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Advanced vascular access workshop for dialysis nurses: a three-year review

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Abstract

There is increased awareness regarding the benefits of ultrasound for vascular access surveillance and guided cannulation in haemodialysis. However, finding time to train staff whilst working within the clinical setting is challenging. In 2009 a workshop was introduced in Victoria to provide a platform for nursing staff to learn advanced skills in surveillance and cannulation in a safe, supportive environment. The workshop covered topics such as: assessment and cannulation; surgical perspectives in vascular access; radiological perspectives in vascular access; surveillance and monitoring; cannulation competency package; antegrade/antegrade cannulation; and introduction to ultrasound plus five hours of practical sessions. Feedback from the workshop over the past three years has been positive, and staff have benefited from the both the theoretical and clinical components of the workshop. The success of this workshop highlights the demand for continuing education within the renal workforce.

Keywords

Vascular access, renal, education, ultrasound, cannulation.

Introduction

Vascular access issues are responsible for approximately 20% of the hospitalisations of dialysis patients in Europe and the US (Hakim & Himmelfarb, 1998). The optimal access for dialysis is the arteriovenous fistula (AVF); therefore, it is paramount that we make sure that dialysis staff are appropriately trained and mentored regarding the correct ways to care for an AVF and increase the longevity of its survival.

The ultimate aim of the dialysis health care team is to reduce the incidence of long-term central venous catheter (CVC) use and increase the incidence of AVFs in the dialysis population (Hakim & Himmelfarb, 2009). However, just increasing the incidence of AVFs is not enough – the AVFs must be cared for adequately by both the patients and those within the health care team. One of the major causes of adverse events occurring with vascular access is simply the need for the dialysis staff to cannulate the AVF (Van Loon, *et al.*, 2009a). Dialysis staff all receive training when commencing work in the unit; however, it is the ongoing education of these staff that is perhaps just as, if not more important, than the initial induction to the dialysis unit.

A recent adjunct to the assessment of the AVF and arteriovenous graft (AVG) is the introduction of the use of ultrasound as a tool to identify possible deficits with the vessels and to use as a guide in difficult cannulations. Use of ultrasound in this manner can be very effective at detecting minor issues, such as small clots

or venous valves that can affect the success of cannulation (van Hooland *et al.*, 2010). Identifying these small issues and avoiding the damaged area can then decrease the number of referrals to radiology for Doppler ultrasound, therefore reducing the cost, time and trauma to the patient.

The success of the ultrasound machine is highly user-dependent and there is a steep learning curve that needs to be addressed with dialysis staff (van Hooland *et al.*, 2010). There is a small window of opportunity to teach staff on real patients, and this is before the patient has been connected to the dialysis machine – ultrasound cannot be performed during dialysis or after dialysis (van Hooland *et al.*, 2010). This restricts the availability of teaching/learning time and some staff may see the ultrasound as too much fuss. Renal services at Barwon Health in Geelong had noted that there was a need for further education and instruction on the use of ultrasound to build confidence in staff, to encourage the use of the ultrasound to decrease the amount of false positive referrals to radiology and reduce trauma to the fragile AVF or AVG. Initially a two and a half day workshop named Advanced Care Workshop for Vascular Access was introduced, incorporating theory and practice related to vascular access and the use of ultrasound for surveillance and guided needle cannulation. This workshop was open to any dialysis staff within Australasia, and capped at 25 participants (increased to 30 after year one). The following paper will discuss the introduction of this workshop and its successes and hurdles over the past three years.

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Background

The importance of careful and precise cannulation is paramount to the life span of the AVF/AVG. An AVF “is neither artery, nor vein; it is a hybrid of the two systems with its own unique anatomy and physiology” (Swinnen, 2011, p. 17). Therefore, it needs to be treated as a unique entity that reacts unlike a vein and unlike an artery. Wilson *et al.* (2010) conducted a study into the “culture” of cannulation amongst dialysis nurses. Their study results were in parallel with what we had noted within the staff culture in our own unit and anecdotally from other units around Australia. The study results identified that staff felt that they had very little time to conduct a thorough assessment of the patients’ AVF/AVG, and that some staff did not have the confidence to conduct their own assessment and merely cannulated where others had gone before in the hope of guaranteeing a successful cannulation. Wilson *et al.* (2010) also touched on the “assembly line” mentality that is common in dialysis units. The “get ‘em in, get ‘em on, get ‘em out” routine, and the pressure that staff were under regarding the number of patients that they had put on the machines compared to their colleagues. Whilst deadlines and time restraints are real, and need to be adhered to, there should always be time for appropriate and thorough assessment of the AVF/AVG. The time taken to prepare and assess may reduce the number of cannulations and trauma to the vessel, notwithstanding saving time that it would take to re-cannulate one or two more times. Wilson *et al.* (2010) also discuss the phenomenon of the “perpetual novice”, where new staff are under strict time pressures and, therefore, put all their time and energy into getting the patient cannulated quickly and hooked up to the dialysis machine, but in doing this, they neglect to do a thorough assessment of the access. This leads to stagnation of their assessment skills and, therefore, they don’t develop the ability to recognise and troubleshoot vascular access issues to be proactive in preventing adverse events.

