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ABSTRACT

The first documented mention of a needlestick injury (NSI) in the medical literature appeared in 1906. Despite growth in academic and clinical interest for NSI prevention, a global report identified that approximately 3 million healthcare workers have suffered percutaneous exposure to blood-borne pathogens. Legislation is an important component of NSI prevention. Unfortunately, the impact of legislation may not always reduce the incidence of NSI as much as expected. Safety-engineered device (SED) implementation has demonstrated a substantial reduction in NSI rates compared with non-SEDs. More importantly, passive SEDs are 10 times less likely to be connected with an NSI incident

Key words: Needlestick injuries ■ Safety-engineered devices ■ Prevention ■ risk ■ legislation

The first documented mention of a needlestick injury (NSI) in the medical literature was 1906 (Groneberg et al, 2020). However, it was not until after 1975, following recognition that NSI was a transmission method for blood-borne viruses such as hepatitis B (HBV), hepatitis C (HCV) and, latterly, human immunodeficiency virus (HIV) that an increase in NSI-related publications was noted (Groneberg et al, 2020).

Despite growth in academic and clinical interest for NSI prevention, a 2002 global report identified that approximately 3 million health professionals had experienced percutaneous exposure to blood-borne pathogens. Further analysis from this report determined that 40% of HBV and HCV infection and 2.5% of HIV infection among health professionals could be attributed to work-based sharps injuries (World Health Organization (WHO), 2002). Nationally, an analysis of occupational exposure in England, Wales and Northern Ireland identified 14 health professionals who acquired NSI-related HCV during a 10-year period (Rice et al, 2015).

Although significant, the numbers suggested may not be wholly accurate or applicable to individual areas. Local, regional and global differences will exist due to factors such as safety-engineered device (SED) use and vaccination programmes for health professionals. In addition, more recent evidence would suggest that NSI under-reporting remains a significant issue (Ong et al, 2019; Yang et al, 2019) and examples exist of healthcare systems that continue to function without a robust NSI safety culture or appropriate post-exposure action plans (Papadopoli et al, 2019; Bouya et al, 2020). Conversely, when health professionals have a positive perception of an organisation's safety culture, the risk of NSI is reduced (Grytdal et al, 2006). What is illustrated is that the continued global prevalence of NSI is multifaceted (Reddy et al, 2017) and requires a somewhat diverse yet managed solution to the problem.

Needlestick legislation

Occupational NSI awareness is an essential component of any healthcare system. Under the Health and Safety at Work etc Act 1974 and the Management of Health and Safety at Work Regulations 1999, the NHS in England has a legal duty to protect anyone on NHS premises from the risk of blood-borne virus transmission. This legislative component was further strengthened with the introduction of specific sharps regulations from the Health and Safety Executive (HSE) (2013). The regulations detail the responsibilities of the healthcare employer, or contractor, who is duty bound to establish and enforce the regulations to protect employees from NSI. Key aspects of the regulations are summarised in *Box 1*.

Legislation is an important component of NSI prevention. Unfortunately, the impact of legislation may not always reduce the incidence of NSI as much as expected (O'Sullivan and Gallagher, 2020). A post-introduction review of the HSE sharps regulations (2013) was undertaken by the HSE (2016). They identified that 83% of the organisations reviewed failed to fully comply with the regulations. The issue of organisations failing to use safer sharps in the way the regulations identify was one of the main findings.

To successfully achieve their obligation to NSI legislation, healthcare organisations will need to introduce additional support measures. One example of a broad assistive approach is the development of four NSI prevention components by Handiyani et al (2018). This approach starts with education, which is viewed as an essential element that will increase users'

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knowledge of safety, including acknowledgement of NSI risk. The second component is safe needle use, and includes topics such as not re-capping needles and the routine use of SED. Third is encouraging and empowering communication, with the addition of established communication channels to increase the reporting of potential risks and incidents. Finally, training in the use of devices and related skills is vital to increase dexterity and clinical performance while handling sharps. Despite the importance of clinical skills training (Stringer et al, 2013), the standard of training required for effective NSI prevention may not always meet the expectations of recipients (Shirreff et al, 2019). In response, it is recommended that structured clinical simulation activities should be undertaken, which will deliver an additional level of realism and understanding regarding real-world NSI prevention (Black Thomas, 2020).

