

INFUSION THERAPY

Peripheral cannulae in oncology: nurses' confidence and patients' experiences

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Abstract

The insertion and care of peripheral intravenous cannulae (PIVCs) is a role performed by clinical staff that is fundamental to oncology. Previous research indicates nurses' confidence and experience could mediate successful first attempt insertion, increasing the longevity of PIVCs and improving the patient experience.

The aim of this audit was to provide a snapshot of care and maintenance of PIVCs, patients' experiences and nurses' confidence at a specialist cancer hospital. An audit tool assessing PIVC care practices ($n=51$) and a patient experience questionnaire ($n=65$) were completed. A questionnaire assessing nurses' confidence and training needs was completed by 36 nurses.

The findings raise some concerns about clinical practice when inserting PIVCs and ongoing care, with 80% adherence to cannulation policies. Almost half of insertion procedures failed at the first attempt and 17% of nurses lacked confidence in PIVC insertion and in recognising or responding to common complications. Patient satisfaction was high for ongoing PIVC care (95%), although some reported increased pain and anxiety after PIVC insertion, with some unresolved concerns.

The audit highlights several important areas for improvement in relation to PIVC insertion and maintenance and the need for greater adherence to clinical guidelines/policy and additional training were identified.

Keywords

assessment skills, cancer, intravenous, patient experiences, peripheral cannulation, vascular access

PERIPHERAL CANNULATION is one of the most common invasive procedures performed in a hospital setting. Historically a junior doctor's role, peripheral cannulation is now also performed by other healthcare workers including nurses, nursing assistants and support workers.

Peripheral intravenous cannulae (PIVCs) can be inserted for a number of indications including administration of medication, fluids, blood and nutrients. Infusion therapy and, therefore, cannulation is also an integral part of many oncology patients' care pathways, including IV access to diagnose and treat cancer through the administration of anti-cancer therapies (Elliot 2010). However, peripheral cannulation is associated with numerous risks. These include multiple cannulation attempts, phlebitis, infiltration and extravasation (Elliot 2010, Wallis et al 2014). Studies show that up to half of PIVCs fail due to infection, blockage, dislodgement or blood vessel damage (Rickard et al 2012, Lim et al 2013). National UK evidence-based guidelines (epic3) were introduced to prevent healthcare-associated infections (HCAIs) in NHS hospitals (Loveday et al 2014).

The guidance states that cannulae should be replaced only when clinically indicated, yet up to 69% fail before treatment is completed (Marsh et al 2015, Rickard et al 2015). Eliminating the problems associated with the act of cannulation and ongoing device care would increase the longevity of the PIVC. This would reduce patients' pain and discomfort, risk of infection, time taken to cannulate and costs for the hospital.

A scoping review recommended an increase in randomised controlled trials to address PIVC post-insertion care and maintenance; this includes dressings/securement, flushing practices and infection prevention strategies (Takashima et al 2015). Success of cannula insertion could be improved if performed by health professionals with greater experience and confidence (Carr et al 2016a, 2016b). This suggests that assessing the experience of nurses who insert cannulae, alongside their perceived confidence in undertaking this procedure, are important considerations for clinical practice. A worldwide pilot study, One Million Global catheters (known as OMGPV), confirmed the need for further research on PIVCs and

interest in an international benchmark; it investigated the use and management of PIVCs from 410 hospitals in more than 50 countries and found 16% of PIVCs still in place although they were no longer needed, and 12% of patients who had a PIVC had at least one symptom of phlebitis (Alexandrou et al 2015).

Local clinical skills training

Competence for PIVC insertion requires acquisition of knowledge and skills across a continuum of pre-insertion, insertion and post-insertion (Higgins et al 2015).

