A Multi-Center Perspective of the Buttonhole Technique in the Pacific Northwest

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There is no solid data on how many dialysis facilities and home hemodialysis programs in the United States are cannulating arteriovenous fistulas via the Buttonhole Technique. In the Pacific Northwest (Northwest Renal Network #16), approximately 38% of facilities are utilizing the buttonhole technique. In this article, four of those facilities will share their experiences, which suggest the Buttonhole Technique is a viable AVF cannulation option that has fewer complications than site rotation and a higher level of patient satisfaction.

The buttonhole technique, a method of needle insertion for native arteriovenous fistulas (AVFs) in which needles are placed in the same two sites each treatment using the same angle, has been utilized for nearly 30 years in Europe and Japan, but has been used only minimally in the United States. The purpose of this article is to share the outcomes of several facilities that are using the buttonhole technique in the Pacific Northwest.

These facilities are part of the Northwest Renal Network #16 (serving Alaska, Idaho, Montana, Oregon, and Washington), which has 59.4% of prevalent patients with AVFs. Currently 38% of facilities are utilizing this technique. Four providers volunteered to share their data on the buttonhole technique as part of the Fistula First project. The data shows that the buttonhole technique is a safe, viable option with less complications and increased patient satisfaction for patients with AVFs.

Development of a Buttonhole AVF Cannulation Program

FMC – Lacey (Formerly RCG of the Northwest)

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Effective functioning of an AVF depends on the size and viability of the renal patients' blood vessels chosen by the surgeon for AVF creation, and on the surgeon's technical expertise in vascular access surgery. The continued effectiveness of the vascular access, however, depends on the way in which the access is cannulated by hemodialysis staff. There are two main methods for cannulation of the AVF: rotation of puncture sites (rope ladder) or constant-site (buttonhole) cannulation. In our practice area, assessment of the patient's AVF is carried out by the dialysis access team, which consists of the vascular surgeon, nephrologist, RN, and patient care technicians (PCTs).

First, the dialysis access team comes to consensus about the maturity of the AVF and its readiness for cannulation. Once the AVF is deemed ready to be used for dialysis, the team makes a recommendation regarding a cannulation plan (site rotation vs. buttonhole), and the nephrologist includes this plan in his orders for the dialysis treatment. The first cannulation of an AVF is assigned only to experienced dialysis nurses and/or patient care technicians with superior access cannulation skills, to avoid trauma to the fragile access.

If a site rotation plan is used, the puncture sites are moved sequentially along the length of the AVF, with needles placed at least one inch apart, to avoid blood recirculation during dialysis. The patient is taught about the importance of site rotation, and informed to remind each person doing cannulation about the rotation plan. AVF diagrams in the "access module" of a computerized documentation program assists staff members in "mapping" planned cannulation sites. An alternative option is to draw an access "site map" to be kept on a patient's clipboard for quick consultation before access cannulation.

If a buttonhole cannulation plan is ordered, additional staffing considerations are necessary. Angles of insertion will vary between staff. To form a consistent, constant site track, the same expert is scheduled for all of the days in

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Acknowledgment: *With thanks to Kandy Collins, RN, CNN for her contributions to successful implementation of the buttonhole technique in the Olympia, WA area.*

CMS Disclaimer: *The analysis upon which this publication is based were performed under Contract Number HHSM-500-2006-NW016C entitled End Stage Renal Disease Networks Organization for the States of Alaska, Idaho, Montana, Oregon and Washington, sponsored by the Centers for Medicare & Medicaid Services, Department of Health and Human Services. The content of this publication does not necessarily reflect the views or policies of the Department of Health and Human Services, nor does mention of trade names, commercial products, or organizations imply endorsement by the U.S. Government. The author assumes full responsibility for the accuracy and completeness of the ideas presented. This article is a direct result of the Health Care Quality Improvement Program initiated by the Centers for Medicare & Medicaid Services, which has encouraged identification of quality improvement projects derived from analysis of patterns of care, and therefore required no special funding on the part of this contractor. Ideas and contributions to the author concerning experience in engaging with issues presented are welcomed.*

