Exploring how the development of a nurse-led vascular access service has benefited patients

A nurse-led service for patients needing long-term venous access has reduced waiting times and resulted in fewer complications

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The management and care of patients in Greater Glasgow and Clyde needing long-term vascular access has changed markedly over the past six years. A nurse-led vascular access service has been introduced to reduce waiting times for patients requiring long-term venous access for treatments such as chemotherapy, long-term antibiotics, renal dialysis and feeding. Nurses in the service now insert tunnelled central venous catheters (TCVCs) and also educate and train other healthcare professionals. This service has led to a reduction in complications and provided a source of expert advice for both patients and healthcare professionals.

Introduction

Nurses are now taking on tasks traditionally carried out by doctors. There are many benefits of developing the nurse’s role, such as improved care and increased job satisfaction.

In north Glasgow in 2000, demand for tunnelled central venous catheters (TCVCs) rose. Primarily, this was due to an ageing population, consumer expectations and technological advances, particularly in the field of interventional radiology (Jones, 2003). The increased demand resulted in a lack of theatre and radiological space for TCVC insertion and, as a consequence, waiting times for the procedure increased dramatically.

The NMC Code of Professional Conduct (NMC, 2002) encouraged nurses to expand their practice if they had the skills and knowledge to do so. It stated that responsibility for actions and omissions would remain with the nurse. A revised code included standards for conduct and ethics (NMC, 2004). The most recent code was published last year (NMC, 2008).

Given this, and initiatives to reduce the number of hours worked by junior doctors and the Department of Health’s (1999) Making a Difference document, it was felt nurses working in new ways could perform TCVC insertion, which might help reduce waiting times.

Service Development

The vascular access service was set up in September 2002, because it was recognised that patients on the waiting list or who had had their procedure cancelled because of emergencies needed a better service. The charge nurse from interventional radiology set out the requirements for a nurse-led service. A proposal and business case were developed, detailing the benefits that a nurse-led service could have for patients.

The business case identified that the aims of the nurse-led service were to:
- Eliminate or reduce waiting lists;
- Reduce catheter-related infection rates;
- Reduce procedural complications;
- Develop competency programmes;
- Free up space in theatre and interventional radiology;
- Provide safe, holistic patient care;
- Provide a safe and seamless patient journey, without the need for patients to transfer from their base site, whenever possible;
- Act as a specialist resource for patients’ clinical management;
- Act in a collaborative and advisory role to senior management;
- Offer training and education to medical and nursing staff.

Following consultation with the medical director, director of nursing and practice development team, a bid was submitted. Funding was eventually secured from The NHS Cancer Plan (DH, 2000) to set up the service. The charge nurse from interventional radiology was then tasked with the role of leading the new service, established in 2002.

Responsibilities of lead nurse

The first nurse into post was the specialist nurse who was responsible for:
- Coordinating, organising and developing the service;
- Clinical duties on each site;
- Developing insertion criteria and the criteria for managing high-risk patients;
- Devising competency programmes and education;
- Building a business case with the involvement of financial services to ensure adequate funding;
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● Developing a clinical teaching package.

The first two months in post were spent devising documentation. This included consent forms, procedural checklists, referral forms, patient and staff information as well as procedural audit forms.

Evidence-based guidelines were developed from *Standards for Infusion Therapy* (RCN, 2003) as well as EPIC guidelines for preventing infection (Pratt et al, 2001).

A group of professionals was set up to monitor the development of the service. This consisted of the lead nurse, service manager, clinical nurse manager, radiologist and high users (oncologist, haematologists and so on).

A project plan was drawn up to keep service development on track and monitor progress.

Three specialist nurses were drawn from high-user areas, including oncology, haematology and interventional radiology, to provide the balance of knowledge, specialisms and skills required. They also provided a ringfenced commitment to the service.

**CATHETER INSERTION**

A TCVC is a long, fine, hollow silicone tube with an opening at each end. A Hickman-type catheter (Fig 1) is used most often in acute settings, whereas a dialysis catheter or Perm cath (Fig 2) is used for renal dialysis.

The entry site is usually the right or left jugular or subclavian vein. The tip of the catheter terminates within the superior vena cava or the right atrium. The catheter is tunneled subcutaneously and a cuff made of fibrous Dacron is located at the exit site. This anchors itself under the skin, to provide stability and also to help prevent infection tracking along the catheter (Pratt et al, 2007).

There are many indications for tunnelled central venous access. They include: difficult venous access; chemotherapy; long-term antibiotics; treatments needing multiple punctures, such as daily blood withdrawals in patients with coagulopathy; renal dialysis; and total parenteral nutrition (Dougherty, 2006).

We use the left or right internal jugular to gain venous access, which is achieved with the aid of a portable ultrasound machine. After cleaning and draping the skin, the internal jugular vein is punctured using a 19-gauge Seldinger needle. A fine wire is passed through the needle to maintain access then a tunnel is created under the skin. This is fashioned back to the point of venous access. A peel-away sheath is then passed over the wire into the inferior vena cava. The catheter is cut to length and, following removal of the dilator and wire, the catheter is fed through the sheath into the superior vena cava. The sheath is peeled away, with the catheter tip in the lower superior vena cava or the right atrium (Fig 3, p18).

