



Complex Child E-Magazine

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Keeping Your Central or PICC Line Safe: Using Chlorhexidine Products to Prevent Infection

When your child has a central line or PICC line, the greatest worry is line infections and sepsis caused by bacteria, fungus, or yeast in the line or the bloodstream. Not only can these infections kill children, but they can also cause injury to the liver or other organs. They also sometimes necessitate removal and replacement of the line, adding additional surgical procedures for children. Finally, children can run out of locations to place a line when lines must be pulled and replaced frequently.

Preventing infections is an absolute must for any child with a line. In this article, we will focus on the role of Chlorhexidine products in preventing infection. These products may be used in three ways in home care: cleaning the skin around the line access point during dressing changes, using a chlorhexidine-impregnated disk around the line access point at all times, and cleaning the hubs and exterior catheter whenever the line is accessed or the cap is changed.

What is Chlorhexidine? Simply put, it is a chemical antimicrobial or antiseptic. The mechanism by which it works is not fully understood at this time. Chlorhexidine is typically mixed with 70% alcohol into a swab, sponge, or other formation. When the Chlorhexidine is applied to the skin or another site, it begins working quickly and its antimicrobial effect continues to work for as long as two days from a single application.¹ It is effective in killing most bacteria, especially the gram positive bacteria on the skin, hard to kill bacteria like MRSA, VRE, or *C. Diff.*, and a wide variety of viruses and fungi.

Using Chlorhexidine During Dressing Changes

Both the American Academy of Pediatrics and the Centers for Disease Control stipulate that Chlorhexidine should be used on the skin around the line entry site during dressing changes.² They recommend a minimum of 2% Chlorhexidine solution. Typically, the Chlorhexidine is applied using two or more swabsticks or applicators filled with 2% Chlorhexidine and 70% alcohol. Each swabstick or applicator is used for approximately 30 seconds and then the entire area is left to dry for about a minute before covering the area with a dressing.

Multiple studies have supported these recommendations, and a recent one comparing Chlorhexidine with Povidone-Iodine showed that catheter sites cleansed with Chlorhexidine have significantly less bacteria.³ The rate of bloodstream infections was also reduced with Chlorhexidine, with 1.7% infected, as compared to 4.2% infected when povidone-iodine was used. The authors of this study estimate that for every 1000 days with a catheter, Chlorhexidine use would prevent nine episodes of bacterial colonization in catheters and two episodes of bloodstream infections.

Another recent study in a Pediatric Intensive Care Unit tracked results after the unit implemented several stepwise changes to reduce infections, including completely sterile insertion, catheters impregnated with antibiotics, handwashing, separating patients, and using Chlorhexidine for dressing changes.⁴ The combined changes led to a 75% reduction in infections over about an eight-year period, from 8.2% of catheters infected in 1998 to 2% in 2005. The implementation of Chlorhexidine occurred in the sixth year of the study, and cut the infection risk in half from 4.3% in 2003 to 2% in 2005.

Applying Chlorhexidine Patches (Biopatch®) at the Line Site

Another way to help fight line infections is to use a Biopatch®, a small disk impregnated with Chlorhexidine that wraps around the line entry site. Biopatch®, made by Johnson & Johnson [www.biopatch.com], comes in two sizes, and can be placed under a standard transparent dressing. It continuously releases Chlorhexidine onto the skin around the catheter site for seven days, at which point the dressing must be changed.

A recent study randomized children into two groups, one that used the Biopatch® and another that employed only a standard dressing.⁵ While the total number of bloodstream infections was similar in this study, bacterial colonization of the catheter was reduced by nearly half, with 14.8% of catheters colonized in the Chlorhexidine group and 29% in the control group. Chlorhexidine was particularly effective on certain bacteria in this study, including *Streptococcus* species and *Enterobacter* species. Other studies have shown similar data, with one adult study also demonstrating a reduction in bloodstream infections.

Cleansing the Hub with Chlorhexidine

While standard guidelines suggest that scrubbing the catheter hub or cap with 70% alcohol swabs is sufficient, some hospitals have begun to switch to Chlorhexidine in an attempt to reduce infections. Unfortunately, few studies on this subject exist at this time, and further studies will be needed before recommendations can be made.

All guidelines mandate that the cap or hub is scrubbed with some form of antiseptic before use. Alcohol is the most common choice, with standard sterile alcohol prep pads applied with friction to the cap for about 10 seconds. Chlorhexidine swabs or swabsticks

may be used in the same way, using friction on all areas of the cap for about 30 seconds and letting it dry for another 30 seconds.