Risk associated with needlestick injury

Although regional findings are variable, pooling of global NSI data demonstrates that most NSI among health professionals is caused by hypodermic needles (55.1%) followed by intravenous cannulas (23%) and suture needles (19.6%) (Bouya et al, 2020).

The EPINet report for needlestick and sharp-object injuries (2018) reviewed a wide variety of information associated with NSI. One pertinent example from the data is that nurses top the list of job categories associated with NSI at 34.8%.

The impact of NSI on nursing is further supported by a socioeconomic study from China that analysed the cost of NSI. The study identified that almost 50% of costs linked to NSI were associated with NSI in nurses (Zhang et al, 2020). A 9-year review of NSI identified nurses as the group at greatest risk, with 62% of nurses reporting an NSI over the study period (Sharma et al, 2020). The study also identified that insertion of intravenous cannulas was the second most common clinical activity associated with NSI at 24.3%. This is ahead of lancet-associated injuries at 16.7% and venepuncture at 11.5%.

Nurses belong to a clinical group that is at significant risk of NSI. Nurses access vein for several clinical reasons, two of the most prevalent of which are blood sampling and insertion of catheters to administer medication or fluids. These procedures generally involve the use of hollow bore needles and, by virtue of the procedure, the presence of the patient's blood. In combination, the patient's blood and the hollow bore needle are thought to increase the risk of seroconversion if the health professional sustains an NSI (Mast et al, 1993). Risk of blood-borne virus transmission following an NSI is variable and reliant upon several factors, including the type of injury, blood volume inoculated, patient's viral status and load, immune status of the individual who is injured and the quality of organisational NSI management strategies in place (Riddell et al, 2015). Nevertheless, the risk of seroconversion following NSI is low, although vascular cannulas are considered to be devices that are associated with a higher risk of seroconversion (Dulon et al, 2018).

It is important to state that NSI risk extends far beyond nursing. Healthcare students from various educational domains remain at risk of NSI. For example, three-quarters of study-related accidents reported by medical students were NSI (Dietz et al, 2020). Similarly, of the adverse events reported by student nurses during clinical practice, NSI accounted for 25.2% of incidents (García-Gámez et al, 2020).

Box 1. Key points of the Health and Safety (Sharp Instruments in Healthcare) Regulations 2013

- Avoid the use of unnecessary sharps
- Use safer sharps (safety-engineered devices)
- Prevent the recapping of needles
- Place medical sharps disposal containers close to the work area
- Provide needlestick injury (NSI)-related information for the employee
- Train the employee in the safe use and disposal of sharps. Also, action required if they sustain an NSI
- Employees have a duty to notify employer of a sharps incident
- Employers must record and investigate a sharps incident
- Employees must have access to immediate medical advice and treatment if an NSI is sustained

It is likely that NSI risk among healthcare students will depend on their level of expertise in handling sharps devices (Sanchez et al, 2019). This is confirmed by Petrucci et al (2009), who reported that novice students are at greatest risk of NSI and the level of risk reduces as they progress and gain greater clinical proficiency. This issue gathers additional relevance since the Nursing and Midwifery Council (2018) states that, on registration, registered nurses will be able to undertake venepuncture and cannulation. This development will widen the pool of novice learners and potentially expose a greater number of them to additional NSI risk.

However, a note of caution must be sounded when specific groups are identified above others as being at risk of NSI. Other groups of workers who are of equal importance, but may be considered by some to be on the periphery of the healthcare team, such as cleaners, may also be at significant risk (Saadeh et al, 2020).

Psychological impact of needlestick injuries

Despite the risk of seroconversion being low, NSI remains a compelling issue for health professionals. When investigated, it is found that the psychological impact of NSI has a considerable negative influence on the wellbeing of the health professional. The possibility of post-NSI anxiety, combined with a negative stress reaction, may result in psychiatric consequences, such as adjustment disorder and post-traumatic stress disorder (Green and Griffiths, 2013). Similarly, a post-NSI psychological review demonstrated that 42.7% of those who had experienced an NSI demonstrated a greater fear of sharps devices after the incident (Matsubara et al, 2020).