Each patient receives written information about the procedure and the reasons for it. On the day of the procedure, the specialist nurse explains the process in detail, including potential complications. The patient is given ample time to ask questions before being asked to sign the consent form. Incapacity procedures are followed where relevant (DH, 2001).

Box 1 shows the number of line insertions and removals the service has carried out since 2003. The complications rate is approximately 2%, and these are predominately arterial puncture, air embolism and misplacement. There has only been one major complication needing surgical intervention.

**COMPLICATIONS**

Many complications are associated with TCVC insertion (McGee and Gould, 2003), including:

● **Air embolism:** the patient will experience respiratory distress, unequal breath sounds, weak pulse and decreased blood pressure. This can be prevented by clamping catheters when open to air and by placing the patient in a head-down position (Drewitt, 2000);

● **Arterial puncture:** the carotid artery lies close to the internal jugular vein so, to prevent this, ultrasound should be used when locating the vein (Bodenham and Simcock, 2009);

● **Infection:** full aseptic technique should be adopted during insertion (Pratt et al, 2007);

● **Cardiac arrhythmia:** if a guide wire enters the right atrium, it can cause arrhythmias – the wire should be pulled back to return the patient to sinus rhythm (Vesely, 2003);

● **Cardiac tamponade:** the heart can be punctured during the insertion of stiff guide wires and dilators. Wires and dilators should never be forced (Russell and Greiff, 2003);

● **Pneumothorax/haemothorax:** the patient will complain of sudden onset of chest pain and dyspnoea. All patients have a chest X-ray performed to check for signs of a pneumothorax (Dougherty and Lister, 2008).

All these complications can be prevented and staff must be aware of preventive measures.

**TCVC INSERTION TRAINING**

As TCVC insertion is a minimally invasive surgical procedure with risks of complication, the interventional radiologists’ support was paramount in ensuring safety. Other specialist nurses’ support was also important.

At the time, there were few centres with nurse-led services for TCVC insertion; one was the John Radcliffe Hospital in Oxford. The lead nurse went to Oxford to learn from the nurses there, which proved invaluable.

On return, the lead nurse went through intensive training with the interventional radiologist, including inserting TCVCs under direct supervision. Competencies and standard operating procedures were used to help...
Practising changing practice

learning and to provide a training log.
It was important to gain the respect and
certainty of the referring doctors. This
meant having a good knowledge of the range
device pre- and post-procedure and
follow-up care, as well as patient conditions.
The following areas of training were
identified as essential for safe TCVC insertion:
- Competence in aseptic technique;
- Attendance at resuscitation courses at
regular intervals defined by service protocol;
- Knowledge of the complications and
fail-safe procedures to prevent them;
- Training in basic radiation protection;
- Ultrasound-guided jugular puncture and
the ability to differentiate between structures
(particularly veins and arteries);
- Knowledge of normal anatomy to conduct
examinations and tell normal from abnormal;
- X-ray interpretation of tip position;
- Adequate blood results before procedures;
- Critical thinking, diagnostic reasoning skills
and clinical decision-making (including the
initiation of emergency procedures);
- Promoting the implementation of evidence-
based practice throughout assessment,
diagnosis, treatment and discharge/referral;
- Ability to treat patients within the inclusion
criteria without medical staff being present.
Specialist nurses were supervised by the
consultant or lead nurse for at least 20 TCVC
placements, and explicitly informed when
they were considered competent. If the lead
nurse or interventional radiologist felt an
individual was not competent, the right to
perform placements was withheld and further training provided.

**Box 2. Exclusion Criteria**

- Pleural effusion
- Pneumothorax
- Consolidation of the lung
- Traechectomy
- Neutrophils lower than 0.7 X 10⁹/L
- International normalised ratio over 1.5
- Neck lymph nodes enlarged
- Supraventricular tachycardia
- Pacing wires in situ
- Fixed neck
- Uncontrollable cough
- Previous thrombosis
- Children under the age of 16

**Conclusion**

The service now consists of a lead nurse, four clinical nurse specialists and two
healthcare support workers. Referrals are
received from medical staff or nurse
practitioners. Patients who fall within our
exclusion criteria (Box 2) are discussed with
medical staff who make themselves available
while nurses carry out the procedure, or add
them to their own lists.

We now have no waiting list for Hickman
line insertion but, because we have only six
radiology slots per week for renal dialysis
insertion, patients needing these can
wait 7–14 days. Urgent requests, however, are
addressed on the same day if possible.
The nurses discuss the procedure and
potential complications and aftercare of the
catheters with patients, and obtain consent
before the procedure. Each patient is given a
detailed information leaflet, with contact
numbers and advice on complications or
queries. Complication rates are low.

Training for the procedure is available
on site and nurses have reported increased
tasking.

This scheme has proved extremely beneficial:
waiting times have reduced and questionnaires
have suggested patients are very satisfied.

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BOX 3. KEY RESULTS

- Reduced waiting times.
- Low complication rates.
- Increased job satisfaction.
- Retention of highly qualified staff in the clinical setting.
- Education and training is now available for health professionals.