**Activity Title:** Line locks: too much of a good thing? Re-evaluating therapies for CVA device patency in a home infusion setting

**Speaker:** Claire Meredith, PharmD

**Mentor(s):** Johanna Bezjak, PharmD, BCNSP

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**Objectives:**

1. Recognize the types of central venous catheters common to a home infusion setting
2. Describe the current roles of therapies to maintain line patency
3. Discuss emerging literature influencing protocols for central line maintenance in a home infusion setting

**Presentation Abstract:**

There is currently conflicting evidence surrounding the optimal maintenance of central venous access (CVA) devices in the home infusion setting. Risks of catheter occlusion, thrombosis, and catheter-related infection have led to clinical evaluations of protocols for preventative flushing and locking techniques and pharmacotherapeutic intervention for line salvage. One of the most common controversies with CVA devices is the use of heparin locks following the administration of intravenous therapies. Historically, heparin has been used to dwell in catheters and prevent the clotting potential of residual blood within CVA devices. In recent years, multiple randomized control trials and meta-analyses have determined increased patient risk and no statistically significant benefit to catheter patency when heparin locks are compared to 0.9% saline solution alone. These studies are clinically evaluated by consensus groups (e.g., INS) to develop outpatient protocols and provide guidance in the home infusion setting, where study data is limited.

In addition to concerns of optimal maintenance, line salvage in another area of care inviting clinical discussion for pharmacotherapeutic intervention. Antibiotic lock solutions (e.g., gentamicin) and alternative solutions (e.g., ethanol, sodium citrate, EDTA, etc.) may be used to manage or prevent line infection. The use of fibrinolytic agents (e.g., alteplase) to treat thrombotic line occlusion also creates safety discussions regarding home administration. In summary, to compensate for limited studies detailing these therapies in the home infusion setting, risk-benefit analyses are needed to build patency protocols that ensure the safety of patients.

**Assessment Questions:**

Which of the following are central venous access devices (CVADs)?

I. Implantable port

II. PASV PICC

III. Skin-tunneled catheter

IV. Midline catheter

Answer choices:

1. I, III, and IV
2. I only
3. II and III
4. I, II, and III

Which of the following is not a growing concern for the use of heparin locks in the home health setting?

1. Additional patient education is needed
2. Interference with CMP/BMP laboratory results
3. Increased likelihood of biofilm formation
4. Additional risk of bleeding events

Which patient is the best candidate for ALT?

1. A patient with a Groshong® with a biofilm containing Candida species
2. An endocarditis patient with a double lumen PICC colonized with coagulase-negative Staphylococci
3. A patient receiving 5-fluorouracil via an implanted port with vancomycin susceptible Enterococcus
4. A patient receiving TPN via an implanted port with new signs of abscess near the port site

**Format:**

Live

Home study

Live and Home study

Webinar (Live)

Date of Live Activity: 12/14/22

Activity length (hr, or CEU): 1 hour

**Topic Designators - activities are related to:**

If a CPE activity's target audience is exclusively for pharmacists, the designation "P" will be used as follows:

* 01-P Disease State Management/Drug therapy



 02-P AIDS therapy

 03-P Law (related to pharmacy practice)