Table 1
Buttonhole Continuous Quality Improvement Project – RCG – Lacey

CQI Project	**Project:** Buttonhole Access
FOCUS: Does the constant site/blunt needle method of AV fistula cannulation contribute to decreased access-related problems (especially infiltrations), increased patient comfort, increased safety to staff, and decreased time for the cannulation procedure and achieving hemostasis after removing the fistula needles.	
ANALYZE: Once the buttonhole tract is formed, any staff member can effectively cannulate even a difficult AV fistula access.	
SELECT: • Large percentage of AV fistulas as dialysis access in the Olympia area • Large percentage of elderly patients with fragile veins as AV fistulas	
TEST: Develop buttonhole access in a few selected patients.	
PLAN: 1) Educate staff in buttonhole cannulation technique. 2) Obtain physician order for buttonhole cannulation. 3) Assign staff member for each patient to create two buttonhole tracts in the AV fistula. 4) Evaluate access for use of blunt needles (after 6 to 9 cannulations using a sharp needle). 5) Document cannulations in AMI computer charting.	
DO: Initiate buttonhole access creation process with four patients with AVF access.	
CHECK: • Buttonhole access was successfully completed on four patients. • All patients developed usable buttonhole tracts.	
• One patient developed a cellulitis at his arterial buttonhole tract, which he related to his having scratched the skin with his fingernails. • One patient complained of discomfort initially with use of the blunt needle for cannulation, but became more comfortable with the blunt needles within a week of their use.	
ACT: • Present a patient questionnaire and a staff questionnaire regarding patient and staff responses to the use of blunt needles. • Add additional patients to study group. • Compare conventional (sharp needle) cannulation results with the results of the buttonhole access technique (infiltrations, infections, aneurysms, access thrombosis, ease of cannulation, patient comfort, staff safety and ease of obtaining hemostasis after needle removal).	

which the patient receives dialysis for the first 2 to 3 weeks. The cannulator uses two conventional sharp-beveled fistula needles to form two cannulation tracks or small "tunnels," not unlike those seen in pierced earlobes. Once the cannulation tracks are formed, then blunt-beveled (buttonhole) needles are used, and any dialysis caregiver can access the buttonhole sites.

Staff members must take care to prevent the incidence of "one-site-itis," or multiple punctures within the same small area of the AVF. This lapse in technique will cause the development of aneurysms ("ballooned-out" areas) with neighboring areas of stenosis (narrowing), leading to blood recirculation during dialysis and, ultimately, clotting of the access. While it was important to utilize "best cannulators" for new AVFs and to establish buttonhole sites, we find it equally important to mentor newer staff members, pairing them with the expert staff members to observe the cannulation process.

Kandy Collins, a nephrology nurse who has worked primarily in acute hemodialysis, initiated the buttonhole cannulation program in our practice area in 1996. She read the article written by Dr. Zbylut Twardowski (1995) titled "The Constant Site Method of AV Fistula Cannulation" regarding the use of the buttonhole method. She obtained an order from the nephrologists to use this method for AVF access cannulation. When the Chehalis (WA) facility opened in 2002, this acute dialysis nurse taught the buttonhole technique to all the dialysis staff. The dialysis staff then formed a continuous quality improvement (CQI) team for implementation of a buttonhole cannulation program (see Table 1), and developed the action plan seen in Table 2.