At the study hospital, a large cancer treatment centre in north west England, hundreds of cannulae are inserted daily to assist with the diagnosis and treatment of patients. As well as doctors, there are more than 320 clinical staff who perform cannulation, including care and maintenance. There is a training process in place for staff required to perform the skill that includes theoretical and simulated practice followed by practice under supervision of competent practitioners. After several observed cannulations – and provided that the practitioner feels confident – an assessment of theory and practice is performed.

Once deemed competent by a standardised assessor, the practitioner may practise independently for a period of three years before a subsequent assessment takes place. However, interim support and reassessment would occur after a prolonged period of absence or need to cannulate. The training pathway follows the principles for good practice in hospital cannulation policy. This is audited annually and reported to the Patient Safety Committee. The policy and training pathway are evidence based, drawing from sources such as epic3 (Loveday et al 2014), Standards for Infusion Therapy (Royal College of Nursing 2016) and the charity Aseptic Non Touch Technique (2016). Although annual audits are conducted, they focus on the process of PIVC insertion. No work has been undertaken to evaluate the maintenance of PIVCs, nurses' confidence and patients' experiences.

Aims

The aim of this audit was to evaluate the care practices and patients' experiences relating to PIVCs. Specific objectives included to assess:

- » The care of patients with PIVCs at a specific time point to provide a snapshot of care.
- » Patients' experiences of PIVCs.
- » Nurses' knowledge and confidence with cannula insertion and care of PIVCs.

Methods

The study involved a point prevalence audit and questionnaire surveys. Permission was obtained to use a modified version of the data collection tool from the OMGPIVC study (Alexandrou et al 2015). The tool was modified to reflect an oncology setting and UK clinical practice. It included data on cannula assessment, IV dressings, IV administration sets/connectors, IV infusions and IV boluses. A questionnaire was designed to assess patients' experiences of PIVC insertion and care, including subjective measurements of pain, anxiety and concerns. The questionnaire for nurses was designed to assess their knowledge of, and confidence in relation to, PIVCs. It was divided into two sections: one for nurses who inserted PIVCs and one for all nurses who cared for patients with a PIVC.

Data collection took place from November 2015 to January 2016. The audit aimed to reflect the OMGPIVC study by obtaining a cross-sectional 'snapshot' of PIVCs in the hospital. However, it was not possible to cover the whole hospital in one day, therefore, researchers visited each department/ward in the hospital on two occasions. Researchers were used to avoid potential bias during assessment/data collection. During each visit the researchers invited all patients with PIVCs to take part in the audit. Patients were given an invitation letter explaining the purpose of the audit/questionnaire and informed that participation was voluntary, however, patients who were asleep were not disturbed. The researcher then assessed each patient using the audit tool, which took approximately ten minutes. Patients then self-completed the questionnaire. It contained 12 tick-box questions about PIVC insertion, concerns and worries about the PIVC, dressings and infusion (where applicable), and took five to ten minutes to complete.

Questionnaires for nurses were posted to individual nurses on each inpatient ward with an invitation letter and envelope to return the completed questionnaire to the research office.

The questionnaire had one section for all nurses, which contained 14 tick-box questions, and one additional section for nurses who inserted PIVCs. This contained ten tick-box questions and five open questions, which may take ten minutes to complete.

Ethical considerations

Approval was obtained from the clinical audit committee to undertake a prospective audit of inpatients and outpatients attending the cancer hospital with a PIVC in place.

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Results

The audit captured patient data from six departments over a three-month period. There were 51 audit tools completed; a 78% response rate based on 65 patients. Of 67 patients approached, 65 completed the patient experience questionnaire; a 97% response rate. Of 175 nurses approached, 36 completed the nurse questionnaire; a 21% response rate.

Results from the audit tool

Thirty two of the 65 patients assessed with PIVCs were receiving outpatient treatment in the ambulatory chemotherapy department and 33 were on inpatient wards at the time of audit. Of all the patients, 55% ($n=36$) were men and 45% ($n=29$) were women. The mean age was 61.2 years (range 31-85).

