HOME DIALYSIS CENTRAL

A How-To Manual: The Art of Teaching Buttonhole Self-Cannulation

Background

Dialysis needles are large and scary! Fear of needles and pain is a reality for most people on dialysis, especially in the beginning. Some have true phobia, and require special techniques and interventions to self-cannulate. All patients, once they become familiar with dialysis, worry about who will put their needles in (and potentially cause access damage that can lead to a hospital stay, surgery, or loss of their lifeline). Some avoid travel because they don't want an unknown staff person to cannulate them. All of these fears can reduce quality of life. Patients who cannulate themselves learn to overcome these fears—and this task is not as formidable as it may seem.

Patients who can see and use their hands well enough to self-cannulate are their own best cannulators. Why? Because patients are the only ones who can feel both ends of the needle. They can better control the angle and direction of the needle. They can tell when the tip of the needle is in the vessel. Thus, patients are far less likely to infiltrate themselves than a dialysis staff member or a care partner. A fistula with a consistent cannulator, i.e. a self-cannulator, will work far longer[1-5] and have fewer problems than one with multiple cannulators.[1-4, 6,7] There is even some evidence that self-cannulation is more comfortable for the patient, i.e., less painful.[7-9] Surprisingly, there are very few studies in the literature on cannulation technique.

The information in this manual is based on extensive clinical experience and observation. The techniques mentioned in this work have been published in peer-reviewed journals. Can your patients succeed with self-cannulation? The answer is a resounding **YES**! In this **FREE** manual, compiled by the non-profit Medical Education Institute (MEI) for its Home Dialysis Central website (www.homedialysis.org), we will be discussing:

I) **Pre-cannulation Education** – to help patients overcome fear of needles

II) **Tandem-Hand Cannulation** – guided help in learning to cannulate

III) **Touch Cannulation** – a method of holding cannulation tubing, to afford better control

IV) **Buttonhole Technique** – faster[7] and less painful[10] than rope-ladder rotation, but with fewer aneurysms and infiltrations[11]

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"Because my ultimate aim was to do dialysis at home, I knew I would have to learn to needle myself. But, at first, I could not even watch the nurse needle me! I started by watching her insert needles out of the corner of my eye. Gradually, by an effort of will, I was able to watch the whole process without blinking. I watched her technique very carefully. After doing this for about 6 weeks, I felt ready to take the next step.

I visualized myself asking the nurse to allow me to have a turn myself. Finally I took a deep breath and asked to insert my own needle. It was easier than I thought and the nurse commended me on my excellent technique. These needles were the very fine ones used for local anesthetic. I simply repeated the process, when I felt brave enough, to cannulate with the large dialysis needles."

— Home dialysis patient

I. Pre-cannulation Education: Countdown to Cannulation

Four weeks prior to initiating self cannulation:

Step 1 – Teach the patient:

- How his or her access works, fistula vs. graft
- Importance of the blood flow rate
- Impact of access flow on dialysis adequacy
- Size and type of needles used, including gauge; (17,16,15,14), length (3/5", 1", 1-1/4"); and sharp or blunt
- Presence of any side vessels branching from fistula and why they are important
- How to assess his or her access before each session: Show how you check the pulse and thrill, then have the patient do it; explain how to recognize problems
- Anything else your clinic feels is important

Step 2 – Show the patient how you find the *bruit* with your stethoscope. Describe the sound and what it means. Then, have the patient find the *bruit* with his or her own stethoscope and describe the sound. You may wish to use the following websites to demonstrate the sounds heard:

- www.asdin.org/displaycommon.cfm?an=1&subarticlenbr=73
- http://fistula.memberpath.com/HealthcareProfessionals/FFBIChangeConcepts/ ChangeConcept9.aspx

Your clinic doesn't use stethoscopes to listen to *bruits*? It should. *KDOQI Vascular Access Guidelines*[12] recommend that patients become familiar with their accesses and check them on a daily basis, including the pulse, thrill, and *bruit*. Training materials such as the *Core Curriculum for the Dialysis Technician*[13] also suggest that the cannulator check the access prior to cannulation, including the *bruit*. It is in your patients' best interests to add this check, and stethoscopes can be very inexpensive.

Three weeks prior to cannulation:

Step 1 – Have the patient assess all aspects of his or her access as you've instructed, making sure that the access is in good condition for cannulation. This must become a ritual.