The dialysis staff member assesses the AVF access for the bruit and thrill. Then the patient thoroughly scrubs the access area for 2 minutes prior to being seated in the dialysis chair. While predialysis weight and vital signs are

Table 2
Action Plan for CQI Project – RCG – Lacey

Action Plan Form			
PROBLEM or ISSUE: Constant-site ("buttonhole") cannulation of the AV fistula is a successful technique used by dialysis patients in Europe for over a decade, to avoid "missed sticks" in fragile AVFs, prevent hematoma and fistula aneurysm, and to successfully cannulate a short AVF access			
GOAL: To determine in our practice setting if buttonhole cannulation of the AVF is a means toward 1) Decreasing access complications such as missed sticks, hematoma, and AVF aneurysm; 2) Decreasing patient discomfort during AVF cannulation; 3) Easier AVF cannulation with no needle safety issues (blunt needle with no needle-stick injury potential).			
KEY CAUSE: Use of blunt needle in buttonhole tract provides a more effective method of cannulating the AV fistula.			
Action Step	**Person Responsible**	**Target Date**	**Follow-Up/Date Completed**
Educate staff in buttonhole cannulation	L.T.	7/15/02	7/10/02- Medisystems Clinical Specialist presented education to dialysis staff
Assess dialysis patients at CHE who are willing to participate in creation of constant-site access	K.C.	7/ 30/02	7/30/02—List of patients willing to try buttonhole access
Obtain physician order for buttonhole access	K.C.	8/5/02	8/2/02
Assign dialysis caregiver to create 2 same-site tracts for each patient in the study	L.T.	8/5/02	8/5/02
Document progress in creating buttonhole tracts for each patient access	All team members	Ongoing	Ongoing
Evaluate buttonhole tracts for readiness for cannulation with blunt fistula needles	K.C.	8/30/02	3 out of the 4 patients were ready for blunt needles; sites were successfully cannulated; the 4th needed additional use of sharp needles x 3 HD treatments
Add 3 additional patients to study group	K.C.	1/13/03	1/10/03—buttonhole tract creation in progress with 3 additional patients

being checked, the dialysis staff member places sterile gauze moistened with normal saline over each buttonhole site, gently securing the gauze in place with paper tape. This process moistens and loosens any scab material at the buttonhole site and then the gauze is used to gently remove the scab. Finally, the cannulation sites are disinfected per facility protocol, allowing the disinfectant to dwell for the appropriate time noted in the access cannulation policy.

Outcomes. Buttonhole cannulation began with four patients. At the time of this article, 60% of the 42 patients with AVFs are using buttonhole access. The review of data for patients with buttonhole access, as compared to those patients using AVFs with a site rotation protocol, found there to be no increase in the access infection rates or the need for angioplasty intervention to treat stenosis or thrombosis.

One difference between results of the rope ladder versus buttonhole cannulation method is a significant difference in the access infiltration rates: 7% for the site rotation method and 0% for the buttonhole method. Another difference observed in our unit is the amount of time to achieve hemostasis at the needle puncture sites after fistula needle removal: an average of 8 minutes for the rotated sites compared to an average of 5 minutes for the buttonhole sites (see Table 3). There was no observable aneurysm formation at the buttonhole cannulation sites.

Table 3
Differences Between Buttonhole Versus Site Rotation

	Site Rotation	Buttonhole
Infiltration Rate	7%	0%
Time to Hemostasis	8 minutes	5 minutes

The greatest difference,however, involves a more subjective factor – that of patient satisfaction. When patients with a buttonhole access were surveyed regarding satisfaction with the cannulation procedure, there was 100% agreement that the buttonhole technique increases the ease and decreases the discomfort of access cannulation, compared to cannulation with sharp-beveled needles. Staff members also express increased satisfaction, especially as it relates to the ease of removal and safety of using blunt-beveled (buttonhole) needles that eliminate needle stick injuries without the need for the protective needle sheath, which is necessary for safe use of sharp-beveled needles.

Discussion. The buttonhole technique is not necessarily the best method for every patient. It is very useful, however, in patients with very short AVF access and in patients with maturing and fragile vascular access sites. A successful buttonhole cannulation program requires the utilization of an access manager, as well as a routine vascular access monitoring regimen, which includes physical assessment of the AVF (bruit and thrill), venous pressure monitoring, and intra-access blood flow monitoring.