Cannula insertion

Chemotherapy nurses on the ambulatory chemotherapy department inserted 63% ($n=32$) of the PIVCs and they were in place for the duration of systemic treatment (1-12 hours). However, there was limited documentation to determine who inserted PIVCs on inpatient wards (Figure 1). The main indication for PIVC insertion was chemotherapy administration (69%, $n=35$) or IV drugs (20%, $n=10$). Only 6% ($n=3$) of PIVCs were inserted because the patient's condition was unstable (2%, $n=1$ for IV fluids; 4%, $n=2$, unknown).

Number of attempts at cannulation

Only 53% ($n=27$) of the patients were successfully cannulated at the first attempt; two patients had five attempts by three different nurses and the number of attempts was not documented for 29% ($n=15$) of the patients. Most PIVCs were placed in the distal portion of the upper limb, including the hand, wrist and forearm (96%, $n=49$), which reflects policy recommendations.

Clinical symptoms

Clinical symptoms in relation to potential PIVC problems were experienced by 12%

($n=6$) of the patients (Figure 2), and some were key symptoms of concern, including partial dislodgement of PIVC, leakage, redness and itching/rash. Of the 51 patients, 80% ($n=41$) had a documented IV assessment in the past 24 hours, however, the assessment was more than 24 hours for two patients and was not documented for 16% ($n=8$).

Dressings and IV administration sets

The IV3000 dressing was used for all patients, but one inpatient had a bandage covering the cannula, which contradicted hospital policy/teaching. All dressings were clean, dry and intact. For patients with an IV administration set attached to the PIVC, sterile or non-sterile tape was used to secure this to the patient's arm, although 20% ($n=10$) had no securement on the IV line. All patients had needleless connectors or a three-way tap for IV fluids or bolus medication. It was difficult to establish accurately what IV fluids inpatients had received since several IV charts were unavailable to the researchers. However, of those reviewed ($n=39$), 69% ($n=27$) had crystalloid fluids, 15% ($n=6$) non-crystalloid fluids and 15% ($n=6$) no IV fluids; 87% ($n=34$) received continuous IV fluids and 13% ($n=5$) intermittent.

IV medications

Six prescription charts were unavailable for inpatients during the audit. Of those reviewed,

Figure 1. Who inserted the peripheral intravenous cannula?

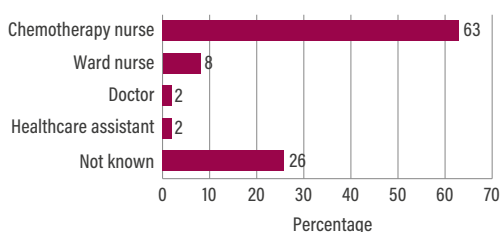


Figure 2. Clinical symptoms for peripheral intravenous cannulae

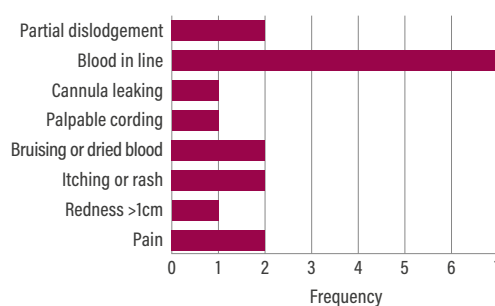
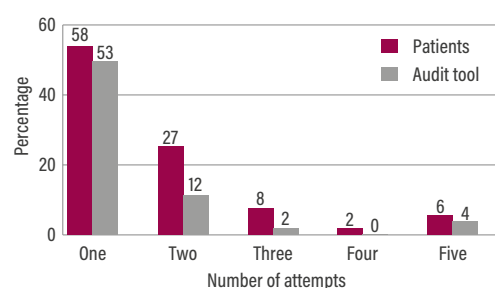


Figure 3. Cannulation attempts: patients and audit tool



30% ($n=8/27$) had IV antibiotics. In contrast, e-prescribing was used on the ambulatory chemotherapy unit for all patients, which provided greater clarity with patients' IV medication and infusions. Of the 51 patients, 65% ($n=33$) had IV chemotherapy – 18% ($n=6$) of these received vesicant chemotherapy and 9% ($n=3$) received monoclonal antibodies/immunotherapy.