Why do needlestick injuries occur

Often described as accidental, how NSIs are viewed in the clinical environment is an important preventive measure. Health professionals must understand how an underlying issue may have contributed to the accident—for example, how increased mental workload can, in turn, increase NSI rates (Hosseinabadi et al, 2019) or how work-based stress management can help

Figure 1. Jelco IntuitIV Safety Catheter with Side Injection Port

Figure 2. Jelco IntuitIV Safety Catheter with Straight Hub

decrease NSI rates and associated costs (D'Ettorre et al, 2020).

What is the role of safety-engineered devices in NSI prevention?

SEDs are associated with a substantial reduction in NSI compared with non-SEDs (Fukuda and Yamanaka, 2016). SEDs are broadly divided into two main categories: passive and active.

Passive devices do not require manual operation of the device, as the safety element will activate during normal use. In addition, as they are automatically activated at the point of use, a wider range of health professionals is protected, including those not actively involved in the procedure, but who are potentially exposed to contaminated needles—for example, those in waste management.

Active devices require activation of the safety function by a health professional (Reddy et al, 2017). This may include activation of a hinged cap or pressing an activation button to deploy the safety mechanism. Crucially, failure to activate the 'active' safety device has been identified as a major cause of NSIs associated with SEDs (Dulon et al, 2017).

Careful consideration must be made to the engineering and operation of the SED, based on its clinical use. Following the introduction of SEDs, any increase in NSI should alert the organisation to consider the quality of training, or whether poor disposal and/or problems with the safety feature exist (Schuurmans et al, 2018). A study of UK hospitals after the implementation of the sharps safety regulations (HSE, 2013) found that 77% of SEDs were correctly activated in 2016 compared with 67% in 2013. Although activation rates improved, the non-activation rate remained a concern (Grimmond, 2019). Poor adherence, such as described, is likely to be improved if the use of SEDs is supplemented with training (Tarigan et al, 2015).

Modelling has suggested that implementation of SEDs results in a 70% reduction in NSI, with a predicted NSI rate from 16.1 per 100 000 procedures with conventional devices compared with the lower figure of 3.9 per 100 000 procedures with SEDs (Hanmore et al, 2013). The model also predicted that, over a 5-year period, there would be significantly fewer incidents of exposure (n=45) to blood-borne viruses (Hanmore et al, 2013). Tosini et al (2010) showed that, when the wide range of SEDs is considered, which includes passive, active and semi-automatic devices, the associated NSI rate is lower at 2.05 per 100 000 SEDs purchased. More importantly, passive SEDs are 10 times less likely to relate to an NSI incident (Tosini et al, 2010).

The patient component cannot be discounted in any NSI debate. Although infrequent, passive device-related NSI is possible. For example, a 'heightened' NSI exposure risk exists during 'unpredictable patient interactions', which can result in NSI prior to activation of the SED (Chambers et al, 2015). These challenging situations may also exist during the cannulation of children. The resistive response of the child to cannulation has been classified into three elements: protest, where the child is insistent in their view; escape, where the child is panicked and attempts to avoid being held; and endurance, where the child may be introverted and refuses to communicate (Svendsen et al, 2015). Cannulation of a resistive child poses a heightened NSI risk to the individuals involved.

Passive SEDs

A range of passive SEDs is available and each device has generic similarities. However, the clinical performance of each of these medical devices will be attributed to a wide variation in design between brands. For example, issues such as initial flashback performance, infusion flow rates, insertion success, potential blood exposure and the force required to remove the needle stylet may vary between manufacturers (Tay et al, 2013). Therefore, it is import that procurement teams seek clinical advice when reviewing potential SEDs for clinical use.