Useful tools in the development of access cannulation skills include the Constant Site Method of Cannulation by Medisystems Corporation (2004) and Dr. Twardowski's video, "The Buttonhole Technique for AVF Cannulation" (2000). In addition, the Northwest Renal Network offers a very effective cannulation instruction program with "hands-on" experience (Ball, 2004; Northwest Renal Network 2004). Effective surgical creation of AVF vascular access and a quality access cannulation program helps increase the use of AVFs in this dialysis practice area to approximately 80%, the result of almost a decade of collaboration among the members of the vascular access planning team (Trea, Seagrove, Griffith, & Nguyen, 2005).

A Plan to Prevent Aneurysms, Samaritan Dialysis Centers
Corvallis and Lebanon, Oregon

Virginia Riffle, RN, CDN, Vascular Access Manager

Samaritan Dialysis Services initially began using the buttonhole technique for patients with AVFs who had a limited area to cannulate or those with an aneurysm to prevent the aneurysm from enlarging. There had been a few cases in the past where a fistula had to be ligated due to a rapidly enlarging aneurysm. We wanted to prevent this problem from recurring in other patients.

As the buttonhole procedure was implemented in the units, there was slight resistance from some staff members to the change. Now that we have been doing buttonhole for some time, there are no complaints from the staff. Some staff members believe that it takes slightly more time to do the buttonhole procedure, due to the removal of scabs, but not enough that they feel it is problematic to the turnover schedule or is noticeable to the patients. As we successfully implemented the procedure, some patients began requesting to have buttonhole cannulation, either from their own past experience of having problems with cannulations or from hearing other patients talk about less pain and longer access life.

The problem we have experienced in implementing the buttonhole procedure has been in regards to having a staff member consistently scheduled with a certain patient long enough to establish a buttonhole track. We have found that it takes longer than six consecutive sticks, as cited in the European literature, and usually takes 10 or more cannulations. We have two dialysis centers with staff members rotating between them, and, at times, we have requested a volunteer to agree to work Saturdays until the buttonhole tunnel is established. We will sometimes temporarily transfer a patient to a different dialysis shift to meet the staff member's schedule. Our Lebanon unit charge nurse has come in on her days off to do sticks, as she is very enthusiastic about the buttonhole procedure and is working on getting 100% of the AVFs in her unit on buttonhole cannulation by 2006.

At the time of this report, we have 15 patients with functioning fistulas (47% buttonholes) at the Lebanon unit and 22 functioning fistulas (27% buttonholes) at the Corvallis unit. After consulting with staff and patients regarding infiltrations and multiple needle sticks, it was widely recognized that the buttonhole procedure helps alleviate both of these problems. In an informal survey, the patients have reported that they experience less pain with the buttonhole technique. Occasionally, there is difficulty switching to blunt needles, and we have one patient who sometimes complains of pain, but if we carefully stay with sharp needles, then that problem is alleviated.

It is well documented that the infection rate in AVFs is less than grafts and catheters, as has been our experience. We have experienced one buttonhole site that developed a superficial infection. The infection was treated with oral antibiotics until the site healed, at which time buttonhole cannulation resumed. There has been no observable evidence of aneurysm formation at the buttonhole sites.

As our nephrologists and dialysis staff members continue to encourage our surgeons to place fistulas whenever possible, we will have some challenging fistulas to cannulate. These fistulas will need to be protected and preserved, and the buttonhole technique helps us attain these goals.

The Buttonhole Technique and the Development of a Patient Satisfaction Survey
Puget Sound Kidney Centers, Everett, WA

Dennis Scherting, BSN, RN, CNN, Nurse Manager, Clinical Education

At the Puget Sound Kidney Centers (PSKC) in Everett, WA, the buttonhole technique was introduced in the Fall of 2003. Interest in this procedure was initiated by the conversations with a vendor at the 2003 ANNA National Conference in Chicago earlier that spring. Through the summer, information was gathered from a number of sources. It was remarkable to discover that this process had quite a history, dating back into the 1960s.