Results from the patient questionnaire

The patient experience questionnaire was completed by 97% of the 67 nurses approached ($n=65$). Of these, 62% ($n=40$) stated PIVCs were inserted on the day of assessment, however, two were unsure when their cannula had been inserted. Patients reported PIVCs had been in place for an average of 2.57 days (range = 1-7 days), and an average of 1.72 attempts at cannulation were made (range = 1-5); however, there were disparities between patient reports and nursing documentation (Figure 3).

Pain on cannula insertion

Patients were asked to rate their perception of pain on PIVC insertion and PIVC pain at the time of assessment. The mean score was 2.03 (range = 0-9). The average score for pain on assessment was 0.55 (range=0-5), however, 9% ($n=6$) of patients reported an increase in pain after PIVC insertion (Figure 4).

Patients' anxiety and concerns about PIVC

Anxiety on PIVC insertion was rated from 0-10 and there was an average score of 2.25 (range = 0-10) in comparison with anxiety at the time of assessment, which had an average of 0.6 (range 0-9) (Figure 5). However, 5% ($n=3$) reported an increase in their anxiety after PIVC insertion. Although 62% ($n=40$) of the patients reported that nurses had addressed their anxiety, 5% ($n=3$) did not feel their anxiety had been addressed and 34% ($n=22$) did not respond. Of the 65 patients, 43% ($n=28$) who had concerns about PIVCs, the dressing, IV line or infusion (Figure 6), with 23% ($n=15$) reporting worries about their cannula; 8% ($n=5$) of the patients had spoken to a ward nurse about their concerns, however, only one patient reported that their concerns were completely addressed; 3% ($n=2$) were addressed to some extent and 3% ($n=2$) were not addressed. In addition, several patients had unresolved anxieties about PIVCs, dressings or IV lines (Box 1).

Results from the nurse questionnaire

Thirty six qualified nurses completed the questionnaire out of 175 delivered. The mean

age was 32 (range 21-54). Of all respondents, 61% ($n=22$) were staff nurses and 39% ($n=14$) sister/charge nurse. The mean amount of years in post was 3.29 years (range = one month to 13 years), including 22% ($n=8$) who had been in post for more than five years.

Of the nurses who responded, 67% ($n=24$) inserted PIVCs, and had a mean 3.46 years' experience of PIVC insertion (range = one month to ten years). All 36 nurses had received IV training and most had completed this in the previous 12 months.

Nurses' training

Communication skills training educates nurses about the importance of identifying and assessing patients' concerns and psychological distress. It had been completed by 64% ($n=23$) of the nurses, but the nature of the training was variable. Although most nurses had completed basic communication skills training, one had a diploma in counselling and five had completed advanced communication skills training in oncology.

The prevalence of patients with cancer and dementia is increasing. Dementia training had

Figure 4. Patients' rating of pain with peripheral intravenous cannulae on a scale of 0-10

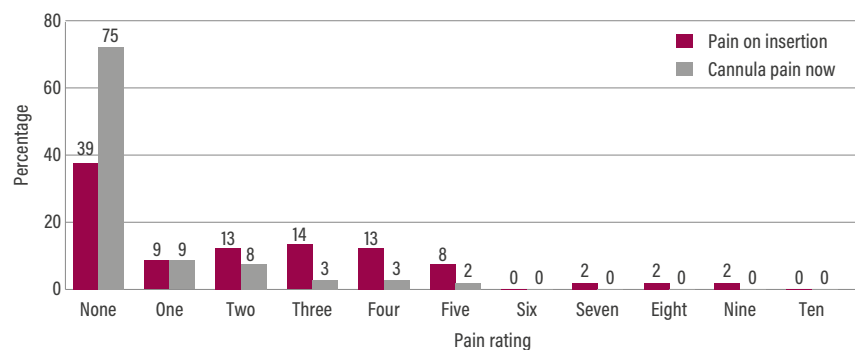


Figure 5. Patients' rating of anxiety with peripheral intravenous cannulae on a scale of 0-10