Van Loon *et al.* (2009b) conducted a study that looked at predictors for unsuccessful cannulation and interestingly they found that during the study period a third of the 158 patients studied had more than 10 miscannulations with 40% of these patients requiring single needle (SN) or CVC to dialyse due to haematoma formation from the miscannulations. In our unit we found that use of the ultrasound (anecdotally) reduced the need for SN or CVC use. Visualising the AVF/AVG on ultrasound offered the opportunity to assess different areas of the AVF for cannulation or the status of the vessel under the haematoma for damage to the vessel wall, thus removing the need for CVC use or, in some cases, sending the patient home to come back and dialyse the next day. Allon and Robbin (2002) make the point that individuals are just as different on the inside as they are on the outside, such as veins and arteries of differing sizes and tortuosities. So instead of guessing or assuming what the vessel underneath looks like, use of ultrasound has removed some of the guesswork from the assessment process, and given us the means to look “inside” the body. Van Loon *et al.* (2009b, p. 88) conclude that “continued education and training of the dialysis staff towards theoretical knowledge and cannulation skills, especially for cannulation of new AVFs’ is essential and may be

beneficial in minimising miscannulation and cannulation-related complication and improving VA [vascular access] outcome”.

Van Hooland *et al.* (2010) believe that the life of the AVF/AVG is increased if unnecessary trauma to the newly created AVF/AVG is avoided. To help avoid this they implemented a protocol that states that the first cannulation of a new AVF/AVG must be preceded by an ultrasound examination.

Therefore, the primary objective of introducing the Advanced Care Workshop for Vascular Access into Australia was to upskill dialysis staff in the use of ultrasound as an adjunct to their clinical assessment skills and provide them with the framework for them to develop confidence to carry out regular AVF/AVG assessments on their patients. Other objectives were: encouraging the sharing of information and experiences; and providing an opportunity for people committed to vascular access care to network together. Long-term possible outcomes would be that fewer patients would be sent for unnecessary radiological scans in the future and that there would possibly be an overall reduction in miscannulations by staff who had completed the workshop.

Vascular access programme design

A steering committee was formed and sponsorship gained through renal equipment supply and renal pharmaceutical companies. The only advertising for the 2009 workshop was in the form of flyers at the June 2008 Renal Society of Australasia (RSA) conference in Sydney. From the distribution of the flyers we reached our target of 25 candidates and we had 45 names on the waiting list for the workshop for the following year’s intake. From this point on there was no further advertising apart from word of mouth and email communications, until more flyers were distributed at the 2011 RSA conference to capture the new renal staff attending the conference. Table 1 outlines the origin of the staff attending the workshop over the past three years.

Table 1. Origin of participants per year.

Origin of participants	2009	2010	2011
Victoria	12	18	21
Tasmania	2	2	2
New South Wales	4	0	3
Australian Capital Territory	0	3	1
Queensland	5	4	1
Northern Territory	0	0	0
Western Australia	0	1	1
South Australia	0	0	0
New Zealand	2	2	1
TOTALS	25	30	30

The two and a half day workshop was a mix of theory and practice. The theoretical component covered topics such as: anatomy and physiology of vascular access; cannulation competency package; Transonic QC machine™; assessment and cannulation skills; basic ultrasound physics and use of the

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ultrasound in practice. Practical components were undertaken on real patients with active arteriovenous fistulae (ultrasound only) and blue phantoms (ultrasound-guided cannulation skills), with emphasis on the basic ergonomics of the use of ultrasound and the staff gaining the “feel” of using the machines and understanding the basics of what they could see on the screen.