Step 2 – Discuss proper handwashing (**Fig. 1**) and the need for cleanliness to maintain a trouble-free access. Have the patient show you how to use the proper technique.

Step 3 – Put a glove onto the patient's cannulating hand. (**Fig. 2**) Ask, "What does this feel like to you?" Many will say, "It's like being on TV, you know, like ER." This is a motivational step that can help engage the patient in the

Figure 1

Figure 2

WORDS COUNT

Avoid using the word "stick," which can stress the patient. Criminals stick up banks and convenience stores; we cannulate dialysis accesses!

Figure 3

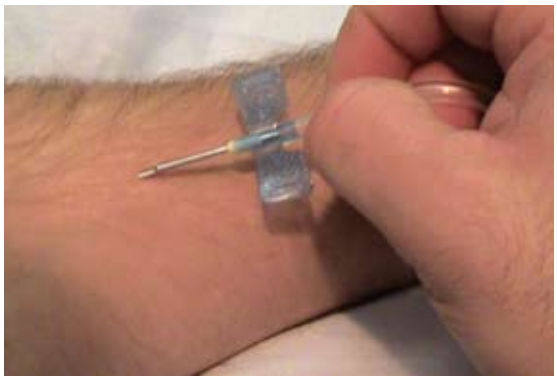

Figure 4

Figure 5

NEEDLE LENGTH

Consider needle length. Using unnecessarily long needles can frighten patients and increase the risk of infiltration. Most forearm AV fistulas are shallow, so a 3/5-inch long needle will reduce the risk of infiltration and vessel wall damage. An upper arm or leg access will probably require a 1-inch long needle.

process of taking control of his or her care.

Two weeks prior to cannulation:

Step 1 – Have patient assess his or her access.

Step 2 – Have the patient show you how to prepare his or her access for cannulation, following your clinic's Standard Operating Procedure, as you have taught.

Step 3 – Have the patient wash his or her hands and arm.

Step 4 – Follow handwashing with a Betadine® cleanse. Scrub in a spiral (**Fig. 3**) motion, moving outward from the cannulation site. Then, have the patient practice this technique.

One week prior to cannulation:

Have patient demonstrate all of the previous steps.

Step 1 – Following your clinic's policy for needle gauge, explain the types of needles you use and why. (For example, our clinic starts with a 17 gauge needle for one treatment, switches to 16 gauge needles for the next three treatments, then goes to 15 gauge needles.)

Step 2 – Give the patient a blunt needle to practice with at home. During the next week, the patient can touch the needle to the skin at the sites where the Buttonholes will be formed. This practice will help eliminate a lot of the nervousness about the needle and having the needle touch the skin, which can make the process less stressful for the patient when the time comes to cannulate. (**Fig. 4**)

Reading glasses

Be sure that you and your patients can see the cannulation sites! About 40% of our patients need reading glasses to cannulate. To check vision, place a small black dot on the patient's arm with a Sharpie marker. (**Fig. 5**) Have the patient try to line up the needle tip with the black dot. If they can't do it, they need glasses! A patient who wears bifocals may still need a pair of reading glasses to cannulate with. Local drug and "big box" stores carry reading glasses from 1.5 to 3.0 diopters in the range of $2-5/pair. Keep a few pairs on hand in the clinic for patients—and staff.

II. Tandem-Hand Cannulation

During the precannulation phase, you talked the patient though each step and answered questions. Now, it is time to move on to cannulation itself.

Tandem-Hand cannulation,[14] is a hands-on method where you work one-on-one with the patient to insert the needles.

Step 1 – As with all cannulation, manipulation of the needle is the most critical aspect. The first step in using the Tandem-Hand method is learning how to "set" and use the cannulating hand. The hand is anchored by resting it on the patient's arm. This produces a solid base, so that with the fingers "cocked," the needle tip is at the insertion site. Then all you have to do to cannulate is move the thumb and forefinger forward. (**Fig. 6**)

Step 2 – To initiate the self-cannulation process, have the patient place his or her thumb and forefinger directly behind your thumb and forefinger. Have the patient squeeze your fingers—tightly enough to feel your thumb and forefinger moving forward to insert the needle. The patient will feel the needle go through the skin and feel the motion to cannulate at the same time. Follow this practice for several treatments, until the patient is ready to move on to the next step.

