

CHILDREN'S HOSPITAL & RESEARCH CENTER OAKLAND

DEPARTMENT OF NURSING

ETHANOL-LOCK PROTOCOL

PURPOSE: To describe patient management issues related to the use of Ethanol-lock for treating or preventing infections of a long-term central venous catheter (CVC) such as tunneled venous catheters or implanted ports.

SUPPORTIVE DATA: Long term CVCs are commonly used in patients who require reliable access for administration of chemotherapy, blood products, parenteral nutrition, intravenous fluids, and antibiotics. However, infections, particularly central line associated bloodstream infections (CLABSIs), are the most serious and frequent complications associated with any type of indwelling CVC such as tunneled CVCs or implanted ports. Microbial organisms embedded in the intraluminal biofilm of indwelling CVCs could eventually migrate, leading to CLABSI in long-term CVCs. Killing organisms in biofilm requires antibiotic concentrations that systemic therapy cannot deliver. While in the past a positive blood culture would lead to catheter removal, in recent years several new methods of prophylaxis and treatment of CLABSI have been used.

Ethanol-lock technique was introduced in 2002 as an adjunctive therapy to systemic antibiotics to disinfect and salvage long-term CVCs among children with CLABSI. Ethanol has broad-spectrum antimicrobial activity, based on denaturation rather than a specific molecular target, making resistance unlikely.

Treatment success is defined as resolution of fever within 24 hours, no recurrence of positive blood cultures with the same organism, and retention of the CVC.

Treatment failure is defined as recurrence within 30 days with the same pathogen or removal of the CVC because of a persistent infection.

Ethanol-lock orders may be written with consultation by attending physician.

SUGGESTED ELIGIBILITY CRITERIA:

1. Stable blood glucose while off TPN for a minimum of 2 hours
2. A patent lumen
3. Negative history of ethanol allergy
4. Patients with active infection with positive blood cultures in tunneled

CVC or implanted vascular port.

5. Patients with recurrent CLABSI (preventative therapy)
6. Silicone catheters only. If the catheter is made of polyurethane, consult with attending physician for use of ethanol.

- ASSESSMENT:**
7. Assess patency of CVC by attempting to flush and draw from the catheter or port.
 8. Ensure patient has a patent PIV if necessary.
 9. Monitor for side effects and report to house officer. Mild clinical side effects include fatigue, headaches, dizziness, nausea and light-headedness.

- DOSAGE:**
10. To ensure a safety margin whereby the child receives the full volume of ethanol lock, a *table of safety margin* is attached. A volume should be selected that does not exceed that of a blood serum level of 0.04% or one-half of an anticipated intoxication dosage (0.08%) should the entire volume of ethanol be infused.

Suggested **maximal** Ethanol dosage based on the catheter sizes and their maximum fill volume (exclude NICU):

4.2Fr Broviac:	0.5mL
6.6Fr Broviac:	0.9mL
7 Fr Hickman: Red:	1.0mL
White:	0.8mL
9 Fr Hickman: Red:	1.6mL
White:	0.8mL
6.6Fr BardPort:	1.3mL
8 Fr Bard x-Port:	1.8mL

11. Obtain order for Ethanol lock including dosage (mL) using 70% Ethanol and dwell time . The dosages are based on the intravascular device intraluminal volume. Refer to “Central Venous Access Device” under the vascular access icon for specific fill volume for the device. This volume should be compared to the safety margin table (attached) prior to administration and discussed with the attending physician.
12. For NICU patients, in order to minimize systemic exposure of ethanol, determine the catheter fill volume as follows:
 - Fill 1 mL syringe with 0.5mL of normal saline.
 - Draw back on the syringe until the first drop of blood is present. The fill volume is the final volume present minus 0.5mL (initial starting volume).
 - Chart measured volume of catheter fill volume on patient’s KARDEX.

- This step should be done initially and does not need to be repeated once the volume is determined.

13. Assemble 3-way stopcock:
one port with a 10 mL syringe containing 10 mL of sodium chloride,
the other port with a 3 mL syringe containing ethanol
14. Attach the assembled 3-way stopcock to needleless connector.
15. Unclamp catheter and gently flush catheter with sodium chloride to ensure no heparin remains in the catheter. The minimum volume of sodium chloride should be at least twice the catheter volume.
Heparin precipitates with ethanol and therefore must be flushed out of the catheter before ethanol lock.
16. Instill ethanol into catheter.
17. Clamp the catheter and remove 3-way stopcock.
- DWELL:**
 18. Leave ethanol for ordered dwell time. The minimum dwell time demonstrated to be effective is 2 hours. For a greater benefit, ethanol should remain within lumen for 2-4 hours once daily for patients in the NICU. In older patients, a longer dwell time (up to 24 hours once a day) may be appropriate to achieve a greater benefit against established biofilm.
 19. If the patient has a double lumen tunneled catheter, instill ethanol in one lumen for 24 hours if possible and continue using other lumen for IV medications. Alternate lumens the following day. Both lumens should be alternately treated for 5 days.
Place “High Risk Medication – Ethanol, Do Not Flush” label on catheter hub.
 20. If the patient has a single lumen tunneled catheter, instill ethanol once a day between antibiotic doses. i.e: if interval between antibiotics is 4 hours, instill ethanol for 4 hours once a day.
 21. After the ordered dwell time, withdraw ethanol and discard.
 22. Flush the catheter with 10mL of normal saline.
 23. Flush the catheter with Heparin per IV Lock and Flush protocol to prevent catheter occlusion.
 24. Total duration of therapy depends on the indication. For active infection, the line can be treated daily for 5 days or longer. For prevention of infection, the line can be treated once a day weekly for the duration that

the line remains in place.