Taking the Jelco IntuitIV peripheral intravenous cannula (Smiths Medical) as an example, users may find a number of clinically relevant design features. For example, the device has improved flashback capability. This important cannula design feature increases the operator's awareness of the needle-tip location as it enters the vessel. Successful cannula insertion is further aided by the V-point needle design. Cannula kinking or tip distortion also need to be considered during insertion. A comparison of two IV cannulas noted that the acuity of the taper at the tip of the cannula may have had a significant impact in reducing catheter distortion rates during insertion (Russell et al, 1996).

Additional features include the passive safety feature incorporated within the cannula design. An innovative needle tip protector encases the needle tip in a cylindrical mechanism, offering passive NSI protection. The device is illustrated in *Figure 1* and *Figure 2*.

Finally, it is important to consider the clinical impact of the cannulas once inserted. It has been suggested that certain catheter materials (eg Teflon) may be associated with an increased tissue response (Elam and Elam, 1993). However, when replacing peripheral intravenous cannulas, issues such as device securement, how the device is monitored and the potential effects of the catheter material on the vessel wall should be considered (Rickard et al, 2010). The Jelco IntuitIV catheter material is manufactured from a new generation of polyurethane. Polyurethane catheter material reduces the incidence of phlebitis (Gupta et al, 2007), and this new improved material specifically delivers high flow rates and better kink flow recovery compared with earlier generation materials.

Case studies

In experienced hands, successful cannulation and reduced post-insertion failure can be achieved (Marsh et al, 2018). In addition, when SEDs are used, it is responsible to expect that the passive safety mechanism will operate without hinderance. With this in mind the following case studies provide an insight into how the Jelco IntuitIV safety cannula was found to operate in both simulated and real-life clinical situations.

Case study 1

Leo Almerol, Vascular Access Clinical Nurse Specialist, Bedfordshire Hospitals NHS Foundation Trust

This case study describes the use of Jelco IntuitIV on a vessel simulator (Blue Phantom, CAE Healthcare, Canada) under ultrasound guidance.

The use of ultrasound guidance is becoming more popular because it increases first-stick success and is a useful aid, especially for patients with difficult venous access. For health professionals who are already competent in cannulation, learning to place cannulas with the aid of ultrasound may be challenging at first but, with education on the theory and supervised practice, it can be a helpful adjunct.

A suitable location for venepuncture is the proximal third of the forearm away from areas of flexion, where the cephalic and basilic vein lie. However, veins in this area may not be easily visible or palpable. Ultrasound helps the inserter to visualise the location and depth of a vessel, as well as the surrounding structures. As with all venepuncture, there are potential risks to the health professional that include exposure to blood-borne pathogens and NSI. This case study explores the compatibility of the Jelco IntuitIV with the use of ultrasound to minimise the potential risks to the health professional.

A Blue Phantom vessel simulator was used to determine whether Jelco IntuitIV is visible under ultrasound guidance. A linear transducer was used, and Jelco IntuitIV was inserted at about 45-degree angle using short-axis out-of-plane (SA-OOP) (*Figure 3*) and long-axis in-plane (LA-IP) approach (*Figure 4*). The tip and body of Jelco IntuitIV is highly visible and brightly echogenic. On SA-OOP view, the tip is seen as a bright dot (*Figure 5*) under the ultrasound beam, and sliding the probe as the tip advances into the vessel improves precision, avoiding the risk of vein wall transfixation or puncture. Similarly, in LA-IP view, the bevel tip and the body are highly visible and can be seen in hyperechoic contrast to the anechoic lumen. This means that the needle can be clearly seen as a bright (hyperechoic) line with a staircase effect. As it is advanced, it is seen entering the vessel, which contains fluid that does not transmit ultrasound waves and that appears as a black (anechoic) layer (*Figure 6*).

Both the Jelco IntuitIV straight 22G and side port/winged 20G with side port, with their new generation PUR/Techrilon material, demonstrate good visualisation under ultrasound. Both designs offer the advantage of a one-handed insertion technique, which leaves the other hand free to manipulate the ultrasound probe. The winged design has the added benefit of a comfortable grip and it also prevents rotation of the hub and catheter, ensuring that the bevel always points upwards.