When both you and the patient feel comfortable with the process, move on. Talk with the patient. The training time will be different for each patient—and confidence is the key to success. When the patient feels comfortable with and is consistent with the process it is time to move on. (**Fig. 7**)

Step 3 – Now, have the patient trade hand positions. Place your forefinger and thumb directly behind the patient's thumb and forefinger. This lets you have a modicum of control if something should go awry, and provides the patient with a sense of security that eliminates a lot of the stress, hesitation, and jerky movements that could otherwise hinder self-cannulation. (**Fig. 8**)

Figure 6

Figure 7

Figure 8

PHOTO DISCLAIMER
Some of the following pictures are shown without gloves so you can better see the position of the thumb and forefinger, which is key to this method. They are not of actual patients, but rather training photos made with a technician.

Figure 9

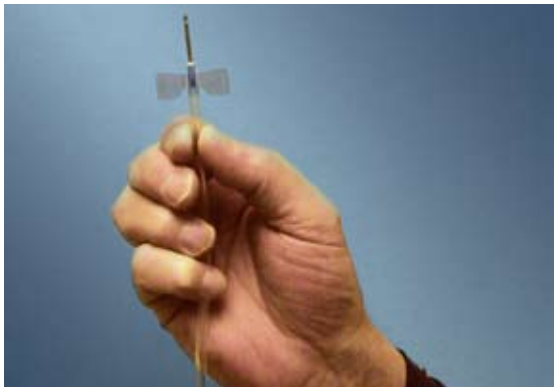

Figure 10

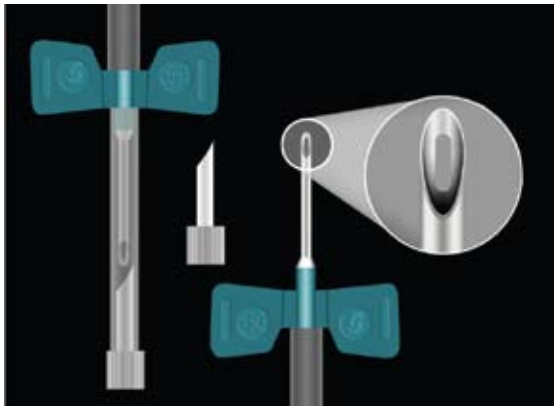

Figure 11

BUTTONHOLE OPTIONS IN EUROPE

Those of you in Europe have two options that are not available in North America: a specially designed plastic peg,[17] or a catheter that can be implanted in the needle tract for this purpose.[18]

WEAR GLOVES

A reminder, anyone who may come in contact with the needle or the patient's skin must wear gloves.

Step 4 – Continue the Tandem-Hand process until both of you feel comfortable and secure that the patient can cannulate with minimal supervision. Then, remove your hand and allow the patient to self-cannulate alone. Continue to observe closely, offering encouragement, support, and guidance as needed. (**Fig 9**)

Patient can choose not to self-cannulate

If at some point, after sufficient time self-cannulating, the patient prefers to have a staff member cannulate him or her, that option should be available. Try to determine why, though, because it may be something as simple as the need for re-education on some point. Even if a patient chooses not to self-cannulate after this education, he or she will understand the access and cannulation process much better, which will help ease fears—and empower the patient to catch potential staff errors before they can harm the access.

III. Touch Cannulation

Touch cannulation[15] is a method that differs from standard cannulation, in that the cannulator *holds the tubing* [about 1.9 – 2.5 cm (3/4 – 1 inch) behind the needle] *rather than the needle wings*. Holding the tubing allows the cannulator to feel what the tip of the needle is doing. This technique is especially useful for the Buttonhole technique, as it gives the needle tip a little "wiggle room" to find its own way down a Buttonhole tract, preventing damage to the tract. (**Fig. 10**)

IV. The Buttonhole Technique

The Buttonhole technique, or "constant-site" cannulation, was developed by Dr. Zbylut Twardowski[16] and has been in use for more than 25 years in Europe. With this method, instead of rotating needle sites, needles are placed into the *exact same spot at the exact same angle*. It usually takes 6-8 consecutive treatments to form a tunnel tract. If you have trouble forming a Buttonhole tract, use a sharp needle for another couple of treatments until the tunnel is developed. Once a tract is formed, change to a blunt Buttonhole needle to avoid damaging the tract with the cutting edge of a sharp needle. (**Fig. 11**)

It is best if the patient forms his or her own Buttonhole tracts. Why? There are a limited number of positions in which a self-cannulator can comfortably anchor his or her hand to achieve the correct needle angle. It is easier for a patient to duplicate an angle if the site and angle are ones that are best suited to the *patient*—not the staff person. Also, if patients are comfortable only with blunt Buttonhole needles, they may be at a loss if they choose home hemodialysis and later need to start new Buttonholes.

