamento catetere Protocolli condivisi con radiologia

38. FLUSHING AND LOCKING

Standard

38.1 Vascular access devices (VADs) should be assessed for patency (ie, flushed and aspirated for a blood return) prior to each infusion to assess catheter function and prevent complications.

38.2 VADs are flushed after each medication administration with sufficient volume and appropriate rate to complete the medication administration and to reduce the risk of contact between incompatible medications.

38.3 Each VAD lumen is locked after completion of the final flush and infusion ceased to decrease the risk of intraluminal occlusion and/or to reduce catheter-associated bloodstream infection (CABSI) risk, depending on the solution used.

38.4 Standardized protocols for flushing and locking solutions are established within each organization.

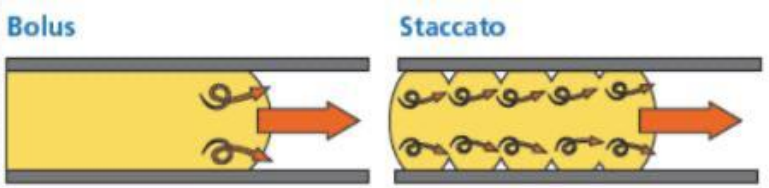
GLOSSARY

Pulsatile flushing technique. Repetitive injection of short (eg, 1 mL) pushes followed by a brief pause for the purpose of creating turbulence within the vascular access device (VAD) lumen.

Locking. The instillation of a solution into a vascular access device (VAD) used to maintain patency in between VAD use and/or reduce risk of catheter-associated bloodstream infection.

Tecnica di Flushing

- All'apertura e chiusura del sistema
- Tra un infusione e la successiva
- Tra un farmaco in bolo e l'altro
- Dopo un prelievo
- Dopo infusione di emoderivati, lipidi, MDC
- Ogni qualvolta all'ispezione la linea non risulta pulita



F. Use positive-pressure techniques to minimize blood reflux into the VAD lumen.[13,15,16,18,19] (I)
   1. Prevent syringe-induced blood reflux by leaving a small amount (eg, 0.5 mL to 1.0 mL) of flush solution in a traditional syringe (ie, one without a positive pressure plunger) to avoid compression of the plunger rod gasket and prevent this type of reflux.[13,15,16,18,19] (V)
   2. Prevent connection/disconnection reflux by using the appropriate sequence for flushing, clamping, and disconnecting determined by the type of needleless connector being used (refer to Standard 34, *Needleless Connectors*).
   3. Use a gentle pulsatile flushing technique to deliver flush into the catheter.

APIC
Association for Professionals in Infection Control and Epidemiology

Considerations for Use of Needleless Connectors in Pediatrics

Connector profile – A larger profile cap may result in unintended issues such as a breakdown in skin integrity due to pressure from the connector or inadvertent dislodging of an intravenous line due to the weight and pull of the larger cap. Also, a larger profile cap may be difficult to secure on a small baby or neonate.

Surface features – Irregular, raised, or concave surfaces may affect the ability to adequately disinfect the surface. Gaps between the surface and the internal parts of the connector may pose difficulty in disinfecting

Flush volume – A smaller flush volume is best, especially for patients that are fluid restricted or are unable to manage a bolus of fluid (e.g., very low birth weight babies, small infants, and neonates). Additionally, pediatric patients may require small volume delivery of medications, thereby making a larger volume connector problematic.

Flushing performance – Connectors that maintain blood after being flushed present a risk for infection. Connectors should be able to be cleared of blood with the minimal amount of fluid.

High-pressure compatibility – On occasion, patients may require administration of fluids at a higher pressure (e.g., rapid infusers in the emergency department).

Source: Pediatrics Vascular Access Network, Best Practice Guidelines in the Care and Maintenance of Pediatric Central Venous Catheters, March 2010.