A syringe can be attached to the flash chamber in place of the flash plug assembly if required for additional hold, especially when using a straight Jelco IntuitIV. Once vein entry and appropriate insertion length is sited under ultrasound, gentle aspiration (*Figure 7*) can further confirm tip position before needle withdrawal.

Following the instructions for use, accidental dislodgement can be prevented during needle withdrawal by stabilising the hub with the free hand as the tip-protector mechanism engages, locking the tip safely (*Figure 8*). This greatly reduces the risk of NSI for the clinician.

On needle removal, the body of the catheter is visible under ultrasound as hyperechoic (*Figure 9*).

Taking into account vessel depth and catheter-to-vessel wall ratio, Jelco IntuitIV is as easy to use as comparable devices with similar dimensions and offers similar levels of safeguarding against NSIs with its intuitive tip protector (*Figure 10*). It is clinically effective, especially for training ultrasound-guided venepuncture. New learners are particularly vulnerable to NSI and the passive protection offered by the tip protector (*Figure 11*) ensures a safe and comfortable learning experience, whether inserting on a visible vein or learning to place cannulas with ultrasound. Vessel simulators also offer extremely realistic ultrasound imaging characteristics that parallel human anatomy, thereby indicating that use of Jelco IntuitIV is clinically efficient.

Patients with difficult venous access can benefit from the ease of visualisation of the echogenic tip under ultrasound because it increases first-stick success. This, together with the V-point needle and catheter bevel design, promotes patient comfort.

Case study 2

Jackie Campbell, Children's Day Care Ward, Children's Hospital, Oxford

The Jelco IntuitIV 24G straight hub safety cannula was trialled by a team of experienced advanced nurse practitioners (ANPs) as an alternative to the standard non-safety devices already in use in a children's ambulatory care department. The nurses did not have previous experience of the device and understood that, while acclimatisation to it would be needed, it was important

Figure 3. Short axis out-of-plane

Figure 4. Long axis in-plane

Figure 5. Short axis out-of-plane

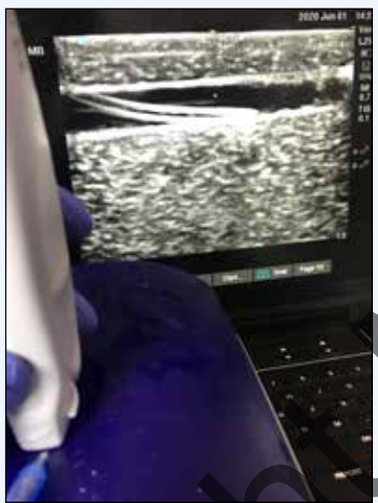

Figure 6. Long axis in-plane catheter body

Figure 7. Aspiration

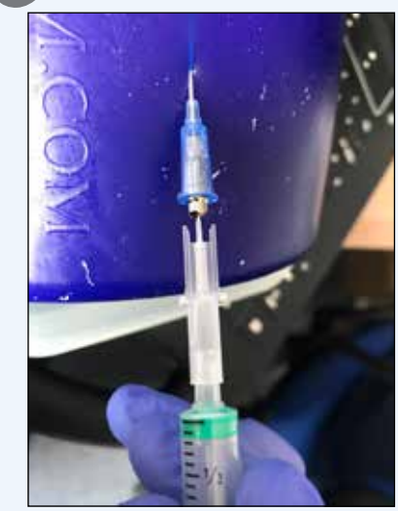

Figure 8. Tip protector engaging

Figure 9. Long axis in-plane catheter body during removal

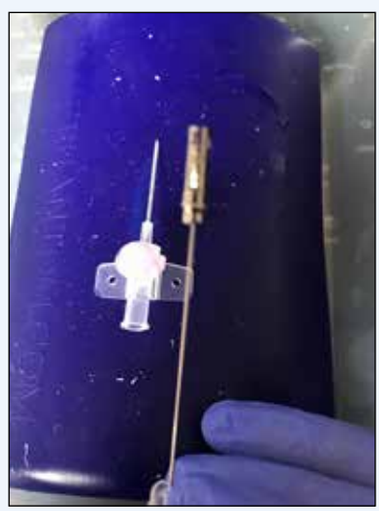

Figure 10. Tip protector out of catheter

Figure 11. Tip protector fully engaged

for their practice to look into alternative devices with safety features to avoid NSIs.