 04-P General Pharmacy

 05-P Patient Safety

 06-P Immunizations

 07-P Compounding

08-P Pain Management/Opioids



**References:**

1. Cheung E, et al. Venous access: a practical review for 2009. Can Fam Physician. 2009;55(5):494-496.
2. Hadaway L, Mermel LA. Midline Catheters: Could They Replace a Central Vascular Access Device?. J Infus Nurs. 2022;45(4):220-224. doi:10.1097/NAN.0000000000000471
3. Rizk E, et al. Alteplase for the treatment of midline catheter occlusions: a retrospective, single-cohort descriptive study. Br J Nurs. 2022;31(14):S6-S16. doi:10.12968/bjon.2022.31.14.S6
4. Gorski LA, Hadaway L, Hagle ME, et al. Infusion Therapy Standards of Practice, 8th Edition. J Infus Nurs. 2021;44(1S Suppl 1):S1-S224. doi:10.1097/NAN.0000000000000396
5. Gorski LA. The 2016 Infusion Therapy Standards of Practice. Home Healthc Now. 2017;35(1):10-18. doi:10.1097/NHH.0000000000000481
6. Boord C. Pulsatile Flushing: A Review of the Literature. J Infus Nurs. 2019;42(1):37-43. doi:10.1097/NAN.0000000000000311
7. Ferroni A, Gaudin F, Guiffant G, et al. Pulsative flushing as a strategy to prevent bacterial colonization of vascular access devices. Med Devices (Auckl). 2014;7:379‐383. doi:10.2147/MDER.S71217
8. McGah PM, Gow KW, Aliseda A. Leakage of central venous catheter locking fluid by hemodynamic transport. ASAIO J. 2014;60(4):443-451. doi:10.1097/MAT.0000000000000089
9. Heidari Gorji MA, et al. Comparison of the effects of heparin and 0.9% sodium chloride solutions in maintenance of patency of central venous catheters. Anesth Pain Med. 2015;5(2):e22595. Published 2015 Mar 30. doi:10.5812/aapm.22595
10. BioFlo PICC [clinician reference tool]. Angiodynamics; Latham, NY. 2013.
11. Groshong peripherally inserted central catheter [disclaimer]. Bard. Avalable at: http://www.quidditymedia.co.uk/access/vad\_devices/piccspec.html
12. Johnston AJ, et al. The effect of peripherally inserted central catheter (PICC) valve technology on catheter occlusion rates--the 'ELeCTRiC' study. J Vasc Access. 2012;13(4):421-425. doi:10.5301/jva.5000071
13. Mishra S, Horswill AR. Heparin Mimics Extracellular DNA in Binding to Cell Surface-Localized Proteins and Promoting Staphylococcus aureus Biofilm Formation. mSphere. 2017;2(3):e00135-17. Published 2017 Jun 21. doi:10.1128/mSphere.00135-17
14. Green JV, Orsborn KI, Zhang M, et al. Heparin-binding motifs and biofilm formation by Candida albicans. J Infect Dis. 2013;208(10):1695-1704. doi:10.1093/infdis/jit391
15. Refaai MA, et al. Delayed-onset heparin-induced thrombocytopenia, venous thromboembolism, and cerebral venous thrombosis: a consequence of heparin "flushes". Thromb Haemost. 2007;98(5):1139-1140.
16. Goossens GA. Flushing and Locking of Venous Catheters: Available Evidence and Evidence Deficit. Nurs Res Pract. 2015;2015:985686. doi:10.1155/2015/985686
17. Gaynes R, Jacob JT. Intravascular catheter-related infection: Epidemiology, pathogenesis, and microbiology. In: Post TW, ed. UpToDate; 2022. Accessed November 12, 2022. [https://www.uptodate.com](https://www.uptodate.com/)
18. Mermel LA, Allon M, Bouza E, et al. Clinical practice guidelines for the diagnosis and management of intravascular catheter-related infection: 2009 Update by the Infectious Diseases Society of America [published correction appears in Clin Infect Dis. 2010 Apr 1;50(7):1079. Dosage error in article text] [published correction appears in Clin Infect Dis. 2010 Feb 1;50(3):457]. *Clin Infect Dis*. 2009;49(1):1-45. doi:10.1086/599376
19. Weiner LM, Webb AK, Limbago B, et al. Antimicrobial-Resistant Pathogens Associated With Healthcare-Associated Infections: Summary of Data Reported to the National Healthcare Safety Network at the Centers for Disease Control and Prevention, 2011-2014. Infect Control Hosp Epidemiol. 2016;37(11):1288-1301. doi:10.1017/ice.2016.174
20. Justo JA, Bookstaver PB. Antibiotic lock therapy: review of technique and logistical challenges. Infect Drug Resist. 2014;7:343-363. Published 2014 Dec 12. doi:10.2147/IDR.S51388
21. Zhang P, et al. Ethanol locks for the prevention of catheter-related bloodstream infection: a meta-analysis of randomized control trials. BMC Anesthesiol. 2018;18(1):93. Published 2018 Jul 24. doi:10.1186/s12871-018-0548-y
22. Ford WJH, Bundy DG, Oyeku S, et al. Central Venous Catheter Salvage in Ambulatory Central Line-Associated Bloodstream Infections. Pediatrics. 2021;148(6):e2020042069. doi:10.1542/peds.2020-042069
23. Tendas, A., et al. Controversies on Antibiotic Lock Technique Duration Experience with a 3-Day Course for Hematological Patients. *Infection Control & Hospital Epidemiology. 2011. 32*(4), 408-410. doi:10.1086/659257
24. Noelting J, Jurewitsch B, Allard JP. Non-Antibiotic Antimicrobial Catheter Lock Solutions in Patients on Home Parenteral Nutrition. Nutrients. 2018;10(9):1165. Published 2018 Aug 25. doi:10.3390/nu10091165
25. Kanaa M, et al. Cathasept Line Lock and Microbial Colonization of Tunneled Hemodialysis Catheters: A Multicenter Randomized Controlled Trial. Am J Kidney Dis. 2015;66(6):1015-1023. doi:10.1053/j.ajkd.2015.04.047
26. Wouters Y, Theilla M, Singer P, et al. Randomised clinical trial: 2% taurolidine versus 0.9% saline locking in patients on home parenteral nutrition. Aliment Pharmacol Ther. 2018;48(4):410-422. doi:10.1111/apt.14904
27. Zhao Y, Li Z, Zhang L, et al. Citrate versus heparin lock for hemodialysis catheters: a systematic review and meta-analysis of randomized controlled trials. Am J Kidney Dis. 2014;63(3):479-490. doi:10.1053/j.ajkd.2013.08.016
28. Weijmer M.C., et al. Randomized, clinical trial comparison of trisodium citrate 30% and heparin as catheter-locking solution in hemodialysis patients. J. Am. Soc. Nephrol. 2005;16:2769–2777. doi: 10.1681/ASN.2004100870.
29. Pironi L, Boeykens K, Bozzetti F, et al. ESPEN guideline on home parenteral nutrition. Clin Nutr. 2020;39(6):1645-1666. doi:10.1016/j.clnu.2020.03.005
30. Cathflo®Activase® (Alteplase)[prescribing information]. Genetech, Inc: South San Francisco, CA. 2019.
31. Baskin JL, Pui CH, Reiss U, et al. Management of occlusion and thrombosis associated with long-term indwelling central venous catheters. Lancet. 2009;374(9684):159-169. doi:10.1016/S0140-6736(09)60220-8