In our four facilities, PSKC (73% AVF rate), PSKC-South (61.9% AVF rate), PSKC-Smokey Point (64.9% AVF

Figure 1
Pain Response

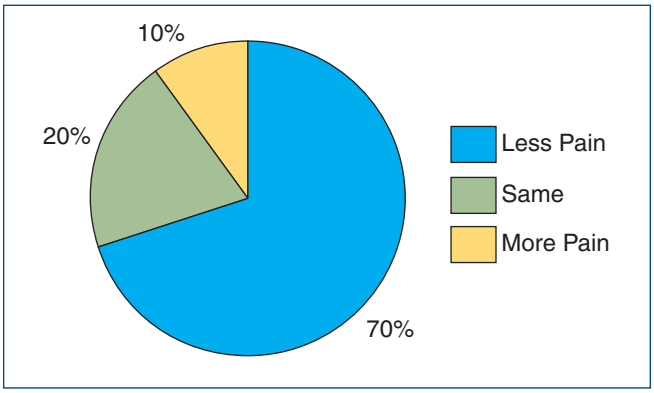


Figure 2
Time Required for Needle Placement

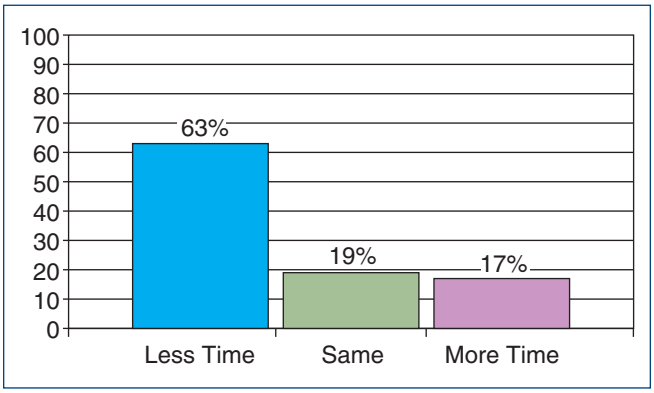


Figure 3
Months to Initiation of Buttonhole

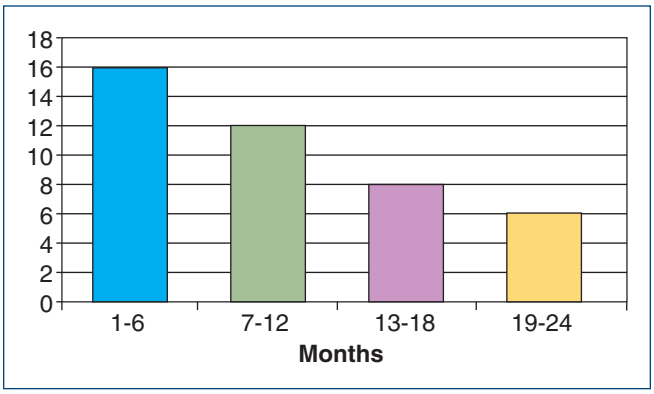
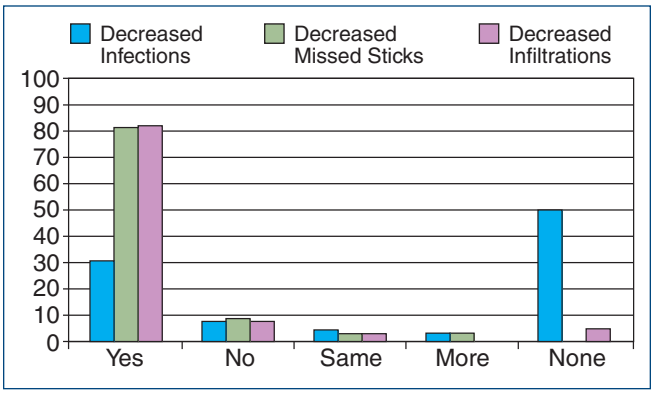


Figure 4
Decreased Complications



rate), and PSKC-Whidbey Island (70% AVFs), all patient care procedures are reviewed and approved by the Medical Director. With information coming to a number of individuals from a number of sources, we had some difficulty settling on an acceptable approach as our standard. Perhaps the greatest obstacle - the same person establishing the buttonhole track- did not have to be addressed. At PSKC, most of the patient care staff work three 13-hour shifts, usually M-W-F or T-Th-S. They care for the same patients for a 3-month period then will move to a new area.