The candidates were sent a pre-workshop questionnaire, which asked them to provide details regarding their current role in practice, their renal experience and their experience with the ultrasound machine (if any). Based on this feedback, the candidates were put into groups of five with a mix of experience in each group. Graph 1 outlines the experience levels of the staff attending the workshop. Staff from the Geelong renal unit were enlisted as group leaders. It was their role to manage the flow of candidates using the ultrasound machine, introduce and attend to the volunteer patients, and ask for help from the expert staff in attendance. The groups then rotated after 30 minutes so they could move on to a different patient.

Graph 1. Experience levels of participants.

Each year a guest expert in the area was invited to present and assist with the practical sessions. Year one saw the invitation of an interventional nephrologist, years two and three, vascular surgeons from interstate, along with local nephrologists, sonographer, vascular surgeon and dialysis nurses.

At the end of the workshop, the delegates were asked to fill out an evaluation form, scoring each theoretical session, practical sessions, and individual speakers via a scoring system of one (poor) to five (excellent), and allowed for extra comments regarding feedback, improvements and suggestions.

Evaluation results

The survey results following the workshop were very favourable. Of the 85 attendees over the three years, 73 (85.8%) responded to the evaluation survey and most of the comments written were positive. The workshop was held over two and a half days, and feedback was that this was a reasonable time frame to fit in all of the content for the workshop. In regard to relevance of the workshop to the participants' clinical practice, 80% responded that the workshop was “extremely relevant” (5/5) and 20% responded that the workshop was “relevant” to their practice (4/5). The individual speakers all scored between 3 and 5/5.

This first year saw one ultrasound company provide the use of their ultrasound machines; however, feedback from the delegates suggested that some units had different ultrasound machines and would like to have been able to practise on the machines more familiar to them. A range of ultrasound machines was included from the 2010 workshop onwards. Some people felt that there was too much practical time and this could be reduced in following years. Feedback from the first workshop was:

“Experience on real patients invaluable. Speakers were motivational. Opportunity for Networking. Well organised workshop. Accommodation and meals exceptional. Staff at Management centre extremely helpful. Please run this again. Thank you for a great workshop.”

“Very good value workshop. Found the A&P and physiology background of fistula talks really helpful. This workshop has been a long time necessary. Hopefully it will continue.”

“Well done to the organisers. A great workshop which should be done on a regular basis.”

The second year, in 2010, the global financial crisis had started to hit the Australian renal companies and sponsorship was difficult to attain. A small amount of money was pledged from one of the renal pharmaceutical companies for the workshop to go ahead. The time was reduced to two days to reduce costs and reduce the time of the practical component as per previous feedback. The format was very similar, with topics such as assessment and cannulation, surgical perspectives in vascular access, radiological perspectives in vascular access, surveillance and monitoring, cannulation competency package, antegrade/antegrade cannulation and an introduction to each ultrasound machine from both ultrasound companies; however, due to time constraints on day one some delegates missed out on seeing both demonstrations. This was highlighted in the feedback and addressed in the 2011 workshop. Other feedback from year two included:

“Even though we do not have access to ultrasound equipment in our country unit it was worthwhile doing the practical sessions. Great quality speakers who are very passionate about their professions.”

“If practical groups were grouped based more on experience with use of u/s [ultrasound] would have been better. More challenging/difficult pts [patients] to practise on would be good. Or sonographer/experienced VA nurse that could point out thrombus/stenosis/bifurcations etc.”

After two years of the same format, the team at Renal Services, Geelong, guided by a new vascular access coordinator at the helm, decided it was time to overhaul the timetable. Most units in Australia now practise antegrade/antegrade needle cannulation, where both needles point in the direction of the blood flow, rather than the arterial needle being pointed towards the hand (retrograde). The change was encouraged by A/Prof John Agar in presentations around the world, referring to the seminal works of Woodson and Shapiro (1974) who discussed the possibility of pseudoaneurysm formation with retrograde cannulation, due to a small “flap” remaining open upon needle removal. Further research into access flow and needle orientation was undertaken by Schoch, Wilson and Agar

