

**Continued Studies in Preventing Complications of  
Central Venous Access Devices (CVADs)  
By**

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Preventing complications that occur as a result of central venous access device placement has been a major targeted improvement for infusion therapy at our hospital. As nurse manager of three nursing areas that have the greatest number of patients with CVADs, there is a tremendous need to keep problems related to their use at a minimum. Four years ago, patient treatment delays due to CVAD complications were a major source of patient, physician and nurse dissatisfaction, with occlusion as our number one problem.

Our procedures at that time, focused on managing the complication once it occurred. This management involved instillation of a thrombolytic, repeating the dose if necessary and if no blood return upon aspiration a radiological venogram was necessary to confirm patency. This process was time consuming, frustrating for the patient and caregivers and very costly.

When positive pressure adapters first became available we conducted a nursing research study on the effects of these adapters in reducing occlusions in CVADs. The results were so dramatic that we instituted a house wide policy to utilize them on all intermittent use CVADs. To our surprise, not only did they effectively eliminate occlusions, but they also contributed to significant reductions in other complications such as infection rates, malfunction and damage of these devices (**Lenhart, "Prevention vs. Treatment of VAD Occlusions," JVAD, Winter 2000**). The results of this study prompted a second study that was similar to the first study, but eliminated the use of heparin in the flushing procedure. This study proved that heparin was indeed not necessary to prevent occlusions as the occlusion rate was even lower than in the first study (**Lenhart, "CVAD Occlusions with Saline Only Flush by Use of an Adapter", JVAD, Summer 2001**). The results led to a preventative strategy for CVADs that included the elimination of all heparin from our flushing procedures for all central lines.

As technology continues to evolve, additional positive pressure device have become available to help eliminate occlusions in CVADs. From October, 2002 through February, 2003 we studied a new positive pressure device called the **MaxPLUS** adapter on intermittent use CVADs in the Medical Short Stay Center, The design of this adapter is symmetrical with the intravenous administration sets, so it was very easy for the nurses to apply to the catheter lumen. They remained in place on all lumens for as long as the CVAD was in place.

We studied thirty-two patients with triple lumen catheters, Peripherally Inserted Central Catheters (PICCs), Implanted Ports and Neostar catheters. The purpose of the study was to determine if there was a blood return upon aspiration of the catheter lumen prior to the initiation of any therapy (medication administration, intravenous solutions, blood, etc.). A total of 316 access attempts were documented on a data collection sheet. Patients were studied for a period of 4 weeks to 8 weeks of a prescribed medical regimen. The results were as follows, comparing the data from our previous nursing research studies:

Pre Positive Pressure Devices  
3 Occlusion/100AA\*  
1 Venogram/200 AA  
1 Cath Replacemtn/325 AA

Post Positive Pressure Devices  
1 Occlusion/100AA  
0 Venograms  
0 Cath Replacement

Post Positive Pressure Devices No Heparin  
1 Occlusion/162 AA  
0 Venograms  
0 Cath Replacements

**Max Plus Positive Pressure Devices**

1 Occlusion/105 AA  
0 Venograms  
0 Cath Replacements

\*Access Attempts

All three studies demonstrated significant reductions in occlusions. It is important to note that any occlusion event was resolved without venogram or catheter replacement so long as there was a positive pressure device in place. The **MaxPlus** product functioned on all types of central venous access devices and the nursing staff had no difficulty in adapting it to their normal infusion and flushing procedures.

There is no question that positive pressure adapters, when used with preventative measures are the major factor in preventing the complications associated with CVADs. The impact on our patient, physician and nurse satisfaction has been enormous. We no longer experience treatment delays or have to verify placement of non-functional CVADs with x-ray studies. We have not replaced a catheter due to occlusion-related problems. We have also eliminated the use of heparin in our flushing procedures, further reducing the patients' risk of complications related to heparin exposure. Lastly, we have significantly reduced our costs, which in the Medical Outpatient Center alone, approximates \$40,000/year(based on costs associated with thrombolytic instillations, venogram verification catheter replacements and heparin flushing solution).

*If you have any questions or would like further information about this article, please contact Cheryl at [clhrm@attbi.com](mailto:clhrm@attbi.com).*