As we initiated the buttonhole technique, staff members were excited to institute something new. There were a few patients with whom we had difficulty establishing buttonhole tracks in the "standard" 10 sticks with sharp needles. Moving to blunt (don't use the word "dull") needles proved difficult, because we made the switch too soon. The time to establish the buttonhole must be individualized. Otherwise, when moving too quickly, one runs the risk of making a conical track, not one shaped like a tube. Bleeding difficulties and higher infection rates can occur. In light of these troubles we increased our standard to 14 sharp sticks.

Another issue that arose unexpectedly related to placing the blunt needle in an established buttonhole on the proximal forearm. In several patients, the skin was readily movable and the subcutaneous tissue loose or thick with loss of skin elasticity. This occasionally caused difficulty with the alignment of the skin puncture site and the vessel hole. There was need to gently "search" for the vessel buttonhole so the blunt needle could be properly placed using reasonable pressure to enter the vessel. At times, the vessel hole could not be found, and a sharp needle was placed elsewhere. There was no aneurysm formation noted at buttonhole sites.

A patient survey was designed and sent to all patients with buttonhole access (61) with a 75% response rate. Figure 1 shows that 70% of the patients experienced less pain, and 20% felt no difference in pain with the buttonhole technique. Sixty-three percent of patients responded that it took less time to insert buttonhole needles than conventional needles (see Figure 2). More new patients (less than 1 year) were buttonholed than those patients in their second year of dialysis, but there were no comments to explain why this pattern emerged. Did doctors prefer this for their new patients? Were newer patients more open to trying a different technique? Did patients come to dialysis with knowledge of this alternative technique (see Figure 3)? The responses regarding complications (see Figure 4), which are probably the most important from the patient's

Table 4
Buttonhole Log

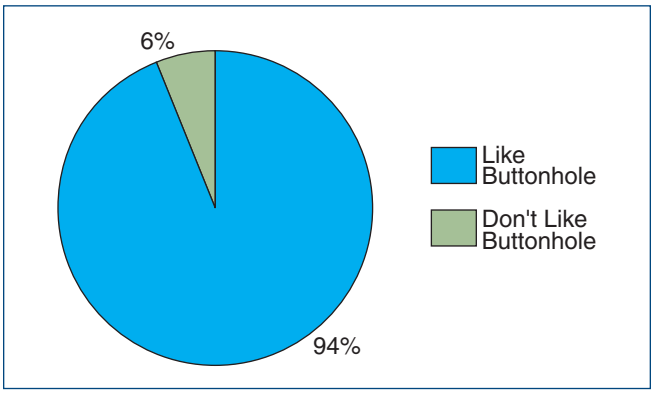
Buttonhole Technique Tracking Log

Patient Name_____

Date	S/B	Ga	QB	Art Pres	URR	Comments and/or Complications
#1						
#2						
#3						
#4						
#5						
#6						
#7						
#8						
#9						
#10						
#11						
#12						
#13						
#14						
#15						
Date	**S/B**	**Ga**	**QB**	**Ven Pres**	**URR**	**Comments and/or Complications**
#1						
#2						
#3						
#4						
#5						
#6						
#7						
#8						
#9						
#10						
#11						
#12						
#13						
#14						
#15						

Document all of the above each treatment:
S/B=Sharp or Blunt needle, Ga=Needle Gauge, QB=Blood flow rate. In the comments section, please give details of stick (i.e., direction of needle, ease of stick, outcome and patient reaction. 1 page for each needle site. A drawn or photographed picture of the patient's access is to accompany this log. It should have needle sites drawn on it and the direction of flow. Revise to show new needle sites.