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(2008) to show that there was a small difference in Transonic QC™ access flow measurements depending on the direction the arterial needle was facing, and no increase in recirculation with the arterial needle in antegrade position (which was the long-held belief). So as this was now common practice, this theoretical component was removed. Another component that was removed was the cannulation competency package, as again, a lot of units around Australia had introduced a package to measure the competency of their staff at cannulating and provided a grading system (novice, intermediate, expert) to monitor and mentor staff to improve their cannulation skills. Another change was the medium used to teach ultrasound-guided cannulation. In past workshops the team had used the blue phantoms for cannulation, which was an appropriate medium to mimic the feel of cannulating an AVG; however, most units in Australia have a majority of AVFs so the ideal was to have something that would preferably mimic the feel of cannulating an AVF. Also the large-bore dialysis needles were found to easily damage the tubing inside the phantoms. The team decided to use fresh chicken fillets stuffed with small water balloons, which seemed to work well and were well-received by the delegates attending in 2011. The feedback from the updated and reorganised workshop was very positive, enhanced by the brilliant presentations given by the invited speaker.

“Very informative and well organised. Practical sessions helped to break things up and small groups meant everyone had the chance to try things.”

“One of the best workshops I have attended. I have been working in dialysis for the last 15 years. John (Swinnen) was a huge asset to the two days.”

Each year, those who did not get in to the workshop were placed on a waiting list for first access to registrations for the following year. There were 45 people on the waiting list for the 2010 workshop, 34 for the 2011 workshop, and currently there are 24 people awaiting the chance for early registration on the 2012 list. Not all of those on the waiting list take up the offer of registration, but the list provides us with an indicator for the interest in the workshop each year. The workshop cost to delegates is kept to a minimum to allow for all renal nursing staff to be able to afford to attend the workshop, without large cost outlays.

Discussion

The importance of vascular access care is paramount in the success of dialysis for patients with chronic kidney disease (CKD). The success and continued interest in this workshop highlights the need for further education and practical assessment of cannulation and ultrasound skills. The importance of accurate clinical assessment should not be underestimated, whilst ultrasound is a very useful *additional* assessment tool, it should not be solely relied upon for detection of AVF/AVG thrombosis and stenosis. The emphasis on updating and teaching staff the correct clinical assessment skills will go a long way to identifying the deterioration of a functioning AVF/AVG. Recent studies have identified that dialysis staff still have a very

basic knowledge of the anatomy and physiology of the vascular access that they are cannulating (Paulson, Moist & Lok, 2011). This needs to be addressed in all units, via increased education programmes and regular staff updates.

The introduction of renal access coordinators/vascular access coordinators around Australia has filled some of the void in best practice for vascular access education. However, as Kulawik *et al.* (2009) point out, the renal/vascular access coordinator roles have not been standardised; therefore, one coordinator may have a large focus on staff and patient education, surveillance and patient advocacy, whereas another may be limited to coordination of appointments, surgical lists and postoperative, follow-up care. There are still inconsistencies in the role added to the time constraints in relation to the ongoing education of new and continuing staff regarding best practice with vascular access. Perhaps there needs to be a standardisation to the role of the renal/vascular access coordinator, to include staff education, particularly if no renal educator is available within that unit.

We also need to consider those units without a renal/vascular access coordinator or an educator. How do these units find the time for staff continuing education? The Nephrology Educators Network of Australia has provided e-learning modules to try to address this issue and provide an adjunct online learning environment for those requiring further education and updating of theoretical and practical skills on a variety of topics (Sinclair & Levett-Jones, 2011). The addition of a practical workshop can extend the knowledge learnt in the e-learning environment and increase confidence in the practical skills required to provide best practice in cannulation of vascular access. Shorter vascular access workshops have been implemented in other countries, such as the Vascular Access Camp and the Vascular Camp in Canada, which were four hours and three hours in length respectively and contained comprehensive lectures, interactive stations, open discussion and feedback, which all received very positive feedback in their post workshop evaluations (Larade & MacQueen, 2008; Lynch *et al.*, 2007).

However, to date, this workshop seems to be the first of its kind in Australia that incorporates: ultrasound basic theory and practical application; cannulation best practice theory and practical application; and instruction and supported practice with ultrasound guided cannulation, with the added benefit of guest speakers who present on the latest topics in their area of expertise.

Conclusion

The introduction of the Advanced Care Workshop in 2009 has provided the wider dialysis community with the opportunity to attend a vascular access workshop that covers aspects of assessment, surveillance and cannulation from expert presenters. The continued interest in this workshop highlights the staff need for this type of further education and professional development. With continued support from the renal community, we hope that this workshop will continue to be a beneficial teaching environment for dialysis staff for the future.

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