One study looked at catheters and caps that were not inserted and compared the rates of infection when accessed with no antiseptic, with alcohol, and with a novel Chlorhexidine-impregnated sponge placed on the end of the catheter.⁶ The catheters were first smeared with *Enterococcus faecalis* and then either not cleansed, swabbed with alcohol, or capped with a Chlorhexidine sponge. 100% of the control group was found to have bacteria inside the catheter, while 67% of the alcohol group also had bacteria inside the catheter. Only 1.6% of the Chlorhexidine group showed bacteria inside the catheter. This study, unfortunately, discusses a device not currently on the market that continuously cleanses the hub, and results may be poorer with intermittent cleansing using Chlorhexidine.

Another study evaluating a specific cap, the PosiFlow® needleless connector, compared alcohol, Chlorhexidine, and Povidone-iodine as antiseptic solutions.⁷ In this study, Chlorhexidine and Povidone-iodine showed similar rates of bacterial contamination, 28% with Chlorhexidine and 23% with Povidone-iodine. Alcohol, on the other hand, left 63% of catheters contaminated with bacteria.

Risks of Chlorhexidine

Other than localized skin irritation, Chlorhexidine is remarkably safe. Preterm infants and newborns seem particularly susceptible to skin irritation from Chlorhexidine and these products should not be used in this population.⁸ There is also a risk when Chlorhexidine is used near open flames since its vapors are flammable.

Available Formulations of Chlorhexidine

Chlorhexidine is available in a wide variety of forms. The least expensive and simplest to use is the Chlorascrub™ swab made by PDI [<http://www.pdipdi.com>], which looks identical to an alcohol prep pad. Other forms include Swabsticks, Applicators, Sepps® and Frepps®, and are available from both Chlorascrub™ and Chloraprep®, a division of Enturia [<http://www.enturia.com/products/chloraPrep/chloraPrep-product.html>].

Conclusions

Chlorhexidine, in all of its various forms, has been proven again and again to be superior to alcohol for preventing infections in central lines. The only downside to Chlorhexidine is cost. While an alcohol wipe costs a mere two cents and a Povidone-iodine wipe six cents, Chlorhexidine wipes are 23 cents each. Swabs, swabsticks, and applicators for daily use range from about 50 cents each to \$2 a piece.

Because of the difference in cost, some insurance companies or infusion suppliers who bundle your supplies into a package cost may be hesitant to supply Chlorhexidine. The reduction in infection rates seen with Chlorhexidine, however, may possibly save your insurance company a significant amount of money in hospital stays, antibiotics, and surgery to replace infected lines. If your infusion supplier refuses to supply Chlorhexidine, even with a doctor's order, it may be time to find a better provider who has your health and safety in mind and provides the highest standards of care.

¹ Information taken from <http://www.enturia.com/products/chloraPrep/chloraPrep-product.html>

² Naomi P. O'Grady, *et al.* "Guidelines for the Prevention of Intravascular Catheter-Related Infections." *Pediatrics* 2002;110(5):e51, 1-24.

³ Olivier Mimoz, *et al.* "Chlorhexidine-based Antiseptic Solution vs. Alcohol-based Povidone-Iodine for Central Venous Catheter Care." *Archives of Internal Medicine* 2007;167(19):2066-72.

⁴ Adnan Bhutta, *et al.* "Reduction of Bloodstream Infections Associated with Catheters in Paediatric Intensive Care Unit: Stepwise Approach." *BMJ* 2007;334:362-5.

⁵ Itzhak Levy, *et al.* "Chlorhexidine-Impregnated Dressing for Prevention of Colonization of Central Venous Catheters in Infants and Children." *The Pediatric Infectious Disease Journal* 2005;24(8):676-9.

⁶ SZ Menyhay and DG Miki. "Disinfection of Needleless Catheter Connectors and Access Ports with Alcohol May Not Prevent Microbial Entry: The Promise of a Novel Antiseptic-Barrier Cap." *Infection Control and Hospital Epidemiology* 2006;27(1):23-7.

⁷ AL Casey, *et al.* "A Randomized, Prospective Clinical Trial to Assess the Potential Infection Risk Associated with the PosiFlow® Needleless Connector." *Journal of Hospital Infection* 2003;54:288-93.

⁸ O'Grady, 13.