Patients in the children's ambulatory care department who require this device are typically babies and young children, but also include older children with difficult veins where a larger gauge needle has failed, requiring intravenous access for medications, contrast for scans and induction of general anaesthesia. To acclimatise to the new device, which is the same size as the non-safety devices currently used in the department, the ANPs watched videos featuring similar devices and then practised unsupervised on an artificial arm before cannulating eight paediatric patients (this is the routine training method used by these experienced nurses before implementing new devices).

Cannulation was successful in five of the eight procedures performed. The ANPs found the needle and cannula glided smoothly into the skin, and the nature of the cannula material made it easy to slide along the needle and into the vein. The slightly longer hub made securing the cannula easier because there was space to apply butterfly stitches and attach extension sets. In the three procedures where cannulation was not successful, this was because, when holding the device at the ridged section behind the yellow hub, it was not easy to visualise the flashback chamber, which was obscured under the health professional's hand, while the unfamiliar feel of the push-off shelf, which is small, sometimes took more than one attempt to dislodge. A winged device would have assisted with this. Finally, the safety feature was too long to enable the one-handed technique used in the paediatric department (the full length of the safety feature when out of catheter is 9 cm). A one-handed technique was required so that the health professional could firmly hold the child's hand with one hand, while manipulating the catheter with their free hand.

A typical case is a 12-year-old child with Crohn's disease and anaemia. She was taking immunosuppressive medication, and required cannulation for the infusion of infliximab every 6 weeks. She had difficult venous access that needed a small-gauge device. A local anaesthetic cream was applied before the procedure and she reported no discomfort during cannulation. She stated that the cannulation felt the same as usual.

Case study 3

Louise Hamilton, IV Clinical Nurse Specialist, Ashford and St Peter's NHS Foundation Trust

Mrs DC, who was 82, was admitted on one of the hottest days of the year, following a fall at her home. She sustained an inch-long laceration to the back of her head. The patient had full recollection of events and reported that she had fallen in the bathroom after an episode of diarrhoea. She lives in a house with her husband, both of whom are independent and have no care package in place.

Mrs DC has a past medical history of atrial fibrillation (AF), hypertension, vertigo and chronic obstructive pulmonary disease (COPD), and was taking edoxaban and steroid inhalers. Initially, she required vascular access for slow IV fluids for dehydration and blood sampling. She also required a head CT to rule out any head injury and the possibility of haemorrhage because she was taking an anticoagulant.

The Jelco IntuitIV 24G straight hub safety cannula was selected as the vascular access device (VAD) due to her fragile peripheral veins—a result of long-term steroid use for COPD. The significant risks for the health professional were blood exposure and sharps injury. The IntuitIV has a cylindrical tip protector that is activated on withdrawal of the needle, 360 degree coverage and appears secure without being cumbersome. It also has a transparent flashback chamber, allowing good visibility of blood return. It requires a slight adjustment of the hand grip at insertion to visualise the flashback and it needs digital pressure at the insertion site on needle withdrawal or when attaching a needle-free valve or extension set, to prevent blood exposure.

Mrs DC's veins appeared very small on ultrasound, but she described the procedure as 'painless compared to previous experience', owing to the device's small gauge and ultra-sharp bevel. The clinician found blood sampling to be easy and sufficient samples were taken. However, lack of stabilisation platform or wings affected the ease of dressing application.

Case study 4

Louise Hamilton, IV Clinical Nurse Specialist, Ashford and St Peter's NHS Foundation Trust

Ms PM, who was 88 years old, was discharged from hospital with an urinary catheter in place. She lives in a care home and has a medical history of Alzheimer's and arthritis, for which she was taking Aricept and paracetamol, as required. Unfortunately, the patient had to be readmitted because she had pulled out her catheter with the balloon still inflated, and had been complaining of lower abdominal tenderness with a noted increased agitation and reduced oral intake over the previous 48 hours.