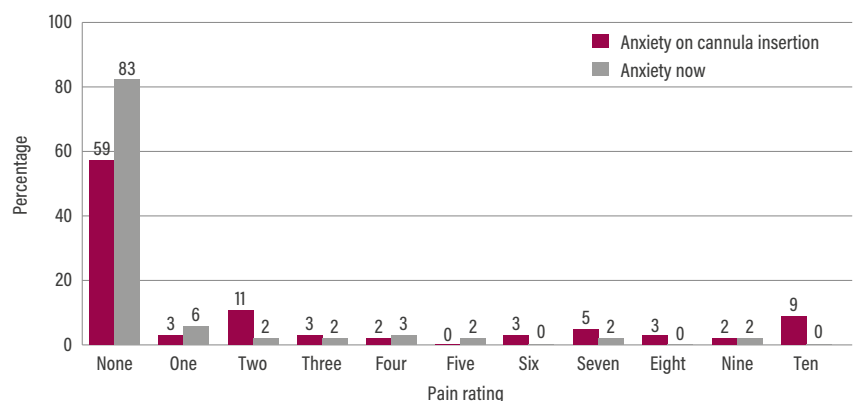
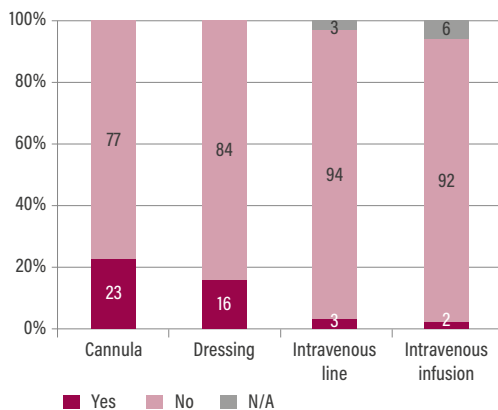


Figure 6. Patient-reported worries or concerns



BOX 1. Description of patients' concerns

Patients' worries about peripheral intravenous cannulae:

- » 'It's been in a long time'
- » 'It's a bit close to the joint'
- » 'It's on the elbow so I have to make sure my arm is not bent so it does not dislodge'
- » 'Ripping it out by mistake'
- » 'Staying in for a week'
- » 'Worried I'll need another'

Patients' worries about PIVC dressings

- » 'Security of the dressing'
- » 'Allergic to the dressing'
- » 'It keeps coming off'
- » 'Quite hairy so it doesn't stick well'
- » 'Sometimes it's coming loose; just put more tape on'
- » 'Stick to hairs when taken off so can hurt'
- » 'Within half an hour the dressing was loose'

Patients' worries about IV lines or IV infusions

- » 'Left on too long'
- » 'Line gets caught, catches on clothes'
- » 'They couldn't flush it last time'

been undertaken by 86% ($n=31$) of the nurses: 39% ($n=14$) at Level 1; 42% ($n=15$) at Level 2; and 19% ($n=7$) unknown.

Nurses' confidence

Nurses were asked to rate their confidence on four different levels from 'not very confident' to 'very confident'. There was a wide range in nurses' perceived confidence in caring for patients with PIVCs, including assessing and communicating with patients (Figure 7), dealing with potential complications (Figure 8), and general care of PIVCs (Figure 9).

Nurses' knowledge

Among the respondents, 44% ($n=16$) had completed training in informed consent but the nature of the training was variable and 56% ($n=20$) nurses had completed training on the Mental Capacity Act 2005, however, some had completed this as a student.