Che siringhe utilizzare

Utilizzare siringhe

- 10 ml per tutti i cateteri
- 2-5 ml **SOLO** per cateteri Power-Injectable **MAI SILICONE**

Pressione esercitata in infusione

- Siringa 2 ml circa 200 psi
- Siringa 5 ml circa 100 psi
- Siringa 10 ml circa 50 psi

Resistenza del catetere

- Silicone circa 50 - 70 psi
- Poliuretano normale circa 110 -140 psi
- Poliuretano Power-Injectable circa 325 PSI

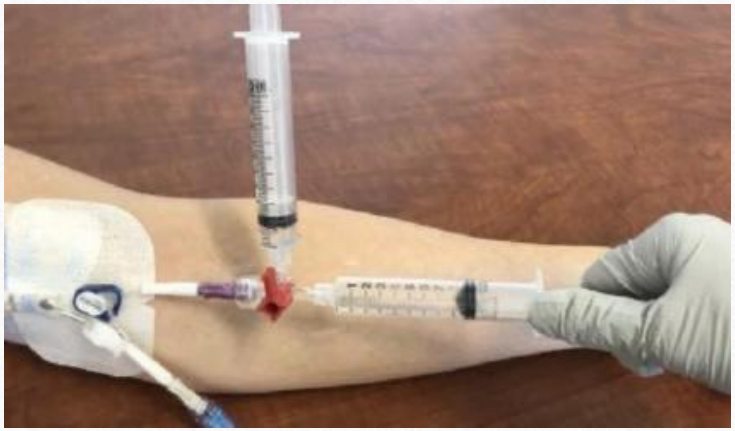
<u>Se non si conosce il materiale del catetere usare SOLO siringhe da 10 ml</u>

Disostruzione idraulica come?

CANADIAN VASCULAR ACCESS & INFUSION THERAPY GUIDELINES

In caso di PWO / occlusione incompleta o completa

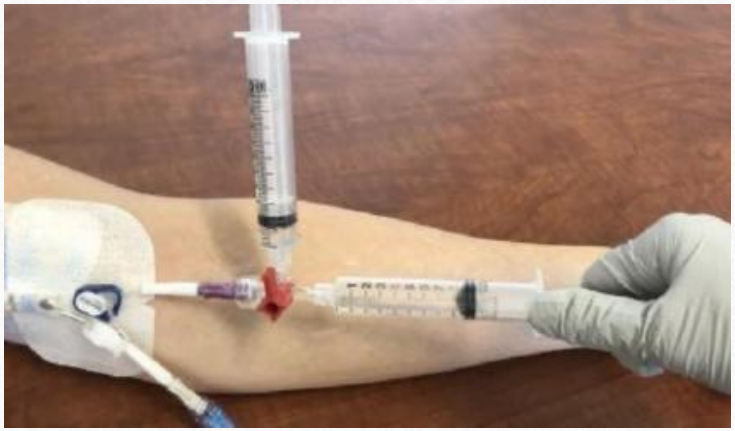
- Sistema delle 2 siringhe con rubinetto a 3 vie
- Piccoli avanzamenti fino a disostruzione del lume



Disostruzione farmacologica come?

1) In caso di PWO / occlusione incompleta
   - Lock del sistema per almeno 1 ore
   - Volume pari allo spazio morto del catetere
   - Ripetibile se non efficace
2) Occlusione completa
   - Sistema delle 2 siringhe con rubinetto a 3 vie
   - Piccoli avanzamenti fino a esaurimento del farmaco

CANADIAN VASCULAR ACCESS & INFUSION THERAPY GUIDELINES



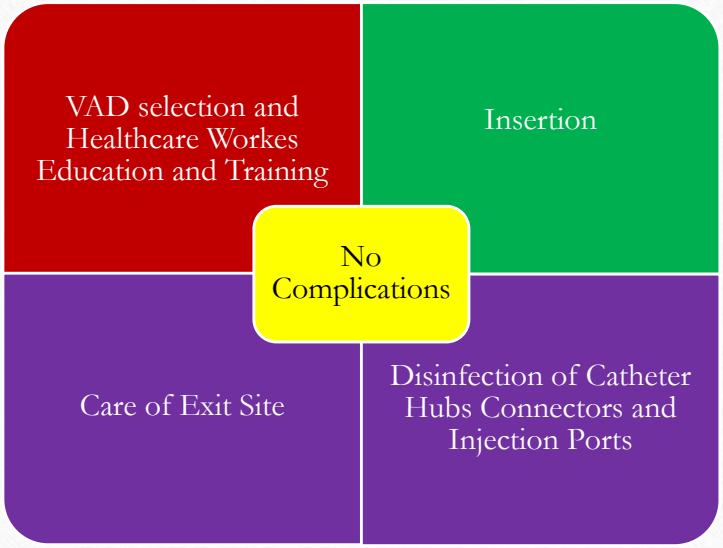
Disostruzione farmacologica cosa?