Cannulating Buttonholes

Show the patient how a Buttonhole is like a pierced earring track by sliding a needle into an end-cap. For a shallow forearm AV fistula where you will be using a 3/5" cannulation needle, use a quarter of a cap, about ¼". For an access requiring a longer needle, such as an upper arm fistula, use the longer needle and an end-cap cut to about ½". (**Fig. 12**)

Step 1 – Clean the access site. The fistula must be prepared following established clinic protocol. Remove the scabs covering the tracts from the previous treatment. (**Fig.13**) This can be done safely in several ways. Let the patient choose the way he or she is most comfortable with:

- A sterile needle
- Sterile tweezers
- The special pick that come with certain brands of needle

Scrub the scabs off, using antibacterial soap and a shower scrubbie in a circular pattern. Rinse and pat dry. Infections due to improper scab removal are the only increased risk factor reported for Buttonhole use—and are entirely preventable with good technique.

Step 2 – Show the patient how to hold the needle, where to anchor the heel of his or her hand, and how to "cock" his or her fingers in preparation to cannulate. (**Fig. 14**) Demonstrate how you grasp the needle so it's ready to insert: Hold the tubing behind the needle with your thumb and forefinger, then curl all four fingers underneath it. Reiterate hand placement and needle angle. Using a 20° to 25° angle will establish a flap in the vessel wall that will heal well, and reduce the risk of infiltration.

BUTTONHOLE TECHNIQUE CAUTION

The Buttonhole technique can be used only in an AV fistula—NOT a graft. Fistula walls have muscle fibers that will "snap" shut after the dialysis needle is removed, preventing excess bleeding. Artificial graft walls have no muscle fibers, so "coring" will result: the needle cuts a hole in the graft wall, causing it to leak blood into the surrounding tissue, and creating a risk of exsanguination and death.

Figure 12

Figure 13

Figure 14

Figure 15

Figure 16

Figure 17

SCAB REMOVAL
Use of fingernails, toothpicks, and other non-sterile tools has led to Buttonhole tract infections which can result in sepsis.

Step 3 – Have the patient anchor his or her hand in a comfortable position relative to the cannulation site, with fingers cocked, and the needle tip at the buttonhole site. (**Figs. 15 & 16**) Then all he or she needs to do to cannulate is to advance the thumb and finger. Advance the needle to cannulate. If resistance is felt, move your fingers closer to the wings for more stability.

Step 4 – When the patient is ready, have him or her hold the tubing. Following the Tandem-Hand Technique, as outlined above, continue the cannulation process by placing your hand over the patient's hand, so that s/he can guide the needle into the Buttonhole. Watch for the flashback. Then remove your hand so s/he can finish sliding the needle into the access. Avoid sudden, jerky movements. When you take your hand off and the patient finishes, he or she will realize that self-cannulation was a success. This can be an amazing discovery! They may say, "I can do this!" And you can respond, "Yes, you sure can!" (**Fig. 17**)

Conclusion

It is generally accepted that patients who self-cannulate have better access outcomes overall.[1-5] They don't rely entirely on their doctors and nurses; they take ownership of their care and control of their lives. They lose their fear of dialysis, of pain, of infiltrations, and of access problems, because they have become empowered and are no longer dependent. You can help! If good education and encouragement are provided, a large number of patients will become self-cannulators, which, in turn, will lighten the staff load. Fewer access problems and hospitalizations translate into money saved, thus lowering the burden of providing dialysis care.

Some of our older population and those with true needle phobia will always want the dialysis staff to cannulate them. This should not, however, relieve them from responsibility for their care. The staff cannulator should start the session with something like "I'll be cannulating you today" and then say, "Please tell me about your access." An empowered patient should be able to provide

all the information as outlined above such as thrill, *bruit*, needle angle, deep or shallow, what blood flow was used last session, etc. Offer to answer any questions the patient has. This routine in and of itself is an opportunity to continue the education process, which will help both the cannulator and the patient. With this kind of patient input, cannulation time should be minimal, as the patient will alert the cannulator of any problems that have developed with the access, e.g. areas to avoid, making it easier for the cannulator to be successful on the initial try— which makes everyone happy.