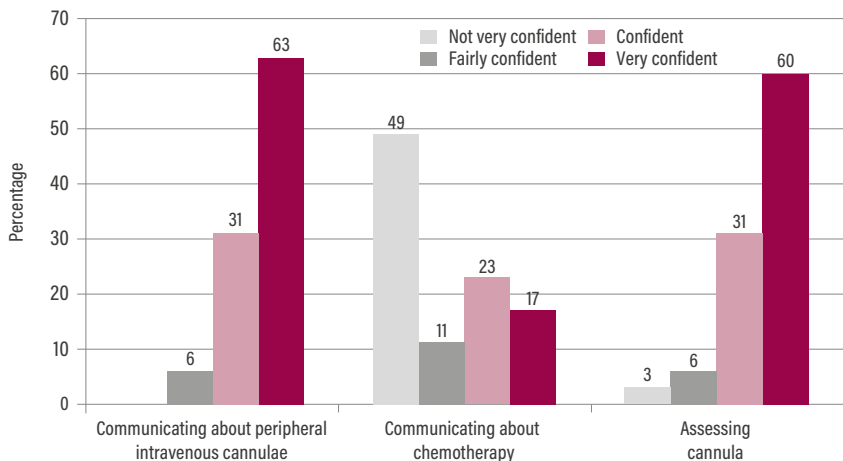
Nearly all of the nurses (97%, $n=35$) felt confident or very confident obtaining informed consent and 94% ($n=34$) felt confident or very confident assessing patients. However, nurses were less confident with practical aspects of inserting peripheral cannulae and potential issues such as vein selection and cannulae that did not bleed back (Figure 10). A summary of the key findings is shown in Box 2.

Discussion

This audit has revealed some interesting findings about the care of patients with peripheral cannulae, although it raises some concerns about clinical practice in the insertion of PIVCs and ongoing care. Almost half of insertion procedures failed at first attempt. This indicates a need for improved training, including better vein identification. Techniques such as insertion under ultrasound guidance or use of a 'vein visualiser' may also be considered (de Graaff et al 2013, Guillon et al 2015, Carr et al 2016a). Patients requiring more than two attempts at cannulation should be referred to nurses with more advanced skills and greater experience in PIVC insertion, such as clinical skills trainers. Patients who require several attempts at cannulation may also be referred for consideration of established venous access, such as central lines.

In addition, 12% of the patients ($n=6$) had clinical symptoms indicating potential problems with PIVCs, including phlebitis and partial dislodgement. The Infusion Nurses Society standards of practice (2016) advocate that incidence of phlebitis should be no higher than 5%. Therefore, the audit findings are worrying, particularly since they represent

Figure 7. Nurses' confidence in patient assessment and communication



a snapshot, which suggests there may be a higher number of potential complications over the life of the PIVC. All dressings were clean, dry and intact, which is good. However, a small number of patients reported increased pain and/or anxiety after PIVC insertion, with indications of some unresolved concerns.

There was some evidence of good adherence with hospital policies and clinical guidelines for vascular access, such as education and cannula insertion, however, documentation relating to PIVCs was generally poor on inpatient wards. In addition, there were some specific issues that did not reflect policy guidelines for ongoing care, for example, no securement for IV lines in 20% of patients, and using bandages and additional tape to secure PIVCs. Incidents falling outside current hospital policy and standards have since been addressed with additional local training and updates by the clinical skills team.