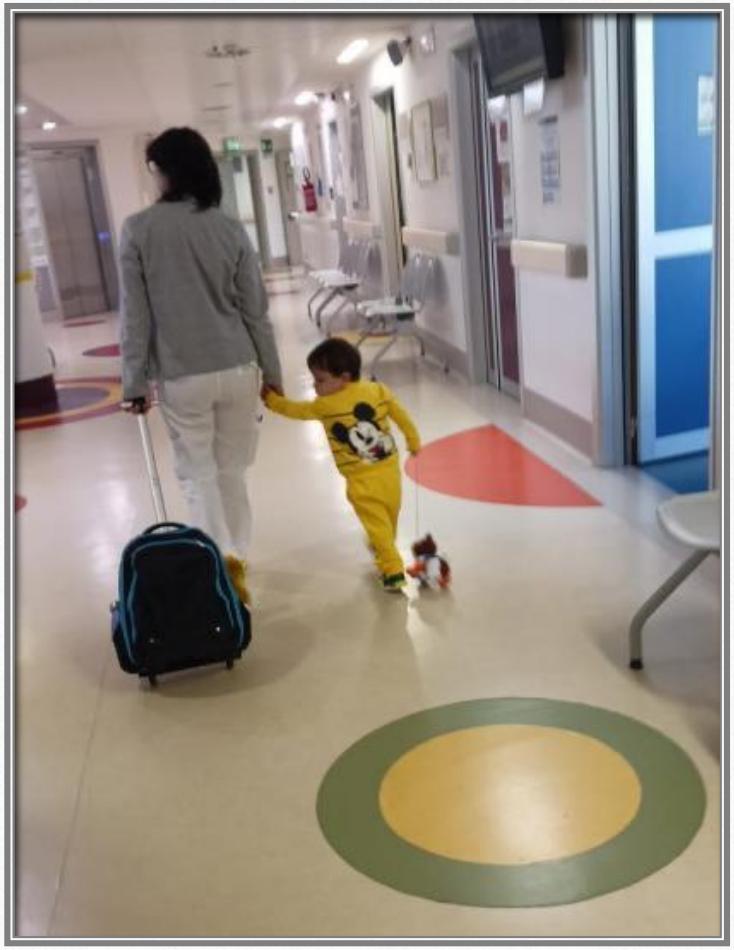
3. Consider resolving a suspected CVAD chemical occlusion (eg, medication precipitate or lipid residue), using a catheter-clearance agent based on the catheter lumen priming volume and allowing it to dwell for 20 to 60 minutes.[1-4] (V)
   a. L-cysteine 50 mg/mL or 0.1 N hydrochloric acid (HCl) have been used with acidic drug precipitates (pH 1-5).[1,2,4,7,11] (II)
   b. Sodium bicarbonate 8.4% or sodium hydroxide 0.1 mmol/L have been used with alkaline drug precipitates (pH 9-12).[4] (V)
   c. Sodium hydroxide 0.1 mmol/L (first attempt) or L-cysteine hydrochloride 50 mg/mL have been reported for PN and calcium phosphate.[1,2,4,7,11] (II)
   d. Sodium hydroxide (0.1 mmol/L) and 70% ethanol (with a systematic review finding the sodium hydroxide to be more effective and trial research and observational studies yielding mixed responses) have been used to treat lipid residue.[2,4,7,11,12,32-34] (II)
   e. Repeat instillation of catheter-clearance agent one further time, if necessary.[1,2] (V)

Infusion Therapy Standards of Practice

Come affermato nell'etica della missione dell'INS,

"Ci impegniamo a promuovere l'erogazione di una terapia infusionale di qualità ai pazienti, migliorando la specialità attraverso rigorosi standard di pratica ed etica professionale e promuovendo la ricerca e la formazione nella pratica infermieristica infusionale"





Grazie per l'attenzione