**DOCUMENTA-
TION**

25. Document on MAR and nursing progress records.

26. Document any side effects on nursing progress records.

Table 1. Estimated Blood Ethanol Level If Ethanol-Lock Infused Into Patient

Volume of Ethanol Lock, mL	Patient Weight, kg									
	2.5	5	10	15	20	30	40	50	60	70
0.1	0.035	0.0175	0.00875	0.005833	0.004375	0.002917	0.002188	0.00175	0.001458	0.00125
0.2	0.07	0.035	0.0175	0.011667	0.00875	0.005833	0.004375	0.0035	0.002917	0.0025
0.3	0.1050	0.0525	0.0263	0.0175	0.0131	0.0088	0.0066	0.0053	0.0044	0.0038
0.4	0.1400	0.0700	0.0350	0.0233	0.0175	0.0117	0.0088	0.0070	0.0058	0.0050
0.5	0.1750	0.0875	0.0438	0.0292	0.0219	0.0146	0.0109	0.0088	0.0073	0.0063
0.6	0.2100	0.1050	0.0525	0.0350	0.0263	0.0175	0.0131	0.0105	0.0088	0.0075
0.7	0.2450	0.1225	0.0613	0.0408	0.0306	0.0204	0.0153	0.0123	0.0102	0.0088
0.8	0.2800	0.1400	0.0700	0.0467	0.0350	0.0233	0.0175	0.0140	0.0117	0.0100
0.9	0.3150	0.1575	0.0788	0.0525	0.0394	0.0263	0.0197	0.0158	0.0131	0.0113
1.0	0.3500	0.1750	0.0875	0.0583	0.0438	0.0292	0.0219	0.0175	0.0146	0.0125
1.1	0.3850	0.1925	0.0963	0.0642	0.0481	0.0321	0.0241	0.0193	0.0160	0.0138
1.2	0.4200	0.2100	0.1050	0.0700	0.0525	0.0350	0.0263	0.0210	0.0175	0.0150
1.3	0.4550	0.2275	0.1138	0.0758	0.0569	0.0379	0.0284	0.0228	0.0190	0.0163
1.4	0.4900	0.2450	0.1225	0.0817	0.0613	0.0408	0.0306	0.0245	0.0204	0.0175
1.5	0.5250	0.2625	0.1313	0.0875	0.0656	0.0438	0.0328	0.0263	0.0219	0.0188
1.6	0.5600	0.2800	0.1400	0.0933	0.0700	0.0467	0.0350	0.0280	0.0233	0.0200
1.7	0.5950	0.2975	0.1488	0.0992	0.0744	0.0496	0.0372	0.0298	0.0248	0.0213
1.8	0.6300	0.3150	0.1575	0.1050	0.0788	0.0525	0.0394	0.0315	0.0263	0.0225
1.9	0.6650	0.3325	0.1663	0.1108	0.0831	0.0554	0.0416	0.0333	0.0277	0.0238
2.0	0.7000	0.3500	0.1750	0.1167	0.0875	0.0583	0.0438	0.0350	0.0292	0.0250
2.1	0.7350	0.3675	0.1838	0.1225	0.0919	0.0613	0.0459	0.0368	0.0306	0.0263
2.2	0.7700	0.3850	0.1925	0.1283	0.0963	0.0642	0.0481	0.0385	0.0321	0.0275
2.3	0.8050	0.4025	0.2013	0.1342	0.1006	0.0671	0.0503	0.0403	0.0335	0.0288
2.4	0.8400	0.4200	0.2100	0.1400	0.1050	0.0700	0.0525	0.0420	0.0350	0.0300
2.5	0.8750	0.4375	0.2188	0.1458	0.1094	0.0729	0.0547	0.0438	0.0365	0.0313
2.6	0.9100	0.4550	0.2275	0.1517	0.1138	0.0758	0.0569	0.0455	0.0379	0.0325
2.7	0.9450	0.4725	0.2363	0.1575	0.1181	0.0788	0.0591	0.0473	0.0394	0.0338
2.8	0.9800	0.4900	0.2450	0.1633	0.1225	0.0817	0.0613	0.0490	0.0408	0.0350
2.9	1.0150	0.5075	0.2538	0.1692	0.1269	0.0846	0.0634	0.0508	0.0423	0.0363
3.0	1.0500	0.5250	0.2625	0.1750	0.1313	0.0875	0.0656	0.0525	0.0438	0.0375

Table shows estimated blood ethanol level based on using 70% ethanol, the weight of the patient, and estimated blood volume of 80 mL/kg. Boldface type indicates intoxicated ≥ 0.08 . Italic type indicates at least half of the intoxicated level.

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