The findings from this audit reflected several of the pilot results from the OMGPiVC study. The OMGPiVC study found that most PIVCs were inserted by nurses (65%), the forearm was the most common site for PIVC placement in North America and Asia (50%), and 12% of patients had at least one symptom of phlebitis, including pain (3%) and erythema (3%) (Alexandrou et al 2015). However, there were some slight differences between the OMGPiVC data and this audit's findings, which may be due to the large proportion of patients receiving ambulatory chemotherapy in this audit and the limited duration of PIVC. For example, the audit identified a greater use of IV medication (86%) compared with 74% patients in the OMG study. In addition, 91% of PIVCs were inserted on general wards in the OMGPiVC study, and 80% of dressings were clean and intact, whereas few PIVCs were inserted on general wards in this audit and 100% of dressings were clean and intact. Gauze and tape was used in 9% of patients in the study from Western Europe, which reflects worldwide disparities in clinical practice (Alexandrou et al 2015), however, there is a lack of evidence about recommendations for PIVC dressings (Gillies et al 2003).

The lack of documentation on inpatient wards about who inserted the PIVC, when it was inserted, and how many attempts were made at PIVC insertion, compromised the evaluation of PIVCs in those locations and interpretation of the findings. This may have caused the disparities between findings from patients and staff. However, there are some instances where patients' anxiety post-cannulation did not appear to be

Figure 8. Nurses' confidence in dealing with complications of peripheral intravenous cannulae

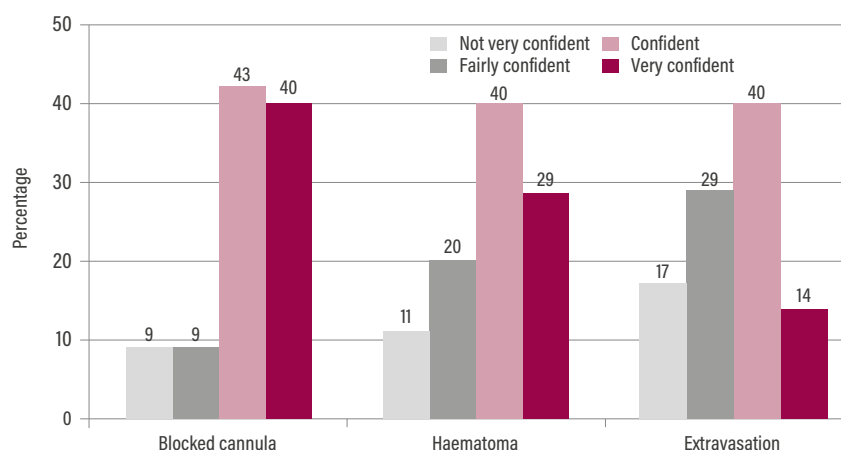


Figure 9. Nurses' confidence in caring for patients with peripheral intravenous cannulae

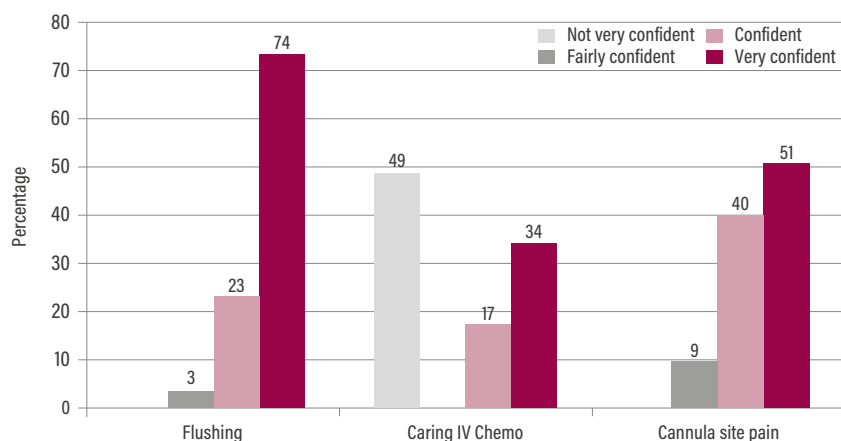
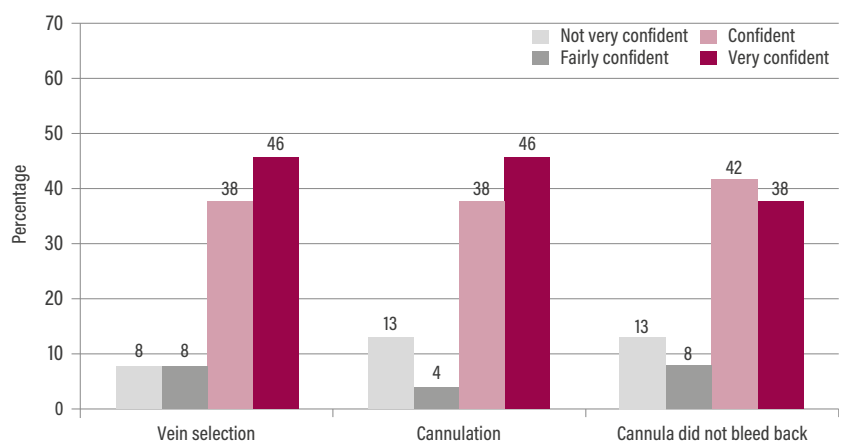