Figure 5
Preference for the Buttonhole Technique



perspective, indicate that this technique decreased events of missed sticks and infiltrations substantially. And finally, 94% of the patients were satisfied with the buttonhole technique (see Figure 5). It would have been interesting to survey the entire population of patients whose accesses were cannulated to ascertain comparative data between the two cannulation techniques.

A stable buttonhole process is also a great stepping-stone for suggesting the patients place the needles themselves. The staff can offer training and guidance to those patients who express an interest, and also use the patients who self-cannulate, to act as mentors and share their experiences.

Program Development: Challenges and Successes, Skagit Valley Kidney Center, Mt. Vernon, WA

Liz Swift, BSN, RN, CNN, Clinical Educator

When starting our buttonhole program, our clinical educator came in and performed all of the preliminary sticks and worked with the Network to create a log sheet for documentation of the process and any associated problems (see Table 4). This system became very cumbersome, as this individual would have to come in before and after work, as well as on days off. After the first four or five buttonholes were established, the staff members were polled to see how many would be interested in learning to create new buttonholes.

In-service education programs on the new procedure and protocols were offered to all staff, and procedures were written and put into effect to assure continuity of the buttonhole cannulation process. Unfortunately, the staff at the kidney center did not want to work the every-other-day schedule that the patients do, so staffing was a problem, and having people come in on their time off was not practical or fiscally responsible.

In an unrelated turn of events, our patient care technicians changed to 8-hour days, 5 days per week, from the previous four 10-hour shifts. This new schedule allowed more consistency during the creation of the buttonhole tracks. When the technician is off on a day that the patient is dialyzing, other staff members do not use the buttonholes for that treatment. The practice is to have the same cannulator until the switch is made to blunt needles, and there really are no exceptions to this rule. We tried several times to have more than one person working on track creation, and it ended up with dead ends and cannulation problems after switching to blunt needles. I believe that creating a track that is consistent by finding a way to have the same cannulator each time is the key to success with the Buttonhole Technique.

Table 5 summarizes the challenges and the successes we have seen at our facility. Surveying your patients and staff will allow you to identify how to proceed with your buttonhole program.

Summary

From the information in this article, there appear to be several areas for improvement when choosing the buttonhole technique for AVF cannulation.

- Standardized education is needed, because creation of the track in the buttonhole technique is different from cannulation using site rotation (Ball, 2006).
- A continuous quality improvement (CQI) process will enable nurses to track cannulation techniques separately, looking at infections, missed sticks, infiltration/hematoma, aneurysm formation, and patient satisfaction.
- The experience of these four facilities suggests that staffing patterns are a major barrier in beginning a buttonhole cannulation program. A staffing plan would be beneficial prior to starting a buttonhole program. Who will train the staff members in the

Table 5
Challenges and Success with a Buttonhole Program

Challenges	Successes
• 3 of 14 experienced infections – all with sharp needles	• 80% of patients experienced less pain
• Staff dissatisfaction – not likely to use someone else's angle of insertion	• Patients report that their arms look better, scabs are smaller, and there is better healing
• Staffing patterns	• Infiltrations are non-existent
• Tracking of grafts and fistula infections are not separated on CQI form	• Patients are self-cannulating and creating their own buttonholes

buttonhole technique? How many staff will be buttonhole cannulators? Are staff members willing to alter their work schedules to match a patient's dialysis schedule? When the buttonhole program begins, how many patients can initially be offered the option?

In conclusion, the Pacific Northwest facilities have shown that the buttonhole technique is a viable option for AVF cannulation. There have been no reports of observable aneurysm formation using the buttonhole technique in this Network, and a recent study from Canada (Marticorena et al., 2006) indicated a modified buttonhole cannulation technique reduced the size of existing aneurysms in two patients. Two of the four facilities reported that utilizing single cannulators during track formation produced buttonhole tracks with fewer complications. And, most importantly, the patients have reported very high satisfaction with this technique, with both a reduction in complications and pain associated with cannulation.

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