When readmitted, IV access was indicated for blood samples and slow intravenous hydration owing to her reduced oral intake. The Jelco IntuitIV 24G straight hub safety cannula was selected in view of her fragile veins and delicate skin due to her age and dehydration. Using the 24G cannula allowed for better haemodilution and catheter-to-vein ratio within the small vein that was used for access, and reduced the catheter dwell time.

Ms PM had dehydrated and friable veins and skin, but despite this the cannula worked well. The ultra-sharp tip caused minimal trauma to the vein on puncturing and enabled sufficient blood sampling. Pressure was applied to the insertion point to prevent exposure to blood on removal of the needle. A criss-cross technique was used to secure the cannula with a semipermeable occlusive dressing.

Given Ms PM's age-related looser skin, stabilisation wings would have prevented the micromovement that occurred (which might have been caused by the dual lumen needle-free extension) and the ensuing potential for dislodgement or mechanical phlebitis.

Case study 5

Louise Hamilton, IV Clinical Nurse Specialist, Ashford and St Peter's NHS Foundation Trust

Mr RS was 78 years old and was admitted after vomiting and a reported short episode (10 seconds) of vacancy. He did

KEY POINTS

- Clinical skills training must accompany the introduction of safety-engineered devices
- Needlestick injury has a considerable negative influence on the psychosocial wellbeing of the healthcare worker
- Passive safety-engineered devices are 10 times less likely to relate to a needlestick injury incident
- It is essential that the procurement process offers a clinical focus on the evaluation of the inherent design of the safety mechanism

not appear confused, but had no recollection of what had happened and said he had no cough or fever. His medical history included a transient ischaemic attack, pacemaker implantation and recurrent urinary tract infections. He was taking atorvastatin, amlodipine, clopidogrel and folic acid. He lived at home with his wife and received a twice weekly care package. He needed a walking stick to aid mobility.

At hospital, IV access was required for initial blood sampling and initial slow intravenous hydration. His forearm veins were not palpable and initial cannulation was performed with a Jelco IntuitIV 24G straight hub safety cannula in the left antecubital fossa. Mr RS described the experience as 'painless' compared with previous experiences, which was likely due to the device's ultra-sharp tip and small gauge of the needle, which also allowed good haemodilution. It was easier to stabilise the cannula with the adhesive strips on this patient because his skin integrity was good.

However, because this is a small cannula, on needle insertion, hand-position adjustment was required for visualisation of the flashback and pressure on the insertion point was required to avoid exposure to blood when changing the extensions.

Conclusion

Organisations must consider the substantial clinical, economic and humanistic burden associated with NSI. Preventive legislation exists; however, NSI prevention is not straightforward. Despite legislation, compliance remains a significant issue. What is clear, however, is that when a safety culture exists, training and education delivered, communication methods and channels created and passive SEDs are in place, NSI rates reduce. SEDs significantly reduce the element of risk associated with human operators.

CPD reflective questions

- How effective is the training and education provided in your trust on the use of peripheral intravenous (IV) cannulas with safety-engineered devices?
- Does the decision tool, if any, in your workplace include the patient's choice or preference?
- Does your trust have a standardised use of safety-engineered devices? If not, identify barriers to implementation of safety-engineered peripheral IV cannulas

Finally, when the direct and indirect impacts on budgets are considered, the overall cost of SED introduction is regarded as cost-effective (Cooke and Stephens, 2017). To ensure an SED is fit for purpose, it is essential that the procurement process acknowledges the need for a clinical evaluation of the inherent design of the safety mechanism (Green-McKenzie et al, 2016; Mitchell et al, 2017) and of the real-world clinical application of the device. An NHS Clinical Evaluation Team (2018) product assessment of peripheral cannulas with safety features that are used in NHS settings included different models of the Jelco IntuitIV safety cannulas. This article complements the review by providing an insight into clinicians' experiences of using this device in clinical practice, highlighting how aspects of its design aided insertion. **BJN**

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