Figure 10. Nurses' confidence in peripheral intravenous cannulae insertion and potential complications



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recognised by nurses and remained a concern. It is important that patients' concerns are identified, acknowledged and addressed, which is a priority of training for communication skills in oncology (Franklin et al 2016), and will be incorporated in future training.

Last, a significant proportion of nurses, despite having received education and training, lacked confidence in important areas of PIVC care such as vein selection and responding to common complications. This suggests that current education may need more emphasis on vein selection rather than the insertion procedure per se and a greater focus on responding to complications and not merely identifying them.

Limitations

The initial plan was for the audit to be led by staff in each department, however, this was not achieved, which may be influenced by ward pressures at the time of audit. Consequently, research assistants completed patient assessments after receiving training by a senior trainer from the clinical skills team. However, this limited the scope of the data collection since patients were not disturbed if they were asleep when the researcher visited the ward, and IV charts were not always available. The response to the nurse questionnaire was poor, despite attempts to contact individual nurses on inpatient wards by direct emails and posting named questionnaires to each ward. This was disappointing since pre-audit engagement with senior clinical nurses appeared promising.

BOX 2. Summary of key findings

1. Of the 51 cases looked at, 63% ($n=32$) peripheral intravenous cannulae (PIVCs) were inserted by a chemotherapy nurse on the ambulatory chemotherapy unit; however, it was not known who had inserted the cannulae in 26% of cases
2. Only 53% ($n=27$) of PIVCs were successfully inserted at the first attempt
3. There were 12% ($n=6$) of inpatients who were symptomatic in relation to PIVCs at one point in time, including partial dislodgement, leakage and erythema
4. All dressings for PIVCs were dry, clean and intact, however, 20% had no documentation in the last 24 hours and 20% no securement for their IV line
5. There are 9% ($n=6$) of patients who reported increased pain after PIVC insertion; 25% had pain of >4 out of 10 on PIVC insertion; 16% had pain >2 out of 10 on assessment
6. Increased anxiety post-PIVC insertion was reported by 5% ($n=3$) of patients; 28 (43%) were worried about their PIVC, dressing and IV line/infusion; most concerns were unresolved
7. There was a wide range in nurses' confidence in caring for patients with PIVCs, but nurses were less confident dealing with potential complications such as haematoma and cannula failure to bleed back
8. The findings reveal areas for improvement in clinical practice relating to the insertion and care of PIVCs

Conclusion

This audit has highlighted several important areas for improvement in relation to PIVC insertion and maintenance, and adherence to clinical guidelines and hospital policy. However, additional training needs were highlighted regarding nurses' confidence in cannulation particularly about potential complications of cannula insertion and nurses' ability to appropriately address patients' anxieties/concerns associated with the cannulation process. Practical and communication skills training targeting these areas may improve patients' experiences during and after cannulation.

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