References

1) Hakim R, Himmelfarb J. Hemodialysis access failure: A call to action. Kidney Int. 54(4), 1029-1040, 1998.

2) Huber, T. S., Carter, J. W., Carter, R. L., & Seeger, J. M.. Patency of autogenous and polytetrafluoroethylene upper extremity arteriovenous hemodialysis accesses: A systematic review. J Vasc Surg. 38(5):1005-1011, 2003.

3) Mehta S. Statistical summary of clinical results of vascular access procedures for hemodialysis. In Vascular Access for Hemodialysis, ed B Sommers and M. Henry, pp. 145-157, Precept Press Chicago, IL, 1991.

4) Perera, G. B., Mueller, M. P., Kubaska, S. M., Wilson, S. E., Lawrence, P. F., & Fujitani, R. M. Superiority of autogenous arteriovenous hemodialysis access: Maintenance of function with fewer Secondary interventions. Ann Vasc Surg. 18, 66-73, 2004.

5) Poisoni, R. L., Young, E. W., Dykstra, D. M., Greenwood, R. N., Hecking, E., Gillespie, B., et al. Vascular access use in Europe and the United States: Results from DOPPS. Kidney Int. 61(1): 305-316, 2002.

6) National Kidney Foundation (NKF). KDOQI clinical practice recommendations for 2006 Updates: Hemodialysis adequacy, peritoneal dialysis adequacy and vascular access. Am J Kidney Dis. 48(suppl 1), S1-S322, 2006.

7) Verhallen AM, Kooistra MP, van Jaarsveld BC. Cannulating in hemodialysis: rope-ladder or buttonhole technique? Nephrol Dial Transplant 22(9):2601-2604, 2007.

8) Ball LK. The buttonhole technique for arteriovenous fistula cannulation. Nephrol Nurs J. 33(3):299-304, 2006.

9) DaVita Rope ladder and constant site or buttonhole technique - Cannulation methods for hemodialysis patients with a fistula, 2007. Retrieved May 9, 2009, from www.davita.com/dialysis/treatment/a/1332.

10) Figuerido AE, Viegas A, Monteiro M, Poli-de-Figueiredo CE. Research into pain perception with arteriovenous fistula (avf) cannulation. J Ren Care. 34(4):169-72, 2008.

11) Van Loon MM, Goovaerts T, Kessels AG, van der Sande FM, Tordoir JH. Buttonhole needling of hemodialysis arteriovenous fistulae results in less complications and interventions compared to the rope ladder technique. Nephrol Dial Transplant. 2009 Sep 4 [Epub ahead of print].

12) *National Kidney Foundation: KDOQI Clinical Practice Guidelines for Hemodialysis Adequacy*, 2000. Am J Kidney Dis 37:S7-S64, 2001 (suppl 1)

13) Core Curriculum for the Dialysis Technician: A Comprehensive Review of Hemodialysis. Fourth Edition. Module 5, Vascular Access. Editors: Lynda Ball, Tim Dillon, Lesley Dinwiddie, Janet E Holland. 2008 Amgen Inc. Developed by the Medical Education Institute. Available for free in PDF form from http://www.meiresearch.org.

14) Mott S, Moore H. Using 'Tandem hand' technique to facilitate self-cannulation in hemodialysis. Nephrol Nurs J. 36(3):313-3166, 2009.

15) Mott S, Prowant BF. The "touch cannulation" technique for hemodialysis. Nephrol Nurs J. 35(1):65-66, 2008.

16) Twardowski Z, Kubara H. Different sites versus constant sites of needle insertion into arteriovenous fistula for treatment by repeated dialysis. Dial Transplant 8:978-80, 1979.

17) Toma S, Shinzato T, Fukui H, Nakai S, Miwa M, Takai I, Maeda K. A timesaving method to create a fixed puncture route for the buttonhole technique. Nephrol Dial Transplant. 18(10):2118-2121, 2003.

18) Marticorena RM, Hunter J, Cook R, Kashani M, Delacruz J, Petershofer E, Macleod S, Dacouris N, McFarlane PA, Donnelly SM, Goldstein MB. A simple method to create buttonhole cannulation tracks in a busy hemodialysis unit. Hemodial Int. Jul;13(3):316-321, 2009.