Is there an optimal way of securing peripheral IV catheters in children?

Kevin Hugill, Director of Nursing Education, Hamad Medical Corporation, Doha, Qatar, explains why the answer to this question might not be as simple as people think—and urges more reflection among practitioners

Venous cannulation using a short peripheral intravenous catheter (PVC) provides an effective way of delivering medications and fluids to patients of all ages. The use of these medical devices in acute care is ubiquitous. Laudenbach et al (2014) consider PVC insertion to be the most common invasive procedure that hospitalised children experience. Despite its pervasive presence, intravenous (IV) cannulation is not benign and can bring numerous complications, such as phlebitis and extravasation (Unbeck et al, 2015). IV cannulation is more challenging in children (*Box 1*). In addition, venepuncture is stressful, painful and can be emotionally traumatic for children and parents alike.

Cursory inspection of paediatric nursing practice highlights differences in the way PVCs are secured. There are many reason for this, chief among them the unique needs of different groups of children (e.g. preterm, adolescent). Other possible reasons for inconsistency might reflect experiential learning by practitioners or technological innovation. However, some variation is unexplained and lacks any rationale or evidence base. This article aims to inspire reflection and debate about PVC securement among practitioners working with children. *Box 2* gives some suggested activities to begin this process.

The aetiology of PVC complications is complex and multifactorial. Inadequate securement is a factor in most unscheduled PVC replacements (Rickard et al, 2016) and can expedite the onset of complications such as occlusion and infiltration (Laudenbach et al, 2014; Unbeck et al, 2015). Several studies involving children report that around one quarter to one third of PVCs require replacement during treatment (Malyon et al, 2014: Rozsa et al, 2015; Unbeck et al, 2015). Skin damage (epidermal stripping, pressure injury) and mechanical phlebitis are related to securement or excessive movement of the catheter in the blood vessel (Marsh et al, 2015). There is broad agreement that secure fixation can decrease the risk of complications, preserve veins, and reduce patient exposure to repeated venepuncture attempts (Rickard et al, 2015).

There is extensive international literature demonstrating how to minimise risks during PVC insertion, use and removal (e.g. National Institute for Health and Care Excellence, 2015; Infusion Nurses Society, 2016). Some of this advice is generic, while other information relates to specific patient groups or types of device. However, despite the importance of catheter protection and security, there is a lack of robust evidence about the best methods or medical products to ensure catheter securement (Marsh et al, 2015).

IV securement for children shares some issues with other patient groups, but also has distinctive issues. All approaches need to facilitate:

- Securing the PVC in position, supporting device contours and the angle of insertion
- Protecting the device and preserving the insertion site
- Enabling visibility of insertion site
- Preventing children from interfering with the PVC while supporting normal activities
- Acceptability for children and parents
- Preventing iatrogenic harm.

How these issues are best addressed is at the core of debate about optimal PVC securement. A universal approach does not exist, as each child's needs vary over time. Transparent film dressings are widely used. Their use has advantages in terms of site visualisation and protection of the surrounding skin from microbial contamination compared with tape and gauze (Bernatchez, 2014). Adhesives used in dressings and tapes have been linked to tissue injury in children, including epidermal stripping, skin tears and dermatitis, particularly in those children born preterm (McNichol et al, 2013). Care must be taken in the selection, use and removal of dressing films and tape adhesives to mitigate these risks.

One study (Laudenbach et al, 2014; n=80, ages 2–17 years) found no differences in the rates of complication (infection, leakage, dislodgment) between children whose PVC was secured with tape and those using a securement device. The interpretation of these findings should be cautious given the small sample size and the considerable age range of participants. Other research teams (Rickard et al, 2015) have proposed larger multicentre

Box 1. Additional factors to consider when securing PVCs in children

- Gestational age
- Chronological age
- Hydration and nutritional status
- Skin maturity
- Level of physical activity
- Developmental stage
- Ability to cooperate
- Intellectual and emotional understanding
- Weight/body size

Box 2. Reflective activities

- What is the average (minimum and maximum) IV catheter dwell time in your unit? Reflect on how these figures compare with other areas in your organisation and the possible reasons for this.
- How do you protect, secure and ensure visibility of the insertion site of PVCs in your setting? What other things do you do to promote catheter longevity? If asked, how would you justify your practice?
- Find out how much your unit is spending on PVCs and IV dressings. Reflect on how these costs could be reduced while at the same time maintaining or enhancing the quality of care.
- Review your organisation's polices around PVC cannulation in children. Consider if and how they reflect the current interpretation of the evidence-base, and how this practice is audited.
- What do children in your unit (or their parents) think about the ways you secure PVCs? Reflect on what you could do to improve children's and their family's experiences around IV therapy.

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studies; while this is welcome, given the study population (adults) it might not produce answers for children's practitioners.

In practice, IV splints (limb boards) can limit excessive catheter movement when veins in joint areas are cannulated; anecdotally, some nurses suggest that, for active children, they protect the device and act as a reminder to take care. Evidence on their ability to prolong PVC use is limited and their use is sometimes contentious. Randomised trials on the effects of splinting on PVC dwell time in neonatal units reported only marginal or no benefit (Dalal et al, 2009; Raghaven and Praveen, 2015). These were small studies in one patient group, so generalisation is problematic. Furthermore, some neonatal nurses offer an alternative rationale, suggesting splints can offer a point of contact for tapes, avoiding excessive adhesive contact with skin and attendant problems.

PVC securement technologies are constantly innovating and nurses need to keep abreast of developments. Two areas of innovation are medical-grade tissue adhesives (cyanoacrylates used in wound care) and antimicrobial-impregnated dressings to reduce the likelihood of infection. These products have shown promise when used with peripherally inserted central catheters (PICCs) (Ullman et al, 2015), although the benefits in children's PVCs are less established and further research is needed to demonstrate their clinical and cost effectiveness.

Effective PVC securement ensures the device performs correctly and helps avoid complications. Currently, there is a lack of robust guidance to direct practice for all groups of children. Because of the large number of PVCs used, even small reductions in premature failure rates could make significant improvements to children's overall experiences and NHS budgets. To advance this ambition, children's nurses need to work in collaboration with others, including medical-device manufacturers, children and parents, to develop the evidence base. This is a challenge, but asking questions and reflecting on our own practice is a vital first step